

Specifications
for

NARRAGANSETT BAY COMMISSION

Phase III CSO Program
OF-210/213/214 Facilities
CONTRACT NO. 308.04C



NARRAGANSETT BAY COMMISSION
1 SERVICE ROAD
PROVIDENCE, RI

PROGRAM MANAGEMENT TEAM



90% - RIDEM Submission

December, 2021

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**NARRAGANSETT BAY COMMISSION
CSO PHASE IIIA-4
OF-210/213/214 FACILITIES
CONTRACT NO. 308.04C**

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NARRAGANSETT BAY COMMISSION

CSO PHASE IIIA-4
OF-210/213/214 FACILITIES
CONTRACT 308.04C

NOTICE TO BIDDERS

Separate sealed Bids for the CSO Phase IIIA-4, OF-210/213/214 Facilities, Contract 308.04C, addressed to the Narragansett Bay Commission will be received at the Narragansett Bay Commission, NBC Corporate Office Building, 1 Service Road, Providence, RI 02905, **until 2:00 PM prevailing time on _____, _____, 202__** at which time and place the bids will be publicly opened and read aloud. Award will be on the basis of the lowest responsive, responsible and eligible bidder. **The bidder must submit a copy of their bids for public inspection upon the opening of the bids.**

The work generally consists of construction of a consolidation conduit, diversion structures, new outfall pipe at OF-214, a Gate and Screenings Structure (GSS) and associated approach channel, associated structures and appurtenances at the site in Pawtucket, RI. Work includes preparation of the site, construction of a consolidation conduit with segments installed by both conventional trench and trenchless installation techniques, construction of diversion structures to divert flow from the outfall to the consolidation conduit, construction of a Gate and Screenings Structure and associated approach channel to divert flow from the consolidation conduit to a newly constructed drop shaft (constructed by others) down to the CSO storage tunnel (constructed by others), construction of a new outfall pipe, protection and relocation of existing utilities, and paving.

Each Bidder shall agree to fully complete the Project, including all punch list items, within 1,000 consecutive calendar days from the date stipulated in the Notice-to-Proceed to commence "Work". Each Bidder further agrees to pay delay damages as specified in the Agreement.

The Contract Documents may be examined at the following locations:

Narragansett Bay Commission
Corporate Office Building
1 Service Road
Providence, RI 02905

The Contract Documents may be obtained for no charge at:

The Contract Documents may be obtained for no charge by sending an e-mail to NBC-Bidding@Stantec.com.

Each BID shall be accompanied by a bid deposit in the amount of 5 percent of the Total Bid Price. This bid security shall be in the form and subject to the conditions provided in the Information for Bidders.

Successful bidder must furnish 100 percent Performance Bond and 100 percent Payment Bond.

Attention of Bidders is particularly referred to the State requirements as to conditions of employment to be observed and wage rates to be paid under the Contract as on file in the Rhode Island Department of Labor, Office of the Director. All terms, conditions, and provisions of Chapters 12 and 13 of Title 37, General Laws of Rhode Island, 1956 as amended, shall apply to all bidders, and the provisions of said Chapters 12 and 13 of Title 37, General Laws of Rhode Island, 1956, as amended, are incorporated herein by reference thereto.

The Bidder's attention is called to the Equal Opportunity Clause and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth herein. This project is subject to Chapter 37-14.1 of the Rhode Island General Laws and regulations promulgated there under, which require that ten percent (10%) of the dollar value of work performed on the project be performed by minority and/or women's business enterprises. The successful Bidder will be required to provide the maximum practicable opportunity to small and minority business enterprises to participate in this Contract.

Bidders on this work will be required to comply with the President's Executive Order No. 11246 and amendments or

supplements to the Executive Order and EPA Form 5720-4.

1. The 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 workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation in each trade
	3.0%	6.9%

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 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 specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. 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 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 subcontract 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 of the subcontractor; 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 Pawtucket, Rhode Island in Providence County.

No Bidder may withdraw his bid within 90-calendar days after the actual date of the openings thereof.

The Owner reserves the right to waive any informality and/or to reject any or all bids.

A pre-bid conference will be held at 10:00 AM on _____, _____, 20____ at at the Narragansett Bay Commission, NBC Corporate Office Building, 1 Service Road, Providence, RI 02905. The meeting place is accessible. Individuals requesting interpreter services for the hearing impaired must notify the Narragansett Bay Commission office at (401) 461-8848/TDD (401) 461-6549, at least 72 hours in advance of the meeting date.

_____,^h, 202____

Laurie Horridge
Executive Director

SECTION IB

INFORMATION FOR BIDDERS

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IB.1 RECEIPT AND OPENING OF BIDS

The Narragansett Bay Commission, herein called the Owner, will receive sealed Bids for CSO PHASE IIIA-4, OF-210/213/214 FACILITIES, NBC Contract No. 308.04C. Such bids, submitted in sealed envelopes plainly marked with the date and time of opening and addressed to the Narragansett Bay Commission, and endorsed for CSO PHASE IIIA-4, OF-210/213/214 FACILITIES, NBC Contract No. 308.04C, will be received at the Narragansett Bay Commission, NBC Corporate Office Building, 1 Service Road, Providence, RI 02905, until the date and time noted in the NOTICE TO BIDDERS, at which time and place the bids will be publicly opened and read aloud. If forwarded by mail, Bid and sealed envelope marked as described above shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face and addressed as indicated above.

All bids shall comply with the provisions of RIGL §37-2-18 which provides as follows:

§ 37-2-18. Competitive sealed bidding

(a) Contracts exceeding the amount provided by § [37-2-22](#) shall be awarded by competitive sealed bidding unless it is determined in writing that this method is not practicable or that the best value for the state may be obtained by using an electronic reverse auction as set forth in § [37-2-18.1](#). Factors to be considered in determining whether competitive sealed bidding is practicable shall include whether:

(1) Specifications can be prepared that permit award on the basis of either the lowest bid price or the lowest evaluated bid price; and

(2) The available sources, the time and place of performance, and other relevant circumstances are appropriate for the use of competitive sealed bidding.

(b) The invitation for bids shall state whether the award shall be made on the basis of the lowest bid price or the lowest evaluated or responsive bid price. If the latter basis is used, the objective measurable criteria to be utilized shall be set forth in the invitation for bids, if available. All documents submitted in response to the bid proposal are public pursuant to chapter 38-2 upon opening of the bids. The invitation for bids shall state that each bidder must submit a copy of their bid proposal to be available for public inspection upon the opening of the bids. The burden to identify and withhold from the public copy that is released at the bid opening any trade secrets, commercial or financial information, or other information the bidder deems not subject to public disclosure pursuant to chapter 38-2, the Access to Public Records Act, shall rest with the bidder submitting the bid proposal.

(c) Unless the invitations for bid are accessible under the provisions as provided in § [37-2-17.1](#), public notice of the invitation for bids shall be given a sufficient time prior to the date set forth therein for the opening of bids. Public notice may include publication in a newspaper of general circulation in the state as determined by the purchasing agent not less than seven (7) days nor more than twenty-eight (28) days before the date set for the opening of the bids. The purchasing agent may make a written determination that the twenty-eight (28) day limitation needs to be waived. The written determination shall state the reason why the twenty-eight (28) day limitation is being waived and shall state the number of days, giving a minimum and maximum, before the date set for the opening of bids when public notice is to be given.

(d) Bids shall be opened and read aloud publicly at the time and place designated in the invitation for bids. Each bid, together with the name of the bidder, shall be recorded and an abstract made available for public inspection.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

(e) Immediately subsequent to the opening of the bids, the copies of bid documents submitted pursuant to subsection 37-2-18(b) shall be made available for inspection by the public. Any objection to any bid on the grounds that it is nonresponsive to the invitation for bids must be filed with the purchasing agent within five (5) business days of the opening of the bids. The purchasing agent shall issue a written determination as to whether the subject bid is nonresponsive addressing each assertion in the objection and shall provide a copy of the determination to the objector and all those who submitted bids at least seven (7) business days prior to the award of the contract. If a bid is nonresponsive to the requirements in the invitation to bid, the bid is invalid and the purchasing agent shall reject the bid. The purchasing agent shall have no discretion to waive any requirements in the invitation to bid which are identified as mandatory. Nothing in this section shall be construed to interfere with or invalidate the results of the due diligence conducted by the division of purchasing to determine whether bids are responsive and responsible.

(f) Subsequent to the awarding of the bid, all documents pertinent to the awarding of the bid that were not made public pursuant to subsection 37-2-18(e) shall be made available and open to public inspection, pursuant to chapter 38-2, the Access to Public Records Act, and retained in the bid file. The copy of the bid proposal provided pursuant to subsection 37-2-18(b) shall be retained until the bid is awarded.

(g) The contract shall be awarded with reasonable promptness by written notice to the responsive and responsible bidder whose bid is either the lowest bid price, lowest evaluated, or responsive bid price.

(h) Correction or withdrawal of bids may be allowed only to the extent permitted by regulations issued by the chief purchasing officer.

(i) As of January 1, 2011, this section shall apply to contracts greater than one million dollars (\$1,000,000); on January 1, 2012 for all contracts greater than seven hundred fifty thousand dollars (\$750,000); on January 1, 2013 for all contracts greater than five hundred thousand dollars (\$500,000); and on January 1, 2014 for all contracts awarded pursuant to this section.

History of Section

(P.L. 1989, ch. 526, § 2; P.L. 1994, ch. 137, § 1; P.L. 1999, ch. 367, § 1; P.L. 2005, ch. 296, § 1; P.L. 2010, ch. 221, § 1; P.L. 2011, ch. 342, § 1; P.L. 2011, ch. 384, § 1 .)

IB.2 LOCATION AND WORK TO BE DONE

The location and general description of the work herein specified to be done (herein sometimes referred to as the "Work") is detailed in Section 01010.

IB.3 PRE-BID CONFERENCE

A pre-bid conference will be held at the project site at Narragansett Bay Commission, NBC Corporate Office Building, 1 Service Road, Providence, RI 02905 at the date and time noted in the NOTICE TO BIDDERS.

The meeting place is accessible. Individuals requesting interpreter services must notify the Narragansett Bay Commission Office at (401) 461-8848/TTD (401) 461-6549, at least 72 hours in advance of the meeting date.

ATTENDANCE AT THE PRE-BID CONFERENCE IS NOT MANDATORY BUT IS STRONGLY ENCOURAGED.

IB.4 CONTRACT DOCUMENTS

The Drawings, INFORMATION FOR BIDDERS, SPECIFICATIONS, all Addenda and forms for BID, AGREEMENT, and BONDS may be examined and obtained at the location and for the deposit sum designated in the NOTICE TO BIDDERS.

IB.5 DEPOSIT ON DRAWINGS AND DOCUMENTS

Not applicable. Contract Documents issued per the NOTICE TO BIDDERS.

IB.6 INFORMATION NOT GUARANTEED

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes or other structures encountered during construction will be the same as those indicated in the Contract Documents.

It is agreed further and understood that no bidder or contractor shall use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner or the Program Manager, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

IB.7 BORINGS

Available boring information is included in an Attachment of the Contract Specifications.

IB.8 WORK ON STATE, MUNICIPAL AND PRIVATE PROPERTY

Particular attention is hereby directed to the fact that portions of the work included under this Contract may be done within the limits of properties that are State-owned, municipally-owned, or privately-owned. The Contractor shall be responsible for coordinating the prosecution of the work of this Contract with the various property owners, and for providing the work in accordance with any additional requirements as specified herein.

IB.9 OTHER CONTRACTS

The attention of bidders is directed to the fact that the work to be done under this contract may be only part of a program of improvements, that contracts could be let for additional facilities, and that the successful operation of the improvements is dependent upon the completion of the work under this contract and of the work to be done by others.

It is essential that all parties interested in the project cooperate to the end that the entire project will be brought to a successful conclusion as rapidly as possible, but the Owner cannot guarantee that no interference or delay will be caused thereby. Interference and delay resulting from such cooperation shall not be the basis of claims against the Owner.

IB.10 BIDDERS TO INVESTIGATE

Bidders are required to submit their Bids upon the following express conditions which shall apply to and be deemed a part of every Bid received, viz.:

Bidders must satisfy themselves by personal examination of the site of the Work and by such other means as they may wish, as to the actual conditions there existing, the character and requirements of the Work, the difficulties attendant upon its execution, and the accuracy of all estimated quantities stated in the Bid.

IB.11 QUESTIONS REGARDING THE CONTRACT DOCUMENTS

In general, no answer will be given to prospective bidders in reply to an oral question if the question involves an interpretation of the intent or meaning of the Contract Documents, or the equality or use of products or methods other than those designated or described in the Contract Documents. Any information given to bidders other than by means of the Contract Documents, including Addenda, as described below, is given informally, for information and the convenience of the bidder only and is not guaranteed. The bidder agrees that such information shall not be used as the basis of nor shall the giving of any such information entitle the bidder to assert any claim or demand against the Owner or the Program Manager on account thereof.

To receive consideration, all questions shall be submitted in writing (by mail, e-mail, or delivery) to To receive consideration, all questions shall be submitted by e-mail to NBC-Bidding@Stantec.com by the close of business ten (10) calendar days prior to the opening of bids. The Program Manager will review and consolidate questions received before the deadline, prepare written answers, and respond by Addenda sent at least four days prior to the receipt of Bids to those prospective bidders known to have taken out sets of the Contract Documents. Such Addenda shall become a part of the Contract Documents. In general, the Program Manager will neither approve nor disapprove particular products prior to the opening of Bids; such products will be considered when offered by the Contractor for incorporation into the Work.

The Contractor agrees to use the products and methods designated or described in the Contract Documents as amended by the Addenda.

Each bidder shall be responsible for determining that he has received all Addenda issued.

IB.12 BLANK FORM FOR BID

All Bids must be submitted upon the prescribed form for Bid annexed hereto, state the proposed price for each item of the Work and be signed by the bidder with his business address and place of residence. Bid forms shall be completed in ink or be typed.

Discrepancies between unit prices and their respective total amounts will be resolved in favor of the unit prices. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

All bids should be prepared in conformity with, and based upon and submitted subject to, all requirements of the Contract Documents, together with all addenda thereto.

All names shall be typed or printed below the signature.

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

IB.13 CONDITIONS OF WORK

Each bidder must inform himself fully of the conditions relating to the construction and labor under which the work is now or will be performed; failure to do so will not relieve the successful bidder of his obligation to furnish all materials and all labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the consideration set forth in his bid. Insofar as possible, the Contractor, in the carrying out of his work, shall employ such methods or means as will not cause any interruption of or interference with: the operation of the existing treatment facilities; sewer; traffic; use of existing utilities and structures affecting the work or other similar conditions at the site, character of equipment and facilities needed preliminary to and during prosecution of the work; requirements of owners and controlling authorities having jurisdiction over the various lands, existing structures, facilities, and utilities; and all other conditions affecting the work to be done, and the labor and materials needed; and he shall make his bid in sole reliance thereon; and shall not, at any time after submission of a bid, assert that there was any misunderstanding in regard to the nature or amount of the work to be done.

IB.14 BID SECURITY

Each Bid submitted shall be accompanied by a bid deposit in the form of bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company qualified to do business in the State of Rhode Island and satisfactory to the Owner. Any checks should be payable to the Narragansett Bay Commission Fund.

The amount of the bid deposit shall be as designated in the NOTICE TO BIDDERS.

The bid deposit must be enclosed in the sealed envelope containing the BID.

Each bid deposit may be held by the Owner as security for the fulfillment of the bidder's promises that the bidder will not withdraw his BID while it is being considered and will execute the AGREEMENT and furnish the required CONTRACT BONDS and Insurance if his BID is accepted. Should the bidder fail to fulfill such agreements, his bid check shall become the property

of the owner or if a bid bond was furnished, the bid bond shall become payable to the Owner, as liquidated damages; otherwise, the bid check shall be returned to the bidder as hereinafter provided, or if the security is a bid bond, the bid bond shall become null and void.

The bid deposit will be returned to all except the three lowest bidders within three working days after the opening of bids, and the remaining checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the agreement, or, if no award has been made within ninety calendar days after the date of the opening of bids, so long as he has not been notified of the acceptance of his bid.

IB.15 WITHDRAWAL OF BIDS

Except as hereinafter in this subsection or otherwise expressly provided, once his bid is submitted and received by the Owner for consideration and comparison with other bids similarly submitted, the Bidder agrees that he may not and will not withdraw it within 90 consecutive calendar days after the actual date of the opening of Bids. The bidder may withdraw his bid by doing so in writing after the 90 day period.

Upon proper written request and identification, bids may be withdrawn at any time prior to the designated time for the opening of bids.

Unless a Bid is withdrawn as provided above, the bidder agrees that it shall be deemed open for acceptance until an AGREEMENT has been executed by both parties thereto or until the Owner notifies the bidder in writing that his Bid is rejected or that the Owner does not intend to accept it or returns his Bid deposit. Notice of acceptance of a Bid shall not constitute rejection of any other Bid.

IB.16 COMPARISON OF BIDS

Bids will be compared on the basis of the experience and competence of the bidders and on the basis of the totals of the quantities listed in the proposal under the enumerated items at the unit prices or lump sums bid for these items. The contract will be awarded to the lowest responsive, responsible and eligible bidder. However, the Owner may reject any and all bids if it is in the public interest to do so.

The term, "Lowest responsive, responsible and eligible bidder," shall mean the bidder whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work.

Bids shall be made on each separate item of work shown in the bid (proposal) with reasonable relation to the probable cost of doing the work included in such items. The Owner reserves the right to reject, wholly, any bid on which an item or items thereof are obviously unbalanced or appear to the Owner to be so unbalanced as to affect or to be liable to affect adversely any interests of the Owner. The attention of the bidder is called to the fact that unbalancing of bids may adversely affect the Contractor if certain portions of the work are increased or decreased as provided in the Contract Documents.

A bidder shall state the proposed price for the work by which the bids will be compared. This price is to cover all the expenses incidental to the completion of the work in full conformity with the

Contract Documents. In the event that there is a discrepancy between the lump-sum or unit prices written in words and numerical figures, the prices written in words shall govern. No bid will be accepted which does not contain a unit price or lump sum as indicated for each of the applicable items enumerated in the proposal form.

IB.17 RIGHT TO REJECT BIDS

The Owner reserves the right to reject any or all Bids should the Owner deem it to be in the public interest to do so.

The Owner may reject every bid which is not accompanied by the required bid deposit or which is on a form not completely filled in, which is incomplete, conditional, obscure, or which contains any addition not called for, or which does not include the State of Rhode Island MBE/WBE Compliance Statement.

A bid which includes for any item a Bid Price that is abnormally low or high may be rejected as unbalanced.

Bidder(s) will be disqualified if more than one proposal is received from an individual, firm, partnership, corporation, or association under the same or different names and such proposals will not be considered.

IB.18 CONTRACT BONDS

The Bidder whose Bid is accepted agrees to furnish the Contract Bonds in the forms which follow in SECTION CB, titled CONTRACT BONDS, each in the sum of the full amount of the Contract Price and duly executed by the said bidder as Principal and by a surety company qualified to do business under the laws of the State of Rhode Island and satisfactory to the Owner, as Surety, for the faithful performance of the Contract and payment for labor and materials. The Surety Company shall have a rating of B+ or better within the Best Key Rating Guide. The premiums for such Bonds shall be paid by the Contractor.

IB.19 EXECUTION OF AGREEMENT

The Bidder whose Bid is accepted agrees to duly execute the AGREEMENT and furnish the required CONTRACT BONDS within the time limit stated in the BID after notification that the AGREEMENT is ready for signature.

When the Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by at least four unsigned copies of the Agreement and all other applicable Contract Documents. Within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification Contractor shall execute and return all copies of the Agreement and all other applicable Contract Documents to the Owner. Within ten days thereafter Owner will deliver one fully signed copy to Contractor.

IB.20 INSURANCE CERTIFICATES

The Contractor will not be permitted to start any construction work until he has submitted certificates covering all insurance called for under that subsection of the AGREEMENT, titled "Insurance".

IB.21 RHODE ISLAND SALES AND USE TAX

Materials and equipment purchased for permanent installation under this Contract are exempt from the Rhode Island Sales and Use Tax. The Owner shall supply the Contractor with the required tax information upon award of the Contract. Each bidder shall take this exemption into account in calculating his bid for the work.

IB.22 PREVAILING WAGE RATES

The Prevailing Wage General Wage Decision in effect at the time that the Bids are opened is included in Section 01067 of the Contract Documents. This information may also be obtained from the Rhode Island Department of Labor and Training, Division of Professional Regulation, 1511 Pontiac Avenue - Building 70, P.O. Box 20247, Cranston, RI 02920-0943. Telephone: (401) 462-8580 Fax (401) 462-8528. This information can also be accessed from the following website address <http://www.access.gpo.gov/davisbacon/ri.html>.

IB.23 MANUFACTURER'S EXPERIENCE

Wherever it is written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period may be considered if the equipment supplier or manufacturer is willing to provide a bond or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

IB.24 ACCESS TO WORK

Representatives of the State and any local, municipal and federal agencies having a direct interest in the Work shall have access to the Work under this Agreement wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and inspection.

IB.25 ABILITY AND EXPERIENCE OF BIDDER

No award will be made to any bidder who cannot satisfy the Owner that he has sufficient ability and experience in this class of work and sufficient capital and plant to enable him to prosecute and complete the Work successfully within the time named. The Owner may make such investigations as they deem necessary to determine the ability of the bidder to perform the work; and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request.

The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder is not properly qualified to carry out the obligations of the contract and to complete the work contemplated therein within the time stated. The Owner's decision on judgment on these matters shall be final, conclusive, and binding.

IB.26 POWER OF ATTORNEY

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

IB.27 LAWS AND REGULATIONS

The bidder's attention is directed to the fact that all applicable Federal and State laws, municipal ordinances, and rules and regulations or authorities having jurisdiction over construction of the project, shall apply to the Contract throughout, and shall be deemed to be included in the Contract the same as though herein written out in full.

IB.28 DATUM

The figures given in the Contract Documents after the word elevation (or letters "El.") shall mean the datum.

IB.29 OWNER MAY OMIT WORK

The Owner reserves the right to omit certain items in their entirety and other items in part as set forth in the Bid.

IB.30 REDUCTION IN SCOPE OF WORK

The Owner reserves the right to decrease the scope of the work to be done under this contract and to omit any work in order to bring the cost within available funds. To this end, the Owner reserves the right to reduce the quantity of any items or omit all of any items as set forth in the BID, either prior to executing the contract or at any time during the progress of the work. The Owner further reserves the right, at any time during the progress of the work, to restore all or part of any items previously omitted or reduced. Exercise by the Owner of the above rights shall not constitute any ground or basis of claim for damages or for anticipated profits on the work omitted.

IB.31 NONDISCRIMINATION IN EMPLOYMENT

Contracts for work under this bid (proposal) will obligate the contractors and subcontractors not to discriminate in employment practice.

The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, handicap, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed and the employees are treated during employment without regard to their race, color religion, sex, age, handicap, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotions, or transfers; recruitment or recruitment advertising, layoffs, or terminations; rates of pay or other forms of compensation; selection for training including apprenticeship; and participation in recreational and educational activities. The Contractor agrees to post in conspicuous places available to employees and applicants for employment a notice setting forth the provisions of this non-discrimination clause. 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 consideration for employment without regard to race, color, religion, sex, age, handicap or national origin. The Contractor will cause the foregoing provisions to be inserted in all sub-contracts for any work

covered by this contract so that such provisions will be binding upon each sub-contractor and upon sub-contracts for standard commercial supplies or raw materials.

The Contractor shall keep such records and submit such reports concerning the racial and ethnic origin of applicants for employment and employees as the Commission may require as consistent with Federal and State law.

The Contractor agrees to comply with such rules, regulations, or guidelines as the State of Rhode Island may issue to implement these requirements. The Contractor further warrants that he will comply with, Title VI of the Civil Rights Act of 1964, 42 U.S.C. 200d to d4.

Contractors shall comply with the provisions of the General Laws of Rhode Island and attention is called to Title 37, Chapter 13, Section 1-16, relative to the payment of wages, obligations and charges by Contractors on public works projects. Non-resident Contractors are subject to Section 44-1-6 of the RI General Laws, as amended, regarding OUT-OF-STATE CONTRACTORS.

The successful bidder will be required to comply with Equal Opportunity Requirements and to abide by the prevailing wage rates for Public Works Projects for all employees on the job. It is the responsibility of Bidders to inform themselves as to the local labor conditions, overtime compensation, health and welfare contributions, labor supply and prospective changes or adjustment of wage rates. Information is available at the Department of Labor.

IB.32 SEQUENCE OF OPERATIONS

The Contractor's attention is directed to the fact that there may be required work sequences in other sections of the Contract. The Contractor shall have no claim for additional compensation or damage on account of the required sequence of operations.

IB.33 PROTECTION OF LIVES AND HEALTH

This project is subject to all of the Safety and Health Regulations (Title 29, Part 1926, CFR, and all subsequent amendments) as promulgated by the United States Department of Labor on June 24, 1974. Contractors are urged to make themselves familiar with these regulations.

IB.34 PROJECT SIGN

The Contractor shall construct one sign in accordance with the Details included in Section 01068. The sign shall be erected in a location selected by the Program Manager. The Contractor shall maintain the sign throughout the duration of the Contract.

IB.35 STEEL PRODUCTS PROCUREMENT ACT

The Contractor shall comply with the Provisions of R.I. General Laws Section 37-2.1-1 et seq. concerning the purchasing of domestic steel.

IB.36 EQUAL EMPLOYMENT OPPORTUNITY

The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the Standard Federal EEO Construction Contract Specification set forth herein.

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

<u>Timetables</u>	Goals for minority participation for each trade	Goals for female participation in each trade
	3.0%	6.9%

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. 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 its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. 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 his projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of 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.

The contractor shall provide written notification to the Director of the office of Federal Compliance Programs within 10 working days of award of any construction subcontract 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.

As used in this notice, and in the contract resulting from this solicitation, the "covered area" is Pawtucket, Rhode Island in Providence County.

IB.37 MINORITY AND WOMEN'S BUSINESS ENTERPRISE PARTICIPATION

The Offeror's or Bidder's attention is called to the "Regulations Governing Participation by Minority Business Enterprises in State Funded and Directed Public Construction Projects, Construction Contracts and Procurement Contracts for Goods and Services".

The goals for minority and/or women's business enterprise, expressed in percentage terms of the total dollar of the Work is ten percent.

Bidders shall submit an MBE/WBE Compliance Statement with the bid. Failure to provide said statement with the bid shall render the bid nonresponsive and result in the rejection of the bid. After a contractor has been identified as the apparent low bidder, the contractor shall, within 10 days of notification, prepare an MBE/WBE Compliance Plan for that project and submit it to the Director of the Department of Administration or his designee for approval. The Plan shall identify the MBE/WBE by name, subcontract dollar amount and type for each subcontract that the contractor projects will be awarded to MBE/WBEs over the period of the project. This plan must be approved by the State of Rhode Island, Department of Administration prior to award of the contract.

IB.38 PERMITS

The Contractor shall be responsible for obtaining local building and other required permits. Costs for such permits are the responsibility of the Contractor and shall be included in the Bid Price.

END OF INFORMATION TO BIDDERS

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BID (B)

Bidder's Name _____

To the Narragansett Bay Commission, herein called the Owner, for Construction of CSO Phase IIIA-4, OF-210/213/214 Facilities, NBC Contract No. 308.04C in Pawtucket, Rhode Island.

The Undersigned, as bidder, herein referred to as singular and masculine, declares as follows:

- (1) The only parties interested in this BID as Principals are named herein;
- (2) this BID is made without collusion with any other person, firm, or corporation;
- (3) no officer, agent, or employee of the Owner is directly or indirectly interested in this BID;
- (4) he has carefully examined the site of the proposed Work and fully informed and satisfied himself as to the conditions there existing, the character and requirements of the proposed Work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this BID, and he has carefully read the Specifications and examined the Drawings, and annexed proposed AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;
- (5) he understands that information relative to subsurface and other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) has been furnished only for his information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered will be the same as those shown on the Drawings or in any of the other Contract Documents and he agrees that he shall not use or be entitled to use any such information made available to him through the Contract Documents or otherwise or obtained by him in his own examination of the site, as a basis of or ground for any claim against the Owner or the Program Manager arising from or by reason of any variance which may exist between the aforesaid information made available to or acquired by him and the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered during the construction work, and he has made due allowance therefore in this BID;
- (6) and he understands that the quantities of work tabulated in this BID or indicated on the Drawings or in the Specifications or other Contract Documents are only approximate and are subject to increase or decrease as deemed necessary by the Program Manager; and he agrees that, if this BID is accepted he will contract with the Owner, as provided in the copy of the Contract Documents deposited in the office of the Program Manager, this BID form being part of said Contract Documents, and that he will perform all the work and furnish all the materials and equipment, and provide all labor, services, plant, machinery, apparatus, appliances, tools, supplies and all other necessities required by the Contract Documents in the manner and within the time therein prescribed and according to the requirements of the Program Manager as therein set forth.

(Note: Bidders must bid on each item. All entries in the entire BID must be made clearly and in ink or be typed; prices bid should be written in both words and figures. In the case of discrepancy the value in words shall govern.)

1.1 BID SCHEDULE

BID ITEM	DESCRIPTION	UNIT	QTY	UNIT BID PRICE	TOTAL COST
-------------	-------------	------	-----	-------------------	---------------

1.	Miscellaneous Utility Allowance	ALLOW	1	\$250,000.00	\$250,000.00
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TOTAL PRICE IN WORDS:

2.	Hazardous Materials Management / Disposal Allowance	ALLOW	1	\$150,000.00	\$150,000.00
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TOTAL PRICE IN WORDS:

3.	Mobilization / Demobilization	LS	1	_____	_____
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TOTAL PRICE IN WORDS:

4.	Earth Excavation and Backfill For Test Pits	CY	200	_____	_____
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TOTAL PRICE IN WORDS:

5.	Rock Excavation and Disposal	CY	1,250	_____	_____
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TOTAL PRICE IN WORDS:

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

BID ITEM	DESCRIPTION	UNIT	QTY	UNIT BID PRICE	TOTAL COST
-------------	-------------	------	-----	-------------------	---------------

6.	Additional Gravel Borrow	CY	100	_____	_____
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TOTAL PRICE IN WORDS:

7.	Additional Crushed Stone	CY	100	_____	_____
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TOTAL PRICE IN WORDS:

8.	Additional Concrete	CY	100	_____	_____
----	---------------------	----	-----	-------	-------

TOTAL PRICE IN WORDS:

9.	Controlled Low Strength Material	CY	200	_____	_____
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TOTAL PRICE IN WORDS:

10.	Disposal of Excess Soil – Category #1	TON	7,000	_____	_____
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TOTAL PRICE IN WORDS:

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

BID ITEM	DESCRIPTION	UNIT	QTY	UNIT BID PRICE	TOTAL COST
-------------	-------------	------	-----	-------------------	---------------

11.	Disposal of Excess Soil - Category #2	TON	800	_____	_____
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TOTAL PRICE IN WORDS:

12.	All Remaining Work	LS	1	_____	_____
-----	--------------------	----	---	-------	-------

TOTAL PRICE IN WORDS:

The Total Amount of this bid, based upon the quantities of materials and labor estimated by the Bidder, (total of Bid Items No. 1 through 12, inclusive), as computed by the Bidder is:

_____ Dollars

and _____ Cents \$ _____
(in words) (in figures)

1.2 ADDITIONAL BID PROVISIONS

The undersigned agrees that for extra work, if any, performed in accordance with the provisions of the annexed form of AGREEMENT, he will accept compensation as stipulated therein in full payment for such extra work.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

As provided in the INFORMATION FOR BIDDERS, the bidder hereby agrees that he will not withdraw this BID within 90 calendar days after the actual date of the opening of Bids. If the Owner shall accept this Bid and a Notice of Award accompanied by at least four unsigned copies of the Agreement and all other applicable Contract Documents are delivered to the undersigned within ninety calendar days of the Receipt of Bids, the undersigned will within five days, excluding Saturdays, Sundays, and holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to the Owner. The premiums for all Bonds required shall be paid by the Contractor and shall be included in the Contract Price. The undersigned further agrees that the Bid Security accompanying this Bid shall become the property of the Owner if the Bidder fails to execute the Agreement as stated above.

The undersigned hereby agrees that the Contract Time shall commence upon the date stipulated in a written Notice to Proceed, and that all work required under the Contract shall be completed before the time limit stipulated in Table A of the Agreement.

Delay damages as detailed in Table A of the Agreement shall be imposed upon Bidder for each calendar day of delay in completing all obligations and work required within the time specified.

The bidder shall complete and submit with his bid the pages 1 through 16 inclusive. Failure to submit all bid pages, completed, shall render the bid nonresponsive and result in rejection of the bid.

Bidder acknowledges receipt of the following addendum:
Addendum No. _____ through Addendum No. _____

The bidder, by submittal of this BID, agrees with the Owner that the amount of the bid security deposited with this BID fairly and reasonably represents the amount of damages the Owner will suffer due to the failure of the bidder to fulfill his agreements as above provided.

(SEAL)

(Name of Bidder)

By _____
(Signature and title of authorized representative)

(Printed name of authorized representative)

(Business address)

(City and State)

Date _____

The bidder is a corporation incorporated, a partnership or an individual in the State or Commonwealth of _____.

(Note: If the bidder is a corporation, affix corporate seal and give below the names of its president, treasurer, and general manager if any; if a partnership, give full names and residential addresses of all partners; and if an individual, give residential address if different from business addresses.)

The required names and addresses of all persons interested in the foregoing Bid, as Principals, are as follows:

STATEMENT OF BIDDERS QUALIFICATIONS

The following shall accompany the bid and is required as evidence of the bidder's qualifications to perform the work, as bid upon, in accordance with the contract drawings and specifications. This statement must be notarized. All questions must be answered. Additional data may be submitted on separate attached sheets.

1. Name of Bidder _____
2. Permanent Main Office Address _____

3. Official Mailing Address This Contract _____

4. When Organized _____
5. Where Incorporated, If a Corporation _____
6. Years Contracting under Present Name _____
7. List contracts on hand, and those completed similar in nature to this project.

Work Performed As
Contractor

Owner	Program Manager	Subcontractor	Description of Work	Contract Amount	Date Cmp.

8. List any work the firm has failed to complete, state where and why.

9. If you have ever defaulted on any contract, state where and why.

Name of Bidder

Signature and title of authorized representative

Printed name of authorized representative

Business address

City and State

Date

NOTARIZED

Signed before me on this _____ day of _____, 20 _____

Notary Public (seal)

My commission expires _____

CERTIFICATE OF AUTHORIZATION
FOR
BIDDING REPRESENTATIVE

(Note: Bidder must complete for certification of authorized representative signing Bid.)

At a duly authorized meeting of the Board of Directors of the

_____, held on _____,
(Name of Corporation) (Date)

at which all the Directors were present or waived notice, it was voted that

(Name of Authorized Representative) (Title)

seal of the company shall be valid and binding upon this company.

A true copy

ATTEST _____
Clerk

Place of business _____

I hereby certify that I am the clerk of the _____
(Name of the Corp.)

_____, that _____
(Name of Authorized Representative)

the duly elected _____ of said
(Title)

company, and that the above vote has not been amended or rescinded and remains in full force and effect as of the date of this contract.

Corporate Seal

Clerk

MBE/WBE COMPLIANCE STATEMENT

_____ hereby acknowledges (its/my)
(Name of Bidder)

obligation to award a minimum of ten percent (10%) of the dollar value of the entire amount of the bid to minority and/or women's business enterprise and to comply with R.I.G.L. 17-14-1 et seq. and the regulations promulgated thereunder.

By _____
(Signature and title of authorized representative)

(Printed name of authorized representative)

Disadvantaged Business Enterprise (DBE) Program

DBE Subcontractor Performance Form

This form is intended to capture the DBE¹ subcontractor's² description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractor's bid or proposal package.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work
DBE Certified By: <input type="checkbox"/> DOT <input type="checkbox"/> SBA		Meets/ exceeds EPA certification standards?
<input type="checkbox"/> Other: _____		<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> Unknown

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

Disadvantaged Business Enterprise (DBE) Program

DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	Date

Subcontractor Signature	Print
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.



Approved: 8/13/2013

Disadvantaged Business Enterprise (DBE) Program

DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE¹ subcontractors² and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Issuing/Funding Entity:			

I have identified potential DBE certified subcontractors	___ YES	O
--	---------	---

If yes, please complete the table below. If no, please explain:

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified

1 A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

2 Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

Disadvantaged Business Enterprise (DBE) Program

DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**CERTIFICATION REGARDING DEBARMENT & SUSPENSION AND OTHER
RESPONSIBILITY MATTERS**

In accordance with the Executive Order 12549, the prospective primary participant certifies to the best of his / her knowledge and belief, that its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;
- b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offence in connection with obtaining, attempting to obtain, or performing a public (federal, state, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification.
- d. Have not within a three-year period preceding this application / proposal had one or more public transactions (federal, state, or local) terminated for cause of default.
- e. Acknowledge that all sub-contractors selected for this project must be in compliance with paragraphs (1) (a – d) of this certification.

Name and Title of Authorized Agent

Date

Signature of Authorized Agent

_____ I am unable to certify to the above statements. My explanation is attached.

SECTION BB

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned

_____, as Principal, and
(insert name of bidder)

_____, as Surety, are hereby
(insert name of surety)

held and firmly bound unto the Narragansett Bay Commission, NBC Corporate Office Building, 1 Service Road, Providence, RI 02905, as Owner, in the sum of 5% of the bid as liquidated damages for payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that whereas the Principal has submitted to the Narragansett Bay Commission a certain Bid attached hereto and hereby made a part hereof, to enter into a contract in writing, hereinafter referred to as the "Agreement" and/or "Contract" for CSO Phase IIIA-4, OF-210/213/214 Facilities, NBC Contract No. 308.04C.

NOW THEREFORE,

(a) If said BID shall be rejected or withdrawn as provided in the INFORMATION FOR BIDDERS attached hereto or, in the alternative,

(b) If said BID shall be accepted and the Principal shall duly execute and deliver the form of AGREEMENT attached hereto and shall furnish and specified bonds for the faithful performance of the AGREEMENT and/or Contract and for the payment for labor and materials furnished for the performance of the AGREEMENT and/or Contract, then this obligation shall be void, otherwise it shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder in no event shall exceed the amount of this obligation.

The Surety, for value received, hereby agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extensions of the time within which such BID may be accepted, and said Surety does hereby waive notice of any such extensions.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

IN WITNESS WHEREOF, the parties hereto have duly executed this bond on the
_____ day of _____, 20__.

(SEAL)

_____ L.S.
(Name of Principal)

By _____

(SEAL)

(Name of Surety)

By _____

Sealed and delivered
in the presence of

CONTRACT AGREEMENT (CA)

Project Title: CSO Phase IIIA – 4: OF-210/213/214 Facilities (hereinafter, the “Project”).

Project Location: City of Pawtucket, RI

Contract: 308.04C

THIS Agreement, is made as of this _____ day of _____ 202__.

(hereinafter, the “Agreement”) by and between the Narragansett Bay Commission, with an address of NBC Corporate Office Building, 1 Service Road, Providence, RI 02905, acting by and through its Commission, duly authorized therefor, which acts herein solely for said Commission and without personal liability to itself, hereinafter referred to as the “Owner,” and _____, a corporation organized and existing under the laws of the State of _____, with an address of _____ (hereinafter referred to as the “Contractor”).

WITNESSETH, that the Owner and the Contractor, each in consideration of the undertakings, promises, and agreements on the part of the other herein contained, have undertaken, promised, and agreed and do hereby undertake, promise, and agree, the Owner for itself, its successors and assigns, and the Contractor for itself and its heirs, executors, administrators, successors and assigns, as follows:

1. The Contractor will furnish all labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, and all other things necessary to do all work required for the completion of the Project as specified and described herein.
2. As specified and described herein, the Contractor will commence the work required by the Contract Documents on a date specified in a written “Notice to Proceed.”
3. The Contractor will fully complete the Project before the expiration of the time limit stipulated in Table A of this Agreement unless the period for completion is extended otherwise by and in accordance with the Contract Documents. The Contractor further agrees to pay delay damages for each calendar day of delay in completing all obligations and work required within the time specified. The value of the delay damages is indicated in Table A included herewith as part of the Agreement.
3. The Contractor agrees to perform all of the work specified in the Contract Documents and necessary to complete the Contract, and comply with the terms therein for the total Contract Price of \$_____.
4. The Owner will pay to the Contractor in the manner and at such times as set forth in this Agreement such amount as required by the Contract Documents.
5. Nothing herein shall be construed as creating any personal liability on part of any officer or agent of any public body which may be a party hereto, nor shall it be construed as giving any rights or benefits hereunder to anyone other than the Owner and Contractor.

6. This Agreement represents the entire understanding of the Owner and Contractor to those matters contained herein. No prior oral or written understanding shall be of any force or effect with respect to those matters covered hereunder. This Agreement may not be modified or altered except in writing signed by both parties.
7. This Agreement shall be administered and interpreted under the laws of the State of Rhode Island. Jurisdiction over all disputes arising from this Agreement shall be in that state.
8. If any part of this Agreement is found by a court of competent jurisdiction to be in conflict with applicable laws, such part shall be inoperative, null, and void insofar of this Agreement shall be in full force and effect.
8. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.
9. This Agreement includes Table A included herewith as part of Section CA.

IN WITNESS THEREOF, the parties to this Agreement have hereunto set their hands and seals as of the day and year first above written. Four copies of this form shall be signed and sealed, with original signatures and seals, by the parties to this Agreement.

OWNER:

NARRAGANSETT BAY COMMISSION

by: _____
Vincent J. Mesolella Jr., Chairman

by: _____
Laurie Horridge, Executive Director

CONTRACTOR:

by: _____

(Name and Title)

Certificate of Acknowledgment
of Contractor if a Corporation

For Agreement

I have the authority to execute this document on behalf of _____, the corporation described herein; I know the corporate seal of said corporation; the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the authority of said corporation, I signed thereto my name and official designation on behalf of the corporation.

Corporate Officer

State of _____)

County of _____)

On this _____ day of _____, 20____,

before me personally came _____,
the _____ of _____ to me known, and known by me to be the party executing the foregoing instrument on behalf of said corporation and he/she acknowledged said instrument by him/her executed to be his/her free act and deed, individually and in his/her said capacity and the free act and deed of said corporation

Notary Public (Seal)

My commission expires _____

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ARTICLE 1 – CONVENTIONS AND DEFINITIONS

§1.1 CONVENTIONS

- a. Whenever in the Contract Documents, or upon the Drawings, the words "as directed," "as ordered," "as requested," "as required," "as permitted," "as instructed," "as designated," "as considered necessary," or words of like import are used, it shall be understood that the direction, order, request, requirement, or permission of the Program Manager is intended, unless clearly indicated otherwise. Similarly, the words "approved," "acceptable," "suitable," "satisfactory," and words of like import shall mean satisfactory to the Program Manager, unless clearly indicated otherwise.
- b. The words "herein," "hereinafter," "hereunder," and words of like import shall be deemed to refer to the Contract Documents.

§1.2 DEFINITIONS

Wherever the words hereinafter defined or pronouns used in their stead occur in the Contract Documents, they shall have the meaning indicated which shall be applicable to both the singular and plural thereof:

- a. Addenda - Written or graphic instruments issued prior to the opening of Bids which modify or interpret the Contract Documents, Drawings, and Specifications by additions, deletions, clarifications or corrections.
- b. Agreement - The written contract between Owner and Contractor covering the Work to be performed; other Contract Documents which are attached to the Agreement and made a part thereof as provided therein.
- c. Application For Payment - The form accepted by Program Manager which is to be used by Contractor in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
- d. Bid - The offer or proposal of the Bidder submitted in the prescribed form setting forth the prices for the Work to be performed together with all required supporting documents.
- e. Bidder - Any person, firm or corporation submitting a Bid for the Work.
- f. Change Order - A written order to the Contractor signed by the Program Manager and the Owner 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 and issued on or after the date of the Agreement.
- g. Completion Date: The date that equates to the date of commencement as specified in the Notice to Proceed plus the Contract Time days, plus approved expansions to the Contract Time.
- h. Construction Superintendent - The person designated by the Contractor to be in charge of the Work and to carry out the provisions of the Contract Documents.

- i. Contract Bonds - Bid, Performance, and Labor and Materials Payment Bonds and other instruments of security furnished by the Contractor and its surety in accordance with the Contract Documents.
- j. Contract Documents - The Notice to Bidders; the Information for Bidders; the Bid; the Agreement; the Contract Bonds; the Specifications; the Drawings; Appendices; Addenda; Shop Drawings; written amendments to the Agreement; Field Orders; Change Orders; and Program Manager's written interpretations and clarifications of the Contract Documents executed on or after the date of the Agreement. The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. Where there is a conflict, the more stringent requirements as determined by the Program Manager shall govern, as provided in Article 4, Administration of the Contract.
- k. Contract Price - The total monies payable to the Contractor under the terms and conditions of the Contract Documents.
- l. Contract Time - The number of calendar days stated in the Contract Documents for the completion of the Work, including completion of all the punch list items.
- m. Contractor - The person, firm or corporation with whom the Owner has executed the Agreement.
- n. Cost and Pricing Data - All data used by the Contractor in negotiating and pricing work covered by changes, or involved in a proposal or claim, including, but not limited to, bid estimates, estimating guides, proposal or claim estimates pricing adjustments in Contract Price or Contract Time, back-up computations and assumptions.
- o. Datum - Any level surface to which Elevations are referred.
- p. Defective -An adjective which, when modifying the word Work, refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference, standard, test or approval referred to in the Contract Documents.
- q. Drawings - The drawings which are part of the Contract Documents and which show the characteristics and scope of the Work to be performed and which have been prepared or approved by the Program Manager.
- r. Earth - The word "earth", wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material other than rock as defined below.
- s. Elevation - The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the datum adopted by the Program Manager.
- t. Program Manager - The person(s) or firm(s) duly appointed by the Owner to represent the Owner during the entirety of the Agreement, to observe the Work on behalf of the Owner, and to undertake certain actions and duties for the Owner as delineated in the Contract Documents. The Owner may designate itself the Program Manager.

- u. Program Manager's Consultant - A person, firm or corporation having a contract with Program Manager to furnish services as Program Manager's independent professional associate or consultant with respect to the Project.
- v. Extra Work - Work in connection with the Project, but not included in the Contract Documents, which is ordered in writing by the Program Manager and the Owner.
- w. Field Order - A written order effecting change in the Work not involving an adjustment in the Contract Price or the Contract Time, issued by the Program Manager to the Contractor during construction.
- x. Final Completion - That date as certified by the Program Manager, through written notice to the Owner, when the construction for the Project is completed in accordance with all provisions of the Contract Documents, including completion of all the punch list items.
- y. Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having any jurisdiction over any area of the Work.
- z. Lump Sum Work - Work to be paid on the basis of a fixed price amount.
- aa. Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of the Work.
- bb. Mobilization - Subject to the written approval of the Program Manager, the Contractor activities required to establish temporary facilities, equipment and personnel at the site thereby enabling the Work to commence.
- cc. Notice of Award - The written notice of the acceptance of the Bid from the Owner to the successful Bidder.
- dd. Notice to Proceed - Written communication issued by the Owner to the Contractor authorizing it to proceed with the Work and establishing the date of commencement of the Work and the date for final completion.
- ee. Owner - The Narragansett Bay Commission, also known as the Commission.
- ff. Partial Utilization - Use by the Owner of a portion of the Work for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion of the Work.
- gg. Product(s) - New material, machinery, components, equipment, fixtures and systems forming the Work; excluding machinery and equipment used for the preparation, fabrication, conveying and/or erection of the Work. Product(s) may also include existing materials or components required for reuse.
- hh. Project - The total construction to be accomplished by the Work as provided in the Contract Documents, sometimes also referred to by the Owner's designated "Contract No. " as set forth on page 1 of the Agreement.

- ii. Project Schedule - The Project Schedule shall represent the Contractor's best judgment and intended plan for the completion of the Work within the Contract Time and in compliance with the Contract Documents.
- jj. Resident Representative - The authorized representative of the Program Manager who is assigned to the Project.
- kk. Rock -The word "rock," wherever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding 1 cu. yd. in volume, or solid ledge rock which, in the sole opinion of the Program Manager, requires, for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. "Rock" shall expressly not mean: (i) soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel; (ii) loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere; and (iii) rock exterior to the maximum limits of measurement allowed, which may fall into the excavation.
- ll. Samples - Physical examples of materials, equipment or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
- mm. Shop Drawings - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, Manufacturer, Supplier, or distributor which illustrate how specific portions of the Work shall be fabricated or installed.
- nn. Specifications - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.
- oo. Sub Agreements - A contract or purchase order awarding a part of the Work under the Contract Documents to a Subcontractor, Supplier or other person or organization.
- pp. Subcontractor - An individual, firm, or corporation, approved by the Owner and Program Manager having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work on the Project.
- qq. Substantial Completion - That date as certified by the Program Manager, through written notice to the Owner, when the construction for the Project or a specified part thereof is sufficiently completed in accordance with the Contract Documents so that the Work or specified part can be utilized for the purposes for which it is intended.
- rr. 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.
- ss. Underground Utilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other similar facilities or attachments, and any encasement containing such facilities which have been installed underground to furnish any of the following: water, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewerage and drainage removal, traffic, or control systems.

- tt. Unit Price Work - Work to be paid on the basis of a unit price for a specific item of Work.
- uu. Work - The entire completed construction required to be furnished under the Contract Documents. Work includes and is the result of performing and furnishing any and all services, obligations, duties, responsibilities, labor, materials, equipment, temporary facilities, and incidentals necessary to complete the construction assigned to, or undertaken by the Contractor, pursuant to the Contract Documents.
- vv. Written Notice - Any notice to any party of the Agreement relative to any part of this Agreement in writing and delivered as set forth in Section 13.2 of this Agreement.

ARTICLE 2 – OWNER

§2.1 ACCESS TO WORK

The Owner, the Program Manager, representatives of the state and any local municipal and federal agencies and their officers, agents, servants and employees may at any and all times and for any and all purposes, enter upon the Work and the site thereof and the premises used by the Contractor including off-site storage facilities and manufacturing facilities, and the Contractor shall at all times provide safe and proper facilities therefor.

§2.2 AUDIT ACCESS TO RECORDS

The Owner, the Governor of the State of Rhode Island or his/her designee, the Secretary of Administration and Finance of the State of Rhode Island or his/her designee, and the State Auditor or his/her designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of data of the Contractor and all Subcontractors which pertain to the performance of the provisions and requirements of this Contract.

If the Contractor has submitted Cost and Pricing data in connection with the pricing of any Change Order or claim related to this Contract, the Owner, the Program Manager, any of their duly authorized representatives, and those organizations itemized in the paragraph above, shall have the right to examine and audit all books, ledgers, records, and documents pertinent to all Cost and Pricing data available and relied upon by the Contractor (including that used by the Contractor in the determination of its Bid for the Work), in order to evaluate the accuracy, completeness, and currency of the Cost or Pricing data. This right to audit shall not apply to prices based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by Laws or Regulations.

The Contractor shall make available at all reasonable times the materials described in the paragraph above, for examination, audit, or reproduction, until six (6) years after final payment under this Contract.

If this Contract is completely or partially terminated, the records relating to the Work terminated shall be made available for three (3) years after any resulting final termination settlement.

Records pertaining to the settlement of claims arising under or relating to the performance of this Contract shall be made available for three (3) years after disposition of such appeals, litigation, or claims.

§2.3 RIGHT TO WITHHOLD MONIES

Notwithstanding anything to the contrary in this Agreement or the existence of any performance or labor or material payment bond, the Owner is hereby empowered to withhold from the Contractor an amount, equal in the opinion of the Owner to the amounts necessary to complete the entire Work, (or any part thereof), necessary to compensate Owner for any unexcused delay on the part of the Contractor, or necessary to pay and fully discharge any claims or liens arising out of the Work performed under this Agreement that may arise and be unpaid, for which, if established, the Owner may become liable. If any such obligations, claims or liens exceed the amount of the unpaid amounts under the Agreement, or arise after the full Agreement Price has been paid or otherwise satisfied in accordance with and subject to the terms and conditions hereof, the Contractor, immediately upon demand, shall pay to the Owner, as the case may be, all monies that the Owner may have paid or become obligated to pay for any and all costs, expenses, losses, damage, liabilities, suits, judgments, engineering/consultant fees, attorneys' fees, court costs, and awards incurred to discharge such obligations, liens or claims with respect to the Project.

ARTICLE 3 – CONTRACTOR

§3.1 OBLIGATIONS AND LIABILITY OF CONTRACTOR

The Contractor shall do all the work and perform and furnish all the labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies and all other things (except as otherwise expressly provided herein) necessary and as herein specified for the proper performance and completion of the Work in the manner and within the time hereinafter specified, in strict accordance with the Contract Documents, in conformity with the directions and to the satisfaction of the Program Manager, and at the prices herein agreed upon therefor.

If, during the performance of the Work, the Contractor discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code or of any instruction of any Supplier, the Contractor shall promptly report it to the Program Manager in writing.

All parts of the Work and all fixtures, equipment, apparatus and other items indicated on the Drawings and not mentioned in the Specifications, or vice versa, and all work and material usual and necessary to make the Work complete in all its parts, including all incidental work necessary to make it complete and satisfactory and ready for use and operation, whether or not they are indicated on the Drawings or mentioned in the Specifications, shall be furnished and executed the same as if they were called for both by the Drawings and by the Specifications.

The Contractor shall conduct the Work so as to interfere as little as possible with private business and public travel. Wherever and whenever necessary or required, it shall maintain fences, furnish watchmen, maintain lights, and take such other precaution as may be necessary to protect life and property.

The Contractor shall have complete responsibility for the Work and the protection thereof, and for preventing injuries to any persons and damage to the Work and property and utilities on or about the Work, until final completion and final acceptance thereof. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures for construction. The Contractor shall be solely responsible for initiating, maintaining and

supervising all safety precautions and programs in connection with the Work. It shall in no way be relieved of its responsibility by any right of the Program Manager to give permission or directions relating to any part of the Work, by any such permission or directions given, or by failure of the Program Manager to give such permission or directions. The Contractor shall bear all costs, expenses, losses and damages on account of the quantity or character of the Work or the nature of the land (including but not limited to subsurface conditions) in or under or on which the Work is done being different from that indicated or shown in the Contract Documents or from what was estimated or expected, or on account of the weather, elements, or other causes.

The Contractor shall conduct its operations so as not to damage existing structures or work installed either by it or by other contractors. In case of any such damage resulting from its operations, it shall repair and make good as new the damaged portions at its own expense with the consent of the damaged party. In the event that consent is not given, the Contractor shall continue to be liable for the damages caused.

The Contractor shall be fully responsible to Owner and Program Manager for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between Owner or Program Manager and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of Owner or Program Manager to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

At its sole discretion, the Parties agree that the Owner may issue joint checks to the Contractor and the Contractor's Subcontractors and Suppliers. In no way should this create an express or implied obligation or expectation on the Owner to issue joint checks.

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

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

All Work performed for the Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of the Owner and Program Manager. Failure of the Contractor to specifically so bind the Subcontractor or Supplier shall constitute a material breach of this Agreement. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Article 11, Insurance and Bonds, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against the Owner, Program Manager and all other additional losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If

the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, the Contractor will obtain the same.

The Contractor shall promptly pay all federal, state and local taxes which may be assessed against it in connection with the Work or its operations under the Contract Documents, including, but not limited to, taxes attributable to the purchase of material and equipment, to the performance of services, and the employment of persons in the prosecution of the Work.

§3.2 COMPLIANCE WITH LAWS

The Contractor shall keep itself fully informed of all existing and future federal, state, and local laws, ordinances, rules, and regulations affecting those engaged or employed on the Work, the materials and equipment used in the Work or the conduct of the Work, and of all orders, decrees and other requirements of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the Drawings, Specifications or other Contract Documents in relation to any such law, ordinance, rule, regulation, order, decree or other requirement, the Contractor shall promptly report the same to the Program Manager in writing. The Contractor shall at all times observe and comply with, and cause all its agents, servants, employees and subcontractors to observe and comply with all such existing and future laws, ordinances, rules, regulations, orders, decrees and other requirements, and it shall protect, indemnify and save harmless the Owner, its officers, agents, servants and employees, from and against any and all claims, demands, suits, proceedings, liabilities, judgments, penalties, losses, damages, costs and expenses, including attorneys' fees, arising from or based upon any violation or claimed violation of any such law, ordinance, rule, regulation, order, decree or other requirement committed by the Contractor or any of his agents, servants, employees or subcontractors.

§3.3 SUPERVISION OF WORK

The Contractor shall be solely responsible for supervision of the Work, shall give the Work the constant attention necessary to ensure the expeditious and orderly progress thereof, and shall cooperate with the Program Manager and the Owner.

At all times, the Contractor shall have as its agent on the Project a full-time, on-site competent Superintendent capable of reading and thoroughly understanding the Contract Documents, with full authority to execute the directions of the Program Manager without delay and to supply promptly such labor, services, materials, equipment, plant, apparatus, appliances, tools, supplies and other items as may be required.

§3.4 EMPLOY COMPETENT PERSONS

The Contractor shall employ only competent persons on the Work and shall not engage in activities which may cause strikes, work stoppages or any disturbances by persons employed by the Contractor, any subcontractor, the Owner, the Program Manager or any other contractor. Whenever the Program Manager notifies the Contractor in writing that in the Program Manager's opinion any person on the Work is incompetent, unfaithful, disorderly, or otherwise unsatisfactory, or not employed in accordance with the provisions of the Contract Documents, such person shall be discharged from the Work and shall not again be employed on it, except with the written consent of the Program Manager.

The Contractor shall verify that all members of the project team, its employees and subcontractors are legally eligible to be employed in the United States. The Contractor is required to utilize such verification sources as necessary to adequately ensure compliance with federal and state law in this regard.

The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, handicap, or national origin. The Contractor shall take affirmative action to ensure that applicants and employees are treated during employment without regard to their race, color, religion, sex, age, handicap, or national origin. Such actions shall include, but not be limited to the following: employment, upgrading, demotions, or transfers; recruitment or recruitment advertising, layoffs or terminations; rates of pay or other forms of compensation; selection of training including apprenticeship; and participation in recreational and educational activities. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notice to be provided setting forth the provisions of this nondiscrimination clause. The Contractor will in all solicitations or advertisement 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, religion, sex, age, handicap or national origin. The Contractor will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this contract so that such provisions will be binding upon each subcontractor and upon subcontracts of standard commercial supplies or raw materials.

The Contractor shall keep such records and submit such reports concerning the racial and ethnic origin of applicants for employment and employees as the Owner may require as consistent with Federal and State law.

The Contractor agrees to comply with such rules, regulations, or guidelines as the State of Rhode Island may issue to implement these requirements. The Contractor further warrants that it will comply with Title VI of the Civil Rights Act of 1964, 42 U.S.C. 200d to d4.

§3.5 EMPLOY SUFFICIENT LABOR AND EQUIPMENT

The Contractor shall at all times employ sufficient labor, plant, equipment or other means to complete the Work within the time specified herein.

If, in the sole judgment of the Program Manager, the Contractor is not employing sufficient labor, plant, equipment or other means to complete the Work within the time specified in the Project Schedule, the Program Manager may, after giving three (3) days written notice to Contractor, require the Contractor to employ such additional labor, plant, equipment and other means as the Program Manager deems necessary to enable the Work to progress properly.

§3.6 NOT TO SUBLET OR ASSIGN

The Contractor shall constantly give its personal attention to the faithful prosecution of the Work, shall keep the same under its personal control, shall not assign the Contract or sublet the Work or any part thereof without the previous written consent of the Owner, and shall not assign any of the moneys payable under the Contract, or its claim thereto, unless by and with the like written consent of the Owner and the Surety on the Contract Bonds. Any assignment or subletting in violation hereof shall be void and unenforceable.

§3.7 WARRANTY

The Contractor warrants that the Work and services to be performed under the Contract Documents, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the same, shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other Contract Documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the Contract Documents shall be fulfilled. The warrantee period shall be one year from the date of substantial completion.

§3.8 ASSIGNMENT OF WARRANTIES

The Contractor shall assign to Owner all manufacturer's and Supplier's warranties on Products. Such warranties shall be in addition to and not in substitution of the Contractor's obligations under Article 3, §3.7, Warranty.

§3.9 PROTECTION AGAINST WATER AND STORM

The Contractor shall take all precautions necessary to prevent damage to the Work by storms or by water entering the site of the Work directly or through the ground. In case of damage by storm or water, the Contractor shall, at its own cost and expense, make such repairs or replacements or rebuild such parts of the Work as the Program Manager may require in order that the finished Work may be completed as required by the Contract Documents. Without limiting the generality of the foregoing, the Contractor shall comply with the requirements of Specification Section 01501.

§3.10 PERMITS

The Contractor shall, at its own expense, take out and maintain from all federal, state, county and local authorities all permits required for its equipment, work force or particular operations (such as blasting) in the performance of the Work.

§3.11 RETURN OF DRAWINGS

All Drawings furnished by the Owner or the Program Manager to the Contractor may be used only in connection with the performance of the Work and shall be returned by the Contractor upon completion of the Work.

§3.12 CLEANING UP

During the progress of the Work, the Contractor shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, the Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. The Contractor shall leave the site clean and ready for occupancy by the Owner at Substantial Completion of the Work. The Contractor shall restore to original condition all property not designated for alteration by the Contract Documents. Without limiting the generality of the foregoing, the Contractor shall comply with the requirements of Section 01000.

§3.13 INTOXICATING LIQUORS AND CONTROLLED SUBSTANCES

The Contractor shall not sell and shall neither permit the introduction or use of intoxicating liquors or controlled substances upon or about the Work. See additional requirements under Specification Section 01540.

§3.14 PAYROLLS OF CONTRACTORS AND SUBCONTRACTORS

The Contractor and each of its Subcontractors shall prepare their payrolls on forms required by the Rhode Island Department of Labor. Pursuant to Rhode Island General Laws, Section 37-13-13, every Contractor and Subcontractor shall furnish a legible, certified copy of its payroll records of its employees employed upon the project to the director of labor and training on a monthly basis for the preceding month's work. A copy of each certified payroll, along with the transmittal letter to the director of labor and training, shall be furnished to the Owner. Each such payroll shall contain the statement required by the Federal Regulations issued pursuant to the "Anti-Kickback Statute," (48 Stat. 948; 18 U.S.C. 874; 40 U.S.C. 276).

The Contractor shall not carry on its payrolls any person not employed by it. The Contractor shall not carry on its payrolls employees of a subcontractor, but such employees must be carried only on the payrolls of the employing subcontractor.

The Contractor and each Subcontractor shall preserve its weekly payroll records for a period of three (3) years from the date of completion of the contract. The payroll records shall set out accurately and completely the name, occupational classification, and hourly wage rate of each employee, hours worked by him/her during the payroll period and full weekly wages earned by him/her, and deductions made from such weekly wages and the actual weekly wages paid to him/her. Such payroll records shall be made available at all times for inspection by the Owner or its authorized representatives, the Program Manager, agents of the United States Department of Labor, and such other persons as are required by state or federal law.

The Contractor agrees to defend, indemnify and hold harmless the Owner, its officers, directors, commissioners, associates, employees, agents, representatives, successors and assigns from and against all claims, losses, expenses (including attorneys' fees and court costs), damages, demands, judgments, causes of action or suits of any kind, arising from the failure of the Contractor or any of its subcontractors to comply with RIGL Section 37-13-13, or the rules, regulations, orders and decisions derived therefrom.

§3.15 GENERAL INDEMNIFICATION

Contractor shall defend, indemnify and hold harmless Owner and its respective parents, subsidiaries, affiliates, successors, assignees, agents, representatives, employees, officers, directors and members (collectively, the "Indemnified Parties") from and against all claims, damages, losses and expenses brought or asserted by third parties, (including but not limited to attorneys' fees and expenses), arising out of or resulting from any negligent or intentionally wrongful act or omission of Contractor or any Subcontractor or Vendor of any tier in the performance of the Work, any breach of a representation or warranty under this Agreement or any other breach of this Agreement including, without limitation, the failure to complete the Project in accordance with the requirements hereof. Contractor shall diligently defend any claim or suit brought against Owner or any assignee of Owner and shall pay all costs and expenses (including reasonable attorneys' fees and expenses) in connection with such claim or suit,

provided that Owner or such assignee gives Contractor written notice of such claim or suit and provides such reasonable assistance in connection therewith as Contractor may request.

In any and all claims, damages, losses or expenses by any employee of the Contractor, Subcontractor, Vendors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Section 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, any Subcontractor, Vendor or any other party under workers' compensation acts, disability benefit acts or other employee benefit acts.

Owner shall be entitled to collect, besides all legal damages attributable to Contractor's breach of any provision of this Article; (i) all attorneys' fees and costs incurred in bringing an action to enforce the provisions of this indemnity or any other indemnity contained in the Contract Documents; (ii) all attorneys' fees and costs incurred in defending the claim for which Contractor has failed to defend Owner; (iii) all expert, engineering, and consultant costs incurred in defending the claim for which Contractor has failed to defend Owner; and (iv) all other related expenses, costs, etc. incurred by Owner or the Indemnified Parties.

Only to the extent prohibited by any law prohibiting a party from being indemnified against their own negligence, the obligations of the Contractor under any indemnification provision in this Agreement shall not extend to the liability of Owner or any Indemnified Parties arising out of that party's own negligence.

§3.16 PATENTS

The Contractor shall indemnify and save harmless the Owner and all persons acting for or on behalf of the Owner from all claims and liability of any nature or kind, and all damages, costs and expenses, including attorney's fees, arising from or occasioned by an infringement or alleged infringement of any patents or patent rights on any invention, process, material, equipment, article, or apparatus, or any part thereof, furnished and installed by the Contractor, or arising from or occasioned by the use or manufacture thereof, including their use by the Owner.

ARTICLE 4 – ADMINISTRATION OF THE CONTRACT

§ 4.1 INTERPRETING THE CONTRACT DOCUMENTS

It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result shall be furnished and performed whether or not specifically called for.

When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe the Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning unless said meaning is modified by the Contract Documents.

Reference in the Contract Documents to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the edition of the standard specification, manual, code or laws or regulations identified in the reference. In the

event a particular edition is not identified, the reference shall mean the latest edition in effect at the time of receipt of the Bid.

However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall change the duties and responsibilities of the Owner, the Contractor or the Program Manager, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the Program Manager, or any of the Program Manager's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the provisions of this Agreement.

Clarifications and interpretations of the Contract Documents shall be issued by Program Manager as provided in §4.2, Authority of the Program Manager.

§ 4.2 AUTHORITY OF THE PROGRAM MANAGER

The Program Manager shall solely decide the intent and meaning of the Drawings, Specifications, and Contract Documents and the Program Manager's decisions thereon and interpretation thereof shall be final, conclusive and binding on the Contractor, subject to the provisions of this § 4.2.

The Program Manager shall be the Owner's representative during the life of the Agreement and shall observe the Work in progress on behalf of the Owner. The Program Manager shall have authority (1) to act on behalf of the Owner to the extent expressly provided in the Contract Documents or otherwise in writing; (2) to determine the amount of the Work and its general conformance to the Contract Documents; and (3) to decide all questions which arise in relation to the Work, and the execution thereof.

The Program Manager will make on-site observations to observe the progress, quantity and quality of the executed Work and to determine if, in the Program Manager's sole judgment, the Work is proceeding in accordance with the Contract Documents. On-site observations by the Program Manager shall not give rise to any duty on the part of the Program Manager to undertake such observations for the benefit of the Contractor or any other third party.

The Program Manager will issue with reasonable promptness written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise), as the Program Manager may determine necessary, which shall be consistent with or reasonably inferable from the intent of the Contract Documents.

The Contractor shall proceed without delay to perform the work as directed, instructed, determined or decided by the Program Manager and shall comply promptly with such directions, instructions, determinations or decisions. If the Contractor has any objection thereto it may, within three (3) days of having received any such direction, instruction, determination or decision, require that any such direction, instruction, determination or decision be put in writing and within three (3) days after receipt of any such writing it may file a written protest with the Owner stating clearly and in detail its objections, the reasons therefor, and the nature and amount of additional compensation, if any, to which it claims it will be entitled under the Contract Documents. A copy of such protest shall be filed with the Program Manager at the same time it is filed with the Owner. Unless the Contractor requires that any such direction, instruction, determination or decision be put in writing within three (3) days of having received such

direction, instruction, determination or decision and unless the Contractor files such written protest with the Owner and Program Manager within such three (3) day period, it shall be deemed to have waived all grounds for protest of such direction, instruction, determination, or decision and all claims for additional compensation or damages occasioned thereby, and shall further be deemed to have accepted such direction, instruction, determination, or decision as being fair, reasonable, and finally determinative of its obligations and rights under the Contract Documents.

The Program Manager may authorize minor variations in the Work (not involving an adjustment in Contract Price or Contract Time) which are consistent with the intent of the Contract Documents and required to produce the intended result. These may be accomplished by a Field Order and shall be binding on the Contractor who shall perform the Work promptly.

The Program Manager shall have authority to evaluate and disapprove any test procedure for construction or equipment, and any pre-operational, start-up, or demonstration tests proposed to be conducted by the Contractor which the Program Manager believes to be inconsistent with the requirements of the Contract Documents, insufficient or unsuitable for the intended purpose, or impracticable. However, it shall not be the Program Manager's primary responsibility to make certain that any such test procedures are acceptable, nor shall this authority give rise to any duty on the part of the Program Manager to exercise this authority for the benefit of the Contractor.

Neither the Program Manager's authority to act under the Contract Documents nor any decision or determination made by the Program Manager in good faith to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Program Manager to the Contractor, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.

Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved", or terms of like effect or importance are used, or the adjectives "reasonable", "suitable", "acceptable", "proper", or "satisfactory" or adjectives of like effect or importance are used to describe a requirement, direction, review or judgment of the Program Manager as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for general compliance with the Contract Documents (unless there is a specific statement indicating otherwise). When such a term or adjective is used, it shall not be effective to assign to the Program Manager any duty or authority to supervise or direct the furnishing or performance of the Work, including but not limited to review of Contractor's Shop Drawings, or any duty or authority to undertake responsibility contrary to the provisions of this paragraph.

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

The Program Manager will not be responsible for the acts or omissions of the Contractor or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

The limitations on the Program Manager's authority and responsibility as set forth in this § 4.2 shall also apply to Program Manager's Consultants and Resident Representative.

§4.3 PROGRESS ESTIMATES

Except as hereinafter provided, the Program Manager shall make a monthly estimate in writing of the total amount and value of the work completed during each of the twelve (12) separate work periods set per the annual schedule promulgated by the Rhode Island Clean Water Finance Agency. The Owner shall retain a percentage of such estimated value, as set forth in Table A at the end of this section, as part security for fulfillment of the Contract by the Contractor and shall deduct from the balance all previous payments made to the Contractor, all sums chargeable against the Contractor and all sums to be retained under the provisions of the Contract Documents. The Owner shall pay monthly to the Contractor the balance not deducted and/or retained as aforesaid, except that payment may be withheld at any time if, in the judgment of the Program Manager, the Work is not proceeding in accordance with the Contract Documents. No progress estimate or payment need be made when, in the judgment of the Program Manager, the total value of the work done since the last estimate amounts to less than the amount set forth in Table A at the end of this section.

Estimates of lump sum items shall be based on a schedule dividing each such item into its appropriate component parts together with a quantity and a unit price for each part so that the sum of the products of prices and quantities will equal the Contract price for the item. This schedule shall be submitted by the Contractor for and must have the approval of the Program Manager before the first estimate becomes due.

The Program Manager will determine the actual quantities and classifications of Unit Price Work performed by the Contractor.

Materials and equipment will not be included in progress estimates until the following requirements have been fulfilled.

1. The Contractor must present an invoice to the Program Manager for each item of equipment he is requesting payment. The invoice must be broken down to show the costs for the actual equipment, and reasonable costs for Operations and Maintenance manuals, spare parts, start-up certification, training, testing, final acceptance testing, and any other services required by Contract Documents.
2. Sufficient monies have been allocated in the payment requisition line items to cover all of the costs listed in "1" above, plus the costs of physically installing the equipment.
3. The equipment has been submitted and approved for use in this Project.
4. The equipment is acceptably stored and protected. Off site storage must be in a facility suitable to the Program Manager, and proof of insurance coverage specifically for the item being stored must be provided.
5. The manufacturer's short and/or long term storage requirements have been received by the Program Manager, prior to payment.
6. The Contractor has established a program to implement the manufacturer's required storage procedures. Said program to consist of at the very least a written schedule of daily, weekly,

monthly, etc., routine maintenance requirements for each piece of equipment. A copy of this schedule, signed by the Contractor, stating that the required maintenance has been performed is to be presented to the Program Manager prior to each requisition submittal.

7. Signed, notarized Title Transfers in a format to be furnished by the Program Manager must be furnished for each item of equipment.

When Items 1 through 7 above have been complied with to the satisfaction of the Program Manager, payment will be authorized for the full invoice values of the item of equipment, less normal retainage and less all costs for Operations and Maintenance manuals, spare parts, start-up certification, training, testing, final acceptance testing, and installation.

The Contractor must submit documentation to certify that the material or equipment has been paid for by the Contractor within 15 days of the Contractor receiving payment by the Owner. If this documentation is not provided, the value of the equipment or material will be deducted from the next pay requisition.

The Contractor shall include a monthly cash flow projection with each progress estimate. These projections shall indicate the actual value paid to date and the Contractor's estimate of the value due each month from that point in time through the Completion Date.

§4.4 CLAIMS AGAINST CONTRACTOR

If at any time there is any evidence of any claims for which the Contractor is or may become liable or responsible hereunder, the Contractor shall promptly settle or otherwise dispose of the same, and until such claims are settled or disposed of, the Owner may withhold payment to Contractor in accordance with Sections 2.3, 12.2, and 12.3.

§4.5 DISCHARGING LIENS

If at any time any notices of lien are filed for labor performed or materials or equipment manufactured, furnished, or delivered to or for the Work, the Contractor shall, at its own cost and expense, promptly discharge, remove or otherwise dispose of the same, and until such discharge, removal or disposition, the Owner may withhold payment to Contractor in accordance with Sections 2.3, 12.2, and 12.3.

§4.6 CLAIMS FOR DAMAGES AGAINST OWNER

If the Contractor makes claim for any damages alleged to have been sustained by breach of contract or otherwise, it shall, within three (3) days after occurrence of the alleged breach or within three (3) days after any part of the alleged damages have begun to be sustained, whichever date is the earlier, file with the Program Manager and Owner a written, itemized statement in triplicate of the details of the alleged breach and the details and amount of the alleged damages. Unless such statement is made and filed as so required, the Contractor's claim for damages shall be deemed waived, invalid and unenforceable, and he shall not be entitled to any compensation for any such alleged damages.

The Contractor shall not be entitled to claim any additional compensation for damages by reason of any direction, instruction, determination or decision of the Program Manager, nor shall any such claims be considered, unless the Contractor shall have complied in all respects with Section

4.2 of this Agreement titled "Authority of the Program Manager", including, but not limited to, the filing of a written protest in the manner and within the time therein provided.

Subject to the provisions of Section 4., Dispute Resolution below, the Contractor, and any Subcontractor, Supplier and any other person or organization performing any part of Work, agree that each of them will waive jurisdiction and venue and shall submit to the jurisdiction of the courts of the State of Rhode Island regardless of residence or domicile, with respect to any actions or suits at law or in equity arising under or related to the bidding, award or performance of the Work.

Subject to the provisions of Section 4.7, Dispute Resolution below, the Contractor, Subcontractor, Supplier or any other person or organization shall not commence any action, other than those in the State of Rhode Island in the county where the Owner's headquarters are located, against the Owner and the Program Manager, or any of their consultants, and/or any of their respective directors, officers, employees, representatives or agents, with regard to any matter whatsoever arising out of or relating to the validity, construction, interpretation or reinforcement of the Contract.

§4.7 DISPUTE RESOLUTION

- A. Claims, counter-claims, disputes and other matters in question between the Owner and the Contractor arising out of, or relating to, this Agreement or the breach of it shall be settled by mediation under the Construction Industry Mediation Procedures of the American Arbitration Association. If a party fails to respond to a written request for mediation within 30 days after service or fails to participate in any scheduled mediation conference, that party shall be deemed to have waived its right to mediate the issues in dispute. In that event, the dispute will be resolved in accordance with this Section.
- B. **Submission to Arbitration:** If the mediation does not result in settlement of the dispute within 30 days after the initial mediation conference or if a party has waived its right to mediate any issues in dispute, then any unresolved controversy or claim arising out of or relating to this Agreement or breach thereof shall be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.
- C. **Number and Qualifications of Arbitrators:** In the event the claim exceeds \$1,000,000, exclusive of interest and attorneys' fees, the dispute shall be heard and determined by three arbitrators consisting of persons qualified in engineering, construction management or construction law and one of the three arbitrators shall be a lawyer specializing in construction law.
- D. **Consolidation and Joinder:** The Owner, the Program Manager, the Contractor, and all subcontractors, specialty contractors, material suppliers, engineers, designers, architects, construction lenders, bonding companies and other parties providing labor, material or services for the Project that is the subject of this Agreement are bound, each to each other, by this arbitration clause, provided that they have signed this Agreement or an Agreement that incorporates this Agreement by reference or signed any other agreement to be bound by this arbitration clause. Each such party agrees that it may be joined as an additional party to an arbitration involving other parties under any such agreement. If more than one arbitration is begun under any such agreement and any party contends that two or more

arbitrations are substantially related and that the issues should be heard in one proceeding, the arbitrator(s) selected in the first filed of such proceedings in which the Owner is a party shall determine whether, in the interests of justice and efficiency, the proceedings should be consolidated before that (those) arbitrator(s).

- E. **Discovery in Arbitration:** At the request of a party, the arbitrator(s) shall have the discretion to order examination by deposition of witnesses to the extent the arbitrator(s) deems such additional discovery necessary to the orderly conduct of the hearings. Depositions shall be limited to a maximum of three per party, limited to three hours each and shall be held within 30 days of the making of a request. Additional depositions may be scheduled only with the permission of the arbitrator(s), and for good cause shown. All objections are reserved for the arbitration hearing except for objections based on privilege and proprietary or confidential information.

- F. **Governing Law and Locale of Arbitration:** This Agreement and any arbitration hereunder shall be governed by the laws of the State of Rhode Island and the place of arbitration shall be Providence, Rhode Island.

ARTICLE 5 – SUBCONTRACTORS

§5.1 AWARD OF SUBCONTRACTS FOR PORTIONS OF THE WORK

Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner and the Program Manager, the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Owner or Program Manager may reasonably object in writing to any such proposed entity or person. In such objection, the Owner or Program Manager shall provide the reason(s) for the objection. It is agreed that the Owner, in determining whether to object, may consider past negative experience with the entity or person, lack of qualifications and experience to perform the work, or a belief of financial inability to perform the work. The Contractor may respond in writing within seven (7) days should it wish to continue with the proposed entity or person. Thereafter, upon a finding of good cause for its objection, the Owner may prohibit the employ of such proposed entity or person.

§5.2 SUBCONTRACTUAL RELATIONS

By appropriate agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner.

ARTICLE 6 – CONSTRUCTION BY THE OWNER OR BY SEPARATE CONTRACTORS

§6.1 SEPARATE CONTRACTS

The attention of the Contractor is directed to the fact that the Work to be done under this Agreement is only part of the program of improvements, that contracts have been let for additional facilities, and that the successful operation of the improvements is dependent upon the completion of the Agreement under the contract and of the work to be done by others.

The Owner reserves the right to let other contracts in connection with the construction of the contemplated work of this project or contiguous projects of the Owner. The Contractor, therefore, will afford any such other Contractors reasonable opportunity for the introductions and storage of their materials and execution of their work, will properly connect and coordinate its work with theirs, and will not commit or permit any act which will interfere with the performance of their work.

The Contractor shall afford the Owner and other Contractors proper and safe access to the site and a reasonable opportunity for the introduction and storage and materials and equipment and the execution of their work, and shall properly correct and coordinate the Work with theirs. The Contractor shall not endanger any work of others by cutting, excavating or otherwise altering that work and will only cut or alter their work with the written consent of the Program Manager and those whose work will be affected.

If any part of the Contractor's Work depends upon proper execution or results of the work of the Owner or any other contractor or owner, the Contractor shall inspect and promptly report to the Program Manager in writing any delays, defects or deficiencies in that work that render it unavailable or unsuitable for proper execution and results. The Contractor's commencement of work will constitute an acceptance of other work as fit and proper for integration with the Work except for latent or nonapparent defects and deficiencies in the other work. Whenever the Work to be performed by the Contractor is dependent upon the work of others, the Contractor shall coordinate its Work with the dependent work; provide necessary dependent data and requirements; supply and/or install items to be built into dependent work; make provisions for dependent work; check and verify dependent dimensions of previously placed work; notify the Program Manager of previously placed dependent work or dependent dimensions which are unsatisfactory or prevent satisfactory installation of its Work, and not proceed with its Work until the unsatisfactory dependent conditions have been corrected. Installation of Work by the Contractor or by a Subcontractor in any given area shall constitute acceptance by the Contractor or the Subcontractor of all previously placed dependent work.

Should the Contractor cause damage to the work or property of any other contractor or owner performing work at or contiguous to the site, or should any claim arising out of the Contractor's performance of the Work at or contiguous to the site be made by any other contractor or owner against the Contractor, the Owner, or the Program Manager, the Contractor shall promptly attempt to resolve such claim with such separate contractor or owner by agreement, or otherwise resolve the dispute at law or in equity. The Contractor shall, to the fullest extent permitted by Laws and regulations, indemnify and hold harmless the Owner, the Program Manager, and their consultants, agents and employees from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys, and other professionals and court or arbitration costs) arising out of or resulting from damage to the work of others caused by the Contractor's performance of the Work.

Should another contractor or owner cause damage to the Work or property of the Contractor, or should the performance of work by another contractor or owner give rise to any other claim by the Contractor, the Contractor shall promptly attempt to resolve such claim with that contractor or owner by agreement, or otherwise resolve the dispute at law or in equity.

The Contractor shall not institute any action, legal or equitable, against the Owner or the Program Manager, their consultants agents or employees, or permit any action against them to be maintained and continued in its name or for its benefit in any court or before any arbiter

which seeks to impose liability or recover damages from the Owner or the Program Manager, or their consultants, agents or employees, on account of such damages or claims caused by another contractor or owner.

In the event that the Owner incurs costs contrary to the provisions of §6.1, Separate Contracts, the Contractor shall reimburse the Owner for those costs, and if the Contractor fails to pay the Owner within thirty (30) days after receipt of an invoice from the Owner, the Owner will be entitled to an appropriate decrease in Contract Price, or to withhold a set-off against any amount recommended for payment.

The Contractor shall be responsible for settling or resolving at equity or at law directly with all other contractors all claims arising out of delay, disruption, interference, hindrance or schedule extension caused by the Contractor or inflicted upon the Contractor by the actions of another contractor, regardless of whether or not an extension or shortening in Contract Time is ordered by the Owner. The Contractor agrees and understands that neither the Owner, the Program Manager, nor any of their consultants, employees or agents, will be involved in any way in such actions, and hereby waives any and all claims against the Owner, the Program Manager and any of their consultants, employees or agents for any such claims.

If the Contractor is delayed at any time in performing or furnishing the Work by any act or neglect of another contractor or owner performing work under a separate contract with the Owner, the Contractor shall absorb all related delay, extension or acceleration costs, however caused; except that if the Owner and the Contractor believe such delay to require an adjustment in Contract Time, the Owner may authorize the necessary extension in Contract Time. However, an extension in Contract Time(s), if any so granted, shall be the Contractor's sole and exclusive remedy with respect to the Owner and the Program Manager, or any of their consultants, agents or employees for any delay, disruption, interference, extension or hindrance and associated costs, however caused, resulting from delays caused by others performing work under separate contracts with the Owner, and the right to additional compensation for such claims is expressly waived.

The Contractor shall give prompt written notice to the Program Manager and any other affected contractor(s) whenever the Contractor anticipates a conflict in Contract Time(s) related to or simultaneous with associated contract time(s) in the work of others. Within ten (10) days thereafter, the Contractor shall be required to deliver to the Program Manager proposed actions to either prevent an adverse effect on the progress schedule of the other contractors arising from delays to the Work, or overcome an adverse effect on the Progress Schedule for the Work arising from delays from another contract, all at no additional cost to the Owner or the Program Manager.

When Work is performed out of sequence and ahead of interfacing work, the Contractor shall be responsible for taking reasonable steps to minimize damage or loss to the Work which may be caused by others during the performance of their work, including but not limited to furnishing prompt written notice to the Program Manager and to the other contractors that Work has been performed out of sequence and ahead of interfacing work.

When work by others is performed out of sequence and ahead of interfacing Work, the said work shall be considered as if it had been shown on the Contract Documents. The Contractor shall be responsible for protecting that work and shall replace, repair or otherwise settle with others any and all damage caused as a result of the performance of work out of sequence unless the Contractor had not actual knowledge thereof or could not reasonably have known thereof.

ARTICLE 7 – CHANGES IN THE WORK

§7.1 CHANGES

The Owner, through the Program Manager or a consultant, if applicable, may make changes in the Work and in the Specifications and Drawings therefor by making alterations therein, additions thereto or omissions therefrom. All Work resulting from such changes shall be performed and furnished under and pursuant to the terms and conditions of the Contract Documents. If such changes result in an increase or decrease in the Work to be done hereunder, or increase or decrease the quantities thereof, adjustment in compensation shall be made as provided hereinafter under the subsection titled "Extra Work".

Except in an emergency endangering life, safety, health or welfare of the public or property, no change shall be made without a prior written order from the Program Manager authorizing the change, and no claim for additional compensation shall be valid unless the change is so ordered in writing.

The Contractor agrees that it shall neither have nor assert any claim for or be entitled to, any additional compensation for damages or for loss of anticipated profits on work that is eliminated.

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

§7.2 EXTRA WORK

The Contractor shall perform any Extra Work when and as ordered in writing by the Program Manager, and shall be compensated therefor at the Cost of the Extra Work plus a Contractor's Fee as set forth in this Section.

No Extra Work shall be paid for unless specifically ordered as such in writing by the Program Manager.

At the request of the Program Manager, the Contractor shall furnish itemized statements of the Cost of the Extra Work ordered as above and give the Program Manager access to all records, accounts, bills and vouchers and correspondence relating thereto. The itemized statements shall be provided by the Contractor within seven (7) days from the date the request is sent by the Program Manager.

The methods to be used to determine an adjustment in Contract Price necessitated by changes ordered or negotiated pursuant to this Agreement, or Extra Work covered by a submittal or a claim are limited to the following:

- a. Where the Extra Work is covered or is of the same character as work covered by lump sum prices in the Contract Documents: On the basis of those lump sum prices.
- b. Where the Extra Work is covered or is of the same character as Unit Price Work: By application of those unit prices to the quantities of the items involved.
- c. Where the Extra Work is not covered by either of the methods specified in subparagraph a or b above: By mutual acceptance of a lump sum price negotiated on the basis of the Contractor's itemized estimate of the anticipated cost of the Extra Work, determined as

- specified in this Article, and a Contractor's Fee determined as one hundred percent (100%) of the fee allowed under this Article.
- d. Where the Extra Work is not covered by either of the methods specified in subparagraph a or b above, and the Program Manager directs the Contractor to proceed with the Extra Work with payments to be made on the basis of actual costs: On the basis of the actual Cost of the Extra Work, determined as specified in this Article, and a Contractor's Fee determined as seventy five percent (75%) of the fee allowed under this Article.
 - e. Where the Extra Work is not covered by any of the preceding methods, and when payment is to be determined pursuant to Section 4.7, Dispute Resolution, the actual cost method in subparagraph d above shall be the method for determining the cost of the Extra Work.

In computing either anticipated, or actual costs, the term "Cost of the Extra Work" means the sum of all reasonable incremental costs which would be, or actually were, necessarily incurred by the Contractor in the proper performance of the Extra Work. Those costs shall be in amounts no higher than those prevailing in the locality of the Project, and shall include only the appropriate items for labor, material/equipment, subagreement, equipment, and supplemental costs specified below.

Payroll costs shall be included for craft assigned to the site and engaged in furnishing and incorporating materials or equipment in the Extra Work. Payroll costs shall include wage plus the necessary labor burdens, which may include social security, unemployment, workers' compensation, health and retirement benefits, vacation and holiday pay, and other payments pursuant to union agreements. When determining payroll costs under subparagraphs d and e above, daily time sheets, certified at the end of each day by the Program Manager and signed by the Program Manager and the Contractor, shall be the record upon which actual payroll costs shall be based. When determining payroll costs under subparagraphs d and e above, daily time sheets shall be valid only if they expressly identify the labor hours are for the Extra Work and if made when the Extra Work was performed.

Payments by the Contractor to Suppliers for all material and equipment in the Extra Work shall be included. All trade discounts, rebates and refunds and all returns from sale of surplus items shall accrue to the Owner, and the Contractor shall make provisions so that they may be obtained. When required by the Program Manager, the Contractor shall obtain competitive bids from Suppliers and shall deliver such bids to the Program Manager. When determining actual material and equipment costs, actual invoices segregating items associated with the Extra Work shall be the record upon which actual costs shall be based.

Payments by the Contractor to Subcontractors for Extra Work performed by Subcontractors shall be included. If required by the Program Manager, the Contractor shall obtain competitive detailed bids from three (3) Subcontractors and shall deliver them to the Program Manager who will then determine which bid will be selected. When determining Subcontractor costs at any tier, the Subcontractor's Cost shall be determined in the same manner as the Contractor's Cost of the Extra Work. All Subagreements shall be subject to the provisions of this Section insofar as applicable.

Equipment costs required solely in connection with the Extra Work reflecting rented or leased or owned equipment costs for individual construction equipment or machinery whose replacement value is in excess of \$1,000.00 shall be included. Transportation, loading and unloading, installation, dismantling and removal costs shall be included only if such equipment is or was transported to the site solely to perform the Extra Work. Payroll costs for craft labor operating

the equipment shall be as described above. Equipment costs shall be computed using the same accounting and estimating rules regardless of whether related to added or deleted items of work.

When determining equipment costs, daily records listing the equipment units, operators, and actual usage, and certified at the end of each day by the Program Manager and signed by the Program Manager and the Contractor, shall be the record upon which actual equipment use shall be based. When determining equipment costs under subparagraphs d and e above, such daily records shall be valid only if they list the equipment units, their operators, and actual usage, and were developed when the Extra Work was performed.

Rented or owned equipment at the site and not in actual use as a direct result of the change, shall be paid at the rates for rented equipment as specified below. In no event shall the idle time claimed in a day exceed the established working schedule. Payments for idle equipment shall come due only as long as the equipment was idled solely by the actions of the Owner or Program Manager, and that the idle period exceeds that normally experienced for such equipment.

For equipment rented or leased by the Contractor, the fair rental shall be based upon the most recent edition of "Rental Rate Bluebook for Construction Equipment" (the Bluebook), published by Nielson/Dataquest, or a similar publication approved by the Program Manager. Rental for machinery and equipment shall be based upon an appropriate fraction of the approved monthly rate schedule. If the Extra Work requires the use of machinery or equipment not already on the site of the Work, the cost of transportation, not exceeding a distance of 100 miles, of such machinery or equipment to and from the Work shall be added to the fair monthly rental; provided, however, that this shall not apply to machinery or equipment already required to be furnished under the terms of the Contract Documents. In addition to the rental or leasing rate, operating costs shall not exceed the estimated hourly rate in the aforementioned guide. There shall be no operating costs allocated for idle time.

Hourly rates shall be developed by dividing the monthly Blue Book rates by 176 hours a month (the "weekly", "hourly", and "daily" rates listed in the Blue Book shall not be used). Rates in all cases shall be adjusted by application of the Rate Adjustment Tables (machine age adjustment) plus adjustments to eliminate Equipment Overhead plus Regional Adjustments.

The equipment rate for usage in excess of eight hours a day shall be fifty percent (50%) of the base hourly rate as established in the initial hourly calculation above.

The rates used for billing purposes will be those most economical to the Owner based on the circumstances of actual usage and all applicable credits and discounts.

For equipment rented or leased from lessor firms associated with or owned by the Contractor, the Contractor shall be entitled to reimbursement as though the equipment was owned equipment, as specified below.

For equipment owned by the Contractor, the Contractor shall be entitled to costs based on its normal accounting practices used in developing general bids, but in no event shall those costs plus the estimated operating costs exceed the hourly rates as established above. The Contractor shall provide documentation to substantiate the equipment rates used when developing the bid if requested by the Owner or Program Manager.

Supplemental costs may include the proportion of necessary transportation, travel and subsistence expenses of Contractor's employees incurred in discharge of duties concerned with the Extra Work, and the cost of materials, supplies and equipment installed in the Extra Work.

The Contractor shall be reimbursed for the direct cost (no additional fee) of any increased Contract Bond premium due to an increase in the adjusted Contract Price, provided, however, that the percentage premium rate applied to the increased Contract Price shall not exceed the percentage premium rate paid for the original Contract Bonds issued to the Owner. Contractor's right to recover this cost is subject to the Owner's right to audit.

The Contractor shall provide a credit to the Owner for any decreased Contract Bond premium due to a decrease in the adjusted Contract Price.

The Cost of the Extra Work shall not include any of the following costs, all of which are considered supplemental costs not allowed, administrative costs, or contingencies and covered by the Contractor's Fee:

- a. Costs already included in the Contract Price for the Work (including all previously authorized adjustments).
- b. Payroll costs and other compensation of personnel employed by the Contractor whether at the site or in the Contractor's principal or a branch office for management, administration or in support of the performance, management or administration of the Work, including, but not limited to, the Contractor's officers, executives, principals, general managers, project managers, construction managers, superintendents, estimators and schedulers, detailer, claims consultants, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, engineers, architects, timekeepers, and clerks.
- c. Expenses of the Contractor's principal and branch offices including, but not limited to, Contractor's office and temporary facilities at the site.
- d. Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Extra Work and charges for delinquent payments.
- e. Costs due to the fault or negligence of the Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, deposits to be lost, costs to correct defective work, disposal of materials or equipment wrongly supplied and making good any damage to property.
- f. Costs of a rental of small tools; costs of a rental of buildings.
- g. Costs associated with the preparation of Change Orders (whether or not ultimately authorized), cost estimates, or the preparation or filing of claims.
- h. Expenses of the Contractor associated with anticipated lost profits or lost revenues, lost income or earnings, lost interest on earnings or unpaid retainage.
- i. Costs derived from the computation of a "home office overhead" rate by application of the Eichleay, Allegheny, Burden Fluctuation, or other similar methods.
- j. Costs of special consultants or attorneys, whether or not in the direct employ of the Contractor, employed for services specifically related to the resolution of a claim, dispute, or other matter relating to the acceptability of the Work.
- k. Acceleration costs incurred as an alternative to an extension in Contract Time on account of delays not meeting the requirements for extensions in Contract Time.
- l. Escalation costs for any part of the Work which is not delayed beyond the applicable Late Dates in the Construction Schedule required by Section 01311 of the Specifications.
- m. Delay costs.
- n. Early completion costs.

- o. Costs associated with the indirect or cumulative impact, disruption, losses of productivity, acceleration, time delays, or overtime performed by the Contractor. Changes and Extra Work are anticipated on this Project and it is entirely anticipated that there will be many Changes during the performance of the Work. Contractor, and its Subcontractors and Suppliers, agree to include any and all costs in their Extra Work pricing proposals.
- p. Other administrative expense or contingent costs of any kind, and the costs of any item not specifically and expressly included in this Section.

The Contractor's Fee, (profit), in connection with the Extra Work shall not exceed the following percentages of the various portions of the Cost of the Extra Work:

- a. For the Contractor's labor costs, the Contractor's Fee shall not exceed fifteen percent (15%).
- b. For the Contractor's material/equipment or construction equipment costs, the Contractor's Fee shall not exceed ten percent (10%).
- c. For Extra Work performed by (a) a Subcontractor having a direct Subcontract with the Contractor, the Contractor's Fee shall not exceed five percent (5%) of the cost of the Extra Work excluding lower tier fees, and the Subcontractor's Fee shall not exceed ten percent (10%); (b) a lower tier Subcontractor, the Contractor's Fee and the corresponding first tier Subcontractor's Fee shall not exceed five percent (5%) each, and the lower tier Subcontractor's Fee shall not exceed ten percent (10%).

No Contractor's fee shall be payable on the basis of Subcontractor's Fees.

The credit to be allowed by the Contractor to the Owner for any individual Change in the Work (combining additions and deletions) which results in a net decrease in cost (Cost of the Extra Work is negative) shall be the amount of the actual net decrease. The Contractor is not required to provide a credit for the fee associated with the decrease.

When more than one individual change, each resulting in a net increase or decrease in the Cost of the Extra Work, is covered in one specific Change Order or submittal or claim, the adjustment in the Contractor's Fee shall be the sum of the individual Fees

§7.3 REDUCTION IN SCOPE OF WORK

The Owner, through the Program Manager or a consultant, if applicable, reserves the right to decrease the scope of the Work to be done under this Agreement and to omit any Work should the Owner deem it to be in the public interest to do so. To this end, the Owner reserves the right to reduce the quantity of any item or omit any item as set forth in the Bid, either prior to executing the contract or at any time during the performance of the Work. The Owner further reserves the right, at any time during the performance of the Work, to restore all or part of any item previously omitted or reduced. An equitable reduction in the Contract Price shall be determined in accordance with the provisions of Section 7.2, Extra Work. Exercise by the Owner of the above rights shall not constitute any ground or basis of claim for damages or for anticipated profits on the work omitted.

§7.4 CHANGES NOT TO AFFECT BONDS

Any changes made in the Work or the Drawings or Specifications therefor (whether such changes increase or decrease the Contract Price or Contract Time or any changes in the manner of time of payments made by the Owner to the Contractor, or any other modifications of the Contract Documents, shall in no way annul, release, diminish or affect the liability of the Surety

on the Bonds given by the Contractor, it being the intent hereof that, notwithstanding such Changes, the liability of the Surety on said bonds continue and remain in full force and effect.

§7.5 MODIFICATION

Except as otherwise expressly provided herein, the Contract may not be amended or otherwise modified except in writing signed by the parties hereto. In the event the Contractor does not sign the respective documents outlined in the Agreement, the Owner shall issue a unilateral modification.

ARTICLE 8 – TIME

§8.1 COMPUTATION OF TIME

Any period of time in days will be computed in calendar days and shall exclude the first and include the last day of such period. If the last day of any such period falls on a day other than a business day, that day shall be omitted from the computation.

§8.2 ALLOWABLE DELAY BY OWNER

The Owner may delay the beginning of the Work or any part thereof if the necessary lands or rights-of-way for such Work shall not have been obtained. The Contractor shall have no claim for additional compensation or damages on account of such delay, but shall be entitled only to an extension of time as hereinafter provided.

§8.3 TIME FOR COMPLETION

The rate of progress shall be such that the Work shall be performed and completed in accordance with the Contract Documents before the expiration of the time limit stipulated in Table A of this Agreement, except as otherwise expressly provided herein.

The time of commencement, any interim milestones and final completion of the Work in accordance with the Contract Documents are essential conditions of this Agreement.

It is agreed that the rate of progress herein required has been purposely set low enough to allow for the ordinary and foreseeable delays incident to construction work of this character. No extension of time will be given for ordinary or foreseeable delays, inclement weather, or accidents, and the occurrence of such will not relieve the Contractor from the necessity of maintaining this rate of progress and completing the Work within the Contract Time.

If delays are caused by acts of God, acts of government, unavoidable strikes, extra work, or other causes or contingencies clearly beyond the control or responsibility of the Contractor, the Contractor may be entitled to additional time to perform and complete the Work, provided that the Contractor shall, within ten (10) days from the beginning of such delay notify the Owner in writing, with a copy to the Program Manager, of the cause and particulars of the delay. Upon receipt of such notification, the Owner shall review and evaluate the cause and extent of the delay. If, under the terms of the Agreement, the delay is properly excusable, the Owner will, in writing, appropriately extend the Contract Time for completion of the Work. (This paragraph will be interpreted to include delays in receipt of equipment provided that the Contractor placed its order and submitted shop drawings for such equipment promptly after execution of the Contract, that it has shown due diligence in following the progress of the order, and that the time

required for delivery is in accordance with conditions generally prevailing in the industry.) The Contractor agrees that it shall not have or assert any claim for nor shall it be entitled to any additional compensation or damages on account of such delays.

The time is of the essence for this Agreement and the Work to be performed and completed in accordance with the Contract Documents. Where, in accordance with the Contract Documents additional Contract Time is allowed for completion of any Work, the new time fixed by such extension shall be of the essence of this Agreement.

§8.4 EXTENSION OF TIME

When Extra Work, as per §7.2, is ordered near the completion of the Work or at any time during the performance of the Work which unavoidably increases the time for the completion of the Work, an extension of time shall be granted as hereinbefore provided. An extension of time for Extra Work which is not on the critical path of the Project Schedule will not be considered.

The criteria to be used to determine an adjustment in Contract Time necessitated by changes ordered or negotiated pursuant to this Agreement, or work covered by a submittal or a claim, are limited to the following:

An adjustment in Contract Time will be based solely upon net increases in the time required for the performance or completion of parts of the Work that negatively impact the Critical Path of the Project Schedule. However, even if time required for the performance or completion of controlling parts of the Work is extended, an extension in Contract Time will not be granted until all of the available Total Float in the Project Schedule is consumed and performance or completion of the controlling Work necessarily extends beyond the Contract Time.

An extension in Contract Time will not be granted unless the Contractor can demonstrate through an analysis of the Project Schedule that the increases in the time to perform or complete the Work, or specified part of the Work, beyond the corresponding Contract Time(s) arise from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and its Subcontractors, suppliers or other persons or organizations, and that such causes in fact lead to performance or completion of the Work, or specified part in question, beyond the corresponding Contract Time, despite the Contractor's reasonable and diligent actions to guard against those effects. Examples of such causes include acts of God, acts of government, unavoidable strikes, certain extra work, or other causes or contingencies clearly beyond the control or responsibility of the Contractor.

It is the intent of the Contract Documents that an extension in Contract Time, if any granted, shall be the Contractor's sole and exclusive remedy in law or in equity for any delay, disruption, interference, or hindrance and associated costs, however caused.

§8.5 DELAY DAMAGES

As set forth in Section 8.3, Time For Completion, time is of the essence with respect to the date for final completion specified in Table A of this Agreement and all other time periods and dates specified in the Contract Documents. The Contractor understands that delays in completion of the Work will cause the Owner to suffer damages and incur costs, and will expose the Owner to other substantial liabilities. Such damages, costs, and liabilities include, but may not be limited

additional engineering/consultant fees, administrative expenses, legal expenses, penalties or fines. The amount currently estimated after the Owner's approximation of these costs is identified in Table A. Contractor and Owner agree that the anticipated damages to the Owner arising from delay are difficult to forecast and to quantify and therefore voluntarily stipulate that the fixed amount per day listed in Table A is a good faith approximation of the anticipated damages. Contractor does not consider this amount of liquidated delay damages a penalty and expressly and voluntarily agrees to the assessment of the liquidated damages.

The Contractor understands that, without limitation of the provisions of Section 3.1, Obligations and Liability of Contractor, or any other provisions of the Contract Document, if the Contractor shall neglect, fail or refuse to achieve final completion of the work within the time specified in Table A, or shall fail to achieve any other interim or milestone date specified in the Contract Documents, as such-times or dates may be extended pursuant to the provisions of the Contract Documents, the Owner will hold the Contractor strictly liable for all such damages, costs, expenses or liabilities sustained or incurred by the Owner arising directly or indirectly out of such delays.

Such damages may be retained from time to time by the Owner from progress payments or any other amounts owing to the Contractor, or otherwise collected. None of the following shall constitute a waiver or release of the Contractor's or its Surety's obligations or liabilities for such damages or any portion thereof: (a) acceptance of any portion of the Work or the use or occupancy thereof; (b) completion of a portion of the Work or the use or occupancy thereof by the Owner or separate Contractor; or (c) the Owner's requiring or allowing the Contractor or its Surety to complete the Work. The Owner's right to recover such damages is in addition to and shall not limit any other rights and remedies provided under the Contract Documents or by operation of law.

However, the Contractor shall not be charged with delay damages or any excess costs when the delay in completion of the Work is for reasons included in Section 8.4, Extension of Time. Provided, further, that Contractor shall furnish Owner the required notification of such delays in accordance with Section 4.6, Claims for Damages Against Owner.

ARTICLE 9 – PAYMENTS AND COMPLETION

§9.1 PRICES FOR WORK

The Owner shall pay and the Contractor shall receive the prices stipulated in the Bid made a part hereof as full compensation for everything performed and furnished and for all risks and obligations undertaken by the Contractor under and as required by the Contract Documents.

§9.2 FORMAL ACCEPTANCE

This Agreement constitutes an entire contract for one whole and complete Work or result. Fixing of the date of completion and acceptance of the Work or a specified part thereof shall only be effective when accomplished by a writing specifically so stating and signed by the Owner.

§9.3 SUBSTANTIAL COMPLETION

Unless otherwise provided in the Contract Documents, Substantial Completion shall mean that substantially all of the Work has been completed and opened to public use except for minor

incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work required by the Contract Documents. Substantial Completion shall be conclusively determined by the Program Manager after inspection of the Work and in accordance with all requirements of the Contract Documents.

When the Contractor determines that he has met all requirements for Substantial Completion as detailed in the Contract Documents, it shall notify the Owner and the Program Manager in writing that the entire Work is substantially complete (except for items specifically listed by the Contractor as incomplete) and request that the Program Manager issue a Certificate of Substantial Completion. Within a reasonable time thereafter, the Owner, the Contractor and the Program Manager shall make an inspection of the Work to determine the status of completion. If, after consultation with the Owner, the Program Manager does not consider the Work substantially complete, the Program Manager will notify the Contractor in writing stating the reasons therefor. If, after consultation with the Owner, the Program Manager determines and the Owner agrees that the Work is substantially complete, the Program Manager will prepare and deliver to the Contractor, in a form approved by the Owner, a Certificate of Substantial Completion which shall fix the date of Substantial Completion. Included or referenced within the Certificate of Substantial Completion shall be a list of items to be completed or corrected before final payment.

The Owner shall have the right to exclude the Contractor from the Work, or specified part, after the date of Substantial Completion, but the Owner shall allow the Contractor reasonable access to complete or correct items on the list included within or referenced by the Certificate of Substantial Completion.

§9.4 PARTIAL UTILIZATION

The Owner may, at any time in a written order to the Contractor (1) declare that he intends to use a specified part of the Work which in the Owner's opinion is sufficiently complete, in accordance with the Contract Documents, to permit its use; (2) enclose a tentative list of items remaining to be completed or corrected, and (3) fix the date of Substantial Completion of that specified part of the Work.

No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of Section 11.1, Insurance, in respect to property insurance.

Within forty-five (45) days after acceptance under this subsection, the Program Manager shall make an estimate in writing of the amount and value of the part of the Work so accepted. The Owner shall pay said amount to the Contractor after deducting therefrom all previous payments, all charges against the Contractor as provided for hereunder, and all amounts to be retained under the provisions of the Contract, said payment to be made at the time of the next monthly progress estimate.

Partial utilization by the Owner under this subsection shall not relieve the Contractor of any obligations under the Contract Documents except to the extent agreed upon in writing between the Owner and the Contractor.

The Owner shall have the right to exclude the Contractor from any part of the Work which has been accepted, but the Owner shall allow the Contractor reasonable access thereto to complete or correct items on the tentative list.

§9.5 FINAL ESTIMATE AND PAYMENT

As soon as practicable (but not more than sixty-five (65) days) after final completion of the Work, the Program Manager shall make a final estimate in writing of the quantity of Work done under the Contract and the amount earned by the Contractor.

The Owner shall pay to the Contractor the entire amount found by the Program Manager to be earned and due hereunder after deducting therefrom all previous payments and all charges against the Contractor as provided for hereunder. Except as in this subsection otherwise provided, such payment shall be made not later than forty five (45) days after but in no event before, the expiration of the time within which claims for labor performed or materials or equipment furnished must be filed under the applicable Lien Law.

All quantities shown on progress estimates and all prior payments shall be subject to correction in the final estimate and payment.

§9.6 LIABILITY OF OWNER

No person, firm or corporation, other than the Contractor, who signed this Contract as such, shall have any interest herein or right hereunder. No claim shall be made or be valid either against the Owner or any agent of the Owner and neither the Owner nor any agent of the Owner shall be liable for or be held to pay any money, except as herein provided. The acceptance by the Contractor of the payment as fixed in the final estimate shall operate as and shall be a full and complete release of the Owner and of every agent of the Owner of and from any and all claims, demands, damages and liabilities of, by or to the Contractor for anything done or furnished for or arising out of or relating to or by reason of the Work or for or on account of any act or neglect of the Owner or of any agent of the Owner or of any other person, arising out of, relating to or by reason of the Work, except the claim against the Owner for the unpaid balance, if any there be, of the amounts retained as herein provided.

§9.7 RIGHT TO MATERIALS

Nothing in the Contract shall be construed as vesting in the Contractor any right of property in the materials, equipment, apparatus and other items furnished after they have been installed or incorporated in or attached or affixed to the Work or the site and no later than the time of payment, but all such materials, equipment, apparatus and other items shall, upon being so installed, incorporated, attached or affixed, become the property of the Owner. Nothing in this subsection shall relieve the Contractor of its duty to protect and maintain all such materials, equipment, apparatus and other items.

ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

§10.1 SAFETY PRECAUTIONS

The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work.

§10.2 HAZARDOUS MATERIALS

If a hazardous material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), is encountered on the site by the Contractor, the Contractor shall, upon

recognizing the condition, immediately stop its Work in the affected area and report the condition to the Owner and Program Manager in writing.

ARTICLE 11 – INSURANCE AND BONDS

§11.1 INSURANCE

Before starting and until final completion and acceptance of the Work, including Warranties, the Contractor shall procure and maintain insurance of the types specified in paragraphs (A) to (F), inclusive, below. All insurance shall be obtained from companies satisfactory to the Owner.

Insurance shall be in such forms as will protect the Contractor from all claims and liability for damages for bodily and personal injury, including accidental death, and for property damage, which may arise from operations under the Work, whether such operations be by itself, its subcontractors, or by anyone directly or indirectly employed or engaged by the Contractor.

The following types of insurance shall be provided. The insurance carriers shall be rated by A.M. Best's with no less than an "A" rating and a financial size of "8" or higher. The limits of the various policies shall be as detailed in the Certificates of Insurance attached hereto:

- A. Statutory Worker's Compensation and Employer's Liability Insurance including Longshore and Harbor Workers Coverage and Maritime coverage if appropriate.
- B. Commercial General Liability Insurance.
 - 1. Commercial General Liability (CGL) Insurance.
 - 2. If the CGL coverage contains a General Aggregate Limit, such General Aggregate shall apply separately to each project.
 - 3. CGL coverage shall be written on ISO Occurrence form CG 00 01(10 93) or a substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, and personal and advertising injury.
 - 4. The Owner and any other entity required by the Owner (including the Program Manager) shall be included as additional insured on the CGL, using ISO Additional Insured Endorsement CG 20 10 (11 85) or CG 2010 (10 93) AND CG 20 37 (10 01) or CG2033 (10 01) AND CG2037 (10 01) or an endorsement providing equivalent coverage to the additional insured. This insurance for the additional insured shall be as broad as the coverage provided for the named insured contractor or subcontractor. It shall apply as primary and non-contributing insurance before any other insurance or self-insurance, including any deductible, maintained by, or provided to, the additional insured. (See waiver of surrogate requirements shown below).
 - 5. Contractor and Subcontractors shall maintain CGL coverage for themselves and the Owner for the duration of the Project and maintain Completed Operations coverage for themselves and the Owner for at least 3 years after final payment of the Work.
 - 6. The Contractor's CGL policy shall include the "Per Project Aggregate" coverage endorsement.

- C. Commercial Automobile Liability Insurance.
1. Business Auto Liability.
 2. Business Auto coverage must include coverage for liability arising out of all owned, leased, hired and non-owned automobiles.
 3. The Owner and any other entity required by the Owner shall be included as an additional insured on the commercial auto policy on a primary, non-contributing basis.
- D. Builders' Risk and Installation Floater Coverage issued on an "All Risk" form including the completed value basis in the amount of the total insurable value of all structures, materials, and equipment to be built and installed. The policy shall indicate the Owner, the Contractor, all Subcontractors, and the Program Manager as the named insured with loss payable to the Owner as Trustee. Any co-insurance clause shall be null and void and the agreed amount endorsement shall apply.

The Builders Risk coverage should include the perils of Flood and Earthquake with a minimum sub-limit of \$10,000,000 for each peril. Flood coverage needs to be provided in Zone X only.

Comprehensive Boiler and Machinery coverage must also be included within the Builders Risk policy or the purchase of a separate policy. This coverage must include equipment and machinery testing exposure.

If the Owner is to occupy and/or utilize the building or structure while under renovation or construction, then the Builders risk Policy must include a "permission to Occupy" endorsement or agreement to the coverage.

- E. Commercial Umbrella Insurance must include as underlying coverage Worker's Compensation and Employer's Liability, Commercial General Liability, Commercial Auto Liability, and include the Owner as an additional insured on the CGL and Auto Liability on a primary, non-contributing basis. Additional insured status must be provided to Owner and any other entity required by the Owner. This additional insured status shall be primary and non-contributing to any other policies maintained by the Owner and any other additional insured.
- F. Pollution Liability including asbestos and lead abatement coverage. The coverage shall include Extended Completed Operations coverage for two years.

If the Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with Section 9.4, Partial Utilization; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent to endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

Should there be an insured loss on any of the above lines of coverage, it shall be the Contractor's responsibility for the payment of any deductible that may apply.

Waiver of Subrogation: The Contractor and its Subcontractors shall waive all rights against the Owner, its officers, directors and employees for recovery of damages to the extent these damages are covered by Workers Compensation and Employers Liability, Commercial General Liability, Commercial Automobile Liability, Commercial Umbrella Liability, Pollution Liability or insurance maintained per requirements stated above.

All insurance shall be obtained before the Work is started and shall be maintained until the date of final completion of the Work and performance of warranty obligation except for Builders' Risk insurance which shall be maintained until final completion, or until the Owner occupies or otherwise takes possession of the structure, whichever occurs first.

All policies shall be so written that the Owner and the Program Manager will be notified in writing of cancellation or restrictive amendment at least thirty (30) days prior to the effective date of such cancellation or amendment.

Copies of the foregoing insurance policies shall be provided to the Owner within thirty (30) days of the execution of the Agreement.

Certificates of Insurance from the Contractor's insurance carriers stating the coverage provided, the limits of liability, and expiration dates shall be filed in triplicate with the Owner and the Program Manager before operations are begun. Such certificates shall be on the form furnished by the Program Manager, a copy of which is attached hereto.

Renewal certificates must be furnished by the Contractor prior to the expiration date of any of the initial insurance.

No insurance required or furnished hereunder, nor the failure of the Owner or the Program Manager to object to same, shall in any way relieve the Contractor of or diminish any of its responsibilities, obligations and liabilities under the Contract Documents.

§ 11.2 ADDITIONAL OR SUBSTITUTE BONDS

If at any time the Owner, for justifiable cause, is or shall become dissatisfied with any Surety or Sureties the Contractor shall, within five (5) calendar days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other Surety or Sureties, as may be acceptable to the Owner. The premiums on such bonds shall be paid by the Contractor with no additional expense to the Owner. No further payments shall be deemed nor will be made until the new Surety or Sureties shall have furnished such as acceptable bond to the Owner.

ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK

§12.1 EXAMINATION OF WORK

The Program Manager shall be furnished by the Contractor with every reasonable facility for examining and inspecting the Work and for ascertaining that the Work is being performed in accordance with the requirements and intent of the Contract, even to the extent of requiring the uncovering or taking down portions of finished work by the Contractor.

Should the Program Manager in its sole judgment consider the Work thus uncovered or taken down satisfactory, the cost of uncovering or taking down and the replacement thereof shall be

considered as Extra Work unless the original Work was done in violation of the Contract Documents in point of time or in the absence of the Program Manager or the Program Manager's inspector and without the Program Manager's written authorization, in which case said cost shall be borne by the Contractor. Should the work uncovered or taken down prove unsatisfactory in the Program Manager's sole judgment, said cost shall likewise be borne by the Contractor.

Examination or inspection of the Work shall not relieve the Contractor of any of its obligations to perform and complete the Work as required by the Contract Documents.

§12.2 DEFECTIVE WORK

Until acceptance and in accordance with its Warranty obligations, the Contractor shall promptly, without charge, repair, correct or replace work, equipment, materials, apparatus or parts thereof which are defective, damaged or unsuitable or which in any way fail to comply with or be in strict accordance with the provisions and requirements of the Contract Documents or applicable Warranty and shall pay to the Owner all resulting costs, expenses, losses or damages suffered by the Owner (including, but not limited to, all costs of repair or replacement of work by others).

If any material, equipment, apparatus or other items brought upon the site for use or incorporation in the Work, or selected for the same, is rejected by the Program Manager as unsuitable or not in conformity with the Specifications or any of the other Contract Documents, the Contractor shall forthwith remove such materials, equipment, apparatus and other items from the site of the Work and shall at its own cost and expense make good and replace the same and any material furnished by the Owner which shall be damaged or rendered defective by the handling or improper installation by the Contractor, its agents, servants, employees or subcontractors.

If the Contractor fails within a reasonable time after written notice from the Program Manager to correct Defective Work or to remove and replace rejected Work as required by the Program Manager in accordance with this Section, or if the Contractor fails to perform the Work in accordance with the Contract Documents, or if the Contractor fails to comply with any other provision of the Contract Documents, the Owner, may, after three (3) days' written notice to the Contractor, correct and remedy any such deficiency. (This notification period may be reduced when the deficiencies affect the health, safety or welfare of the public or critical facility operations.) In exercising the rights and remedies under this paragraph the Owner shall proceed expeditiously. In connection with such corrective and remedial action, the Owner may exclude the Contractor from all or part of the site, take possession of all or part of the Work, and suspend the Contractor's services related thereto, take possession of the Contractor's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which the Owner has paid the Contractor but which are stored elsewhere. The Contractor shall allow the Owner, the Owner's representatives, agent and employees, the Owner's other contractors and the Program Manager access to the site to enable the Owner to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by the Owner in exercising such rights and remedies will be charged against the Contractor. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or the damaged by correction, removal or replacement of the Contractor's Defective Work. The Contractor shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by the Owner or the Owner's rights and remedies hereunder.

If, instead of requiring correction or removal and replacement of Defective Work, the Owner prefers to accept it, the Owner may do so. The Contractor shall pay all claims, costs, losses and damages attributable to the Owner's evaluation of and determination to accept such Defective Work. A Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Owner shall be entitled to an appropriate decrease in the Contract Price.

§12.3 RETAIN MONEY FOR REPAIRS

If at any time any part of the Work requires repair, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction, or replacements. If the Contractor neglects to commence making such repairs, correction, or replacements to the satisfaction of the Owner within (3) days from the date of receipt of such notice, or having commenced fails to perform such Work with diligence, the Owner may employ other persons to make the same, and all direct and indirect costs of making said repairs, correction or replacements, including compensation for additional professional services, shall be paid by the Contractor.

ARTICLE 13 – MISCELLANEOUS PROVISIONS

§13.1 NIGHT AND SUNDAY WORK

No work shall be done at night or on Sunday except (1) usual protective work, such as pumping and the tending of temporary lighting/power and temporary heating, (2) work done in case of emergency threatening injury to persons or property, or (3) if all of the conditions set forth in the next paragraph below are met.

No work other than that included in (1) and (2) above shall be done at night or on Sunday except when (a) in the sole judgment of the Program Manager, the work will be of advantage to the Owner and can be performed satisfactorily, (b) the work will be done by a crew organized for regular and continuous work, (c) the Program Manager has given written permission for such work, or (d) the work is specified in Section 01311 or Section 01810 to be completed in accordance with specific time restraints.

§13.2 NOTICE AND SERVICE

Any notice given per this Agreement shall be in writing

The principal contacts for written notices for the Owner and Contractor shall be the following at the commencement of the Work:

Owner's Contact for Notice: _____

Address: _____

Email: : _____

Contractor's Contact for Notice: _____

Address: : _____

Email: : _____

The Owner and Contractor may only change the contact person for notice in writing.

For all notices other than those given pursuant to Article 14, Termination and Suspension, or communications to the Contractor's sureties, notice and delivery of the written communication shall be deemed accomplished by one or more of the following methods:

- (a) Email communication. Notice shall be deemed effective one (1) business day after sending of the email communication to the proper email address designated above (or later designated substitute) unless receipt is confirmed by the recipient or otherwise responded to by the recipient in which case notice is accomplished the same day the email was sent and actually received.
- (b) Personal delivery. Written notices may be delivered in-hand to the contact person designated above. Notice shall be deemed effective on the date of actual receipt.
- (c) Mail. Written notices may be delivered by U.S. Mail, Federal Express, UPS, or some other professional delivery service provided that the written communication is properly addressed to the contact person (or later designated substitute) for the Owner or Contractor.

For notices given pursuant to Article 14, Termination and Suspension or any written notice or other communication to the Contractor's sureties, such notices shall be mailed by certified mail, return receipt requested, to the home office of the Contractor, the home office of the Surety (or address listed for notice by the Surety on the issued Bonds, if any), or to the agent who executed the Bonds on behalf of the Surety.

§13.3 HEADINGS

The headings or titles of any section, subsection, paragraph, provision, or part of the Contract Documents shall not be deemed to limit or restrict the content, meaning or effect of such section, subsection, paragraph, provision or part.

§13.4 NO CONFLICT WITH LAWS OR REGULATIONS

The duties, obligations, criteria or procedure imposed by this Agreement and the rights and remedies made available are in addition to, and are not be construed in any way as a limitation of any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, except that in the event that a specific part of detailed requirement of a provision, criterion or procedure in this Agreement and a specific part or detailed requirement of a provision, criteria or procedure imposed or available by Laws or Regulations are in conflict, the specific part or detailed requirement of such provision, criterion or procedure imposed or available by Laws or Regulations in conflict shall govern. All other specific parts or detailed requirements in the provisions, criteria or procedures of this Agreement not in conflict with applicable laws or regulations shall remain in full force and effect and be read with the controlling specific part or detailed requirement.

The provisions of this Section will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

If the Agreement or Contract Documents contain any unlawful provisions, such unlawful provisions shall be of no effect. Upon the application of either party, the unlawful provisions shall be considered stricken from the Agreement or the Contract Documents without affecting the remainder of the Agreement or Contract Documents.

It is intended that all provisions of law required to be inserted in the Agreement or Contract Documents shall be and are inserted herein. If through mistake, neglect, oversight or otherwise, any such provisions is not herein inserted or inserted in improper form, upon the application of either party, the Agreement or Contract Documents shall be changed by the Owner, at no increase in Contract Price or extension in Contract Time, so as to strictly comply with the law and without prejudice to the rights of either party hereunder.

§13.5 NO WAIVER

Observation by the Program Manager or by any of the Program Manager's representatives, any measurement or report by the Program Manager, any order by the Owner for the payment of money, any payment for or acceptance of any Work or any extension in Contract Time or any Partial Utilization by the Owner shall not operate as a waiver of any provision of the Contract Documents, or any power preserved to the Owner, or of any right to any damages provided. Any waiver of any breach of this Contract shall not be held to be a waiver of any other or subsequent breach.

Neither the inspection by the Owner or the Program Manager, nor any order, measurement, approval, determination, decision or certificate by the Program Manager, nor any order by the Owner for the payment of money, nor any payment for or use, occupancy, possession or acceptance of the whole or any part of the Work by the Owner, nor any extension of Contract Time, nor any other act or omission of the Owner or of the Program Manager shall constitute or be deemed to be an acceptance of any Defective Work, materials, or equipment nor operate as a waiver of any requirement or provision of the Contract Documents, nor of any remedy, power or right of or herein reserved to the Owner, nor of any right to damages for breach of contract. Any and all rights and/or remedies provided for in the Contract are intended and shall be construed to be cumulative; and, in addition to each and every other right and remedy provided for herein or by law, the Owner shall be entitled as of right to a writ of injunction against any breach or threatened breach of the Agreement by the Contractor, by its Subcontractors or by any other person or persons.

The Owner reserves the right to correct any error that may be discovered in any estimate that may have been paid, and to adjust same to meet the requirements of the Contract Documents. The Owner further reserves the right, should proof of Defective Work on the part of the Contractor be discovered after final payment, to claim, and recover from the Contractor or its surety, or both, such sums as may be sufficient to correct the error, or make good the defects in the Work.

Any waiver issued by the Owner of any provision of the Contract Documents shall only be effective if issued in writing by the Owner and shall be specific, shall apply only to the particular matter concerned and not to other similar or dissimilar matters.

ARTICLE 14 – TERMINATION AND SUSPENSION

§14.1 SUSPENSION OF WORK

The Owner may at any time and without cause suspend the Work or any portion thereof for a period of not more than ninety (90) days by notice in writing to the Contractor that shall fix the date on which Work shall be resumed. The Contractor shall resume the Work on the date so fixed. The Contractor shall be entitled to an extension of the Contract Time in accordance with the provisions of Section 8.4, Extension of Time.

The Contractor may be entitled to an equitable adjustment in accordance with the provisions of Section 7.2, Extra Work. No equitable adjustments shall be made for any suspension to the extent that performance would have been so suspended pursuant to this Agreement or for which an equitable adjustment is provided for or excluded under any other provision of the Contract Documents.

§14.2 TERMINATION FOR CAUSE

The Owner, acting on belief or knowledge, shall have full power and authority to give written notice to the Contractor and the Surety of the Owner's intention to terminate the services of the Contractor seven (7) days after the giving of notice, or sooner, if, in the opinion of the Owner it is in the best interests of the Owner to do so, because:

- a. The Contractor fails to complete the Work, or a separable part of the Work, within the corresponding Contract Time, including any authorized adjustments;
- b. The Contractor refuses or fails to perform the Work, or a separable part of the Work, with the diligence that will cause its completion within the corresponding Contract Time, including any authorized adjustments;
- c. The Contractor refuses or fails to supply sufficient skilled workers, materials, or equipment in adherence with the Project Schedule revised from time to time;
- d. The Contractor refuses or fails to provide labor, including that of subcontractors, that can work in harmony with all other elements of labor employed or to be employed by Contractor or other contractors of Owner;
- e. The Contractor refuses or fails to comply with the Project Schedule requirements;
- f. The Contractor disregards the authority of the Program Manager;
- g. The Contractor is unable to pay its debts generally as they become due;
- h. The Contractor in response to a demand by the Owner as a result of the Contractor becoming insolvent, seeking relief in bankruptcy, or making a general assignment for the benefit of creditors, fails to provide adequate assurances, the adequacy of which the Owner shall be the sole judge, of the Contractor's future performance in accordance with the requirements of the Contract Documents;
- i. A trustee, receiver, custodian or agent of the Contractor is appointed under applicable law or under Contract, whose appointment or authority to take charge of property of such Contractor is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of the Contractor's creditors; or
- j. The Contractor otherwise violates any provisions of the Contract Documents, fails to perform the Work in accordance with the Contract Documents, or disregards Laws or Regulations of any public entity having jurisdiction over any aspect of the Work.

If upon receipt of a notice of intent to terminate for cause, the Contractor does not cure the default or make adequate assurances that it will immediately take action to cure the default

within three (3) days of that notice, the Owner shall have full power and authority, to terminate in whole or in part the Work of the Contractor, exclude the Contractor from the site and, take possession of the Work and of all the Contractor's tools, appliances, plant, construction equipment and machinery at the site and use the same to the full extent they could be used by the Contractor (without liability to the Contractor for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which the Owner has paid the Contractor but which are stored elsewhere and prosecute the Work to completion by Contract or as the Owner may deem expedient. Upon receipt of a notice of termination, the Contractor shall immediately proceed in accordance with any specific provisions or instruction, to protect and maintain the Work, and make reasonable efforts to mitigate any costs.

In the event that the Owner so terminates the Contractor's services for cause, 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, indirect and consequential costs of completing the Work (including but not limited to delay damages, fees and charges of engineers, consultants, architects, attorneys and other professionals and court costs) that excess will be paid to the Contractor. If those costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. Costs incurred by the Owner will be incorporated in a Change Order.

Where the Contractor's services have been so terminated by the Owner, the termination will not affect any rights or remedies of the Owner against the Contractor then existing or which may accrue after termination. Any retention or payment of monies due the Contractor by the Owner will not release the Contractor from liability.

All provisions of the Contract Documents that by their nature survive the Completion Date under the Agreement shall remain in full force and effect after a termination for cause.

The Owner may, at its sole discretion, permit the Contractor to continue to perform Work when the Contractor is in default, however caused, including but not limited to default under subparagraph b above. Such a decision by the Owner shall in no way operate as a waiver on the part of the Owner of any of its rights under the Contract Documents.

Where the Contractor's services have been so terminated by the Owner, and the Surety completes the Work in place of the defaulted Contractor, the Surety's contract with another contractor makes that Contractor a Subcontractor under the Agreement, in which case:

The provisions of §7.2, Extra Work, shall remain in full force and effect, and the methods and criteria to be used to compute the Surety's and that contractor's Cost of the Work involved in any subsequent changes shall be limited to those provided in §7.2, Extra Work. All Work performed by any such contractor pursuant to a Subcontract between that contractor and the Surety shall be governed by the requirements of the Contract Documents pertaining to Subcontracts.

§14.3 TERMINATION FOR CONVENIENCE

Upon seven (7) days written notice to the Contractor and the Surety, the Owner may, without cause and without prejudice to any other right or remedy, elect to terminate the Agreement in whole or in part. Upon receipt of such notice, the Contractor shall immediately proceed in accordance with any specific provisions or instructions, protect and maintain the Work, and make reasonable and diligent efforts to mitigate costs associated with the termination.

In any such termination for the convenience by the Owner, the Contractor shall be paid for Work completed in accordance with the Contract Documents prior to receipt of the notice of termination, and for reasonable termination settlement costs relating to commitments which had become firm prior to the termination; provided, however, that the payment to the Contractor will exclude any and all anticipated supplemental costs, administrative expenses and profit on uncompleted Work.

If, after notice of termination of the services of the Contractor for any of the causes listed in subparagraphs a through g, "Termination for Cause", it is determined that the Contractor was not in default, the termination shall be deemed to have been for the convenience by the Owner. In such event, the Contractor may recover from the Owner payment in accordance with this Section.

TABLE A

<u>AGREEMENT SUBSECTION</u>	<u>ITEM</u>	<u>LIMITS</u>
§8.3	Contract	Contract Time, as defined in the Contract Agreement Article 1.2.1, shall be on or before 1,000 consecutive calendar days from date stipulated in the Notice-to-Proceed to commence "Work".
§8.5	Delay Damages	\$500.00 per calendar day
§4.3	Percentage of Progress Estimates to be Retained	5% Until Substantial Completion; 0.5% plus Punch List through one year after the Completion Date
§4.3	Amount of Minimum Progress Estimates	\$10,000.00

CERTIFICATE OF INSURANCE

PROJECT: _____

INSURANCE AGENCY: _____

TYPE	COVERAGE REQUIRED BY INSURANCE CONTRACT DOCUMENTS	POLICY COMPANY	POLICY NUMBER	COVERAGE	EXPIRATION DATE
Workmen's Compensation and Employee's Liability Insurance	As Required by the Laws of the State of Rhode Island	_____	_____	\$ _____	_____
Commercial General Liability	\$1,000,000 each occurrence	_____	_____	\$ _____	_____
	\$2,000,000 annual aggregate Products – Completed Operation aggregate	_____	_____	\$ _____	_____
Commercial Automobile Liability	\$1,000,000 each accident	_____	_____	\$ _____	_____
Builder's Risk Insurance	Not Required				
Commercial Umbrella Liability Insurance	\$2,000,000	_____	_____	\$ _____	_____
Pollution Liability including asbestos and lead abatement	\$1,000,000 each occurrence	_____	_____	\$ _____	_____
	\$3,000,000 aggregate	_____	_____	\$ _____	_____

We certify that the coverages noted above meet or exceed the coverages required under Article 11 of the Contract Agreement.

Contractor's Authorized Representative
Date _____

Insurance Agents. Authorized Representative
Date _____

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SECTION CB

CONTRACT BONDS

PERFORMANCE BOND

(Note: This Bond is issued simultaneously with the attached Labor and Materials Bond in favor of the Narragansett Bay Commission ("Owner".))

KNOW ALL MEN BY THESE PRESENTS:

That we,

(an individual, a partnership, a corporation)

duly organized under the Laws of the State of _____,

and having a usual place of business at _____,

as Principal, and _____,

a corporation duly organized under the Laws of the State of _____

and duly authorized to do business in the State of Rhode Island, and having a usual place of business at _____, as Surety, are holden and stand firmly bound and obligated unto Owner, Narragansett Bay Commission, as Obligee, in the sum of _____ Dollars (\$ _____) lawful money of the United States of America, to and for the true payment whereof we bind ourselves and, each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal, by means of a written AGREEMENT (which together with the Contract Documents in said AGREEMENT referred to are collectively sometimes referred to as the "Contract") dated _____, has entered into a contract with the said Obligee for CSO Phase IIIA-4, OF-210/213/214 Facilities, NBC Contract No. 308.04C, in Pawtucket, Rhode Island, a copy of which AGREEMENT is attached hereto and by reference made a part hereof.

NOW THEREFORE, THE CONDITION of this obligation is such that if the Principal shall well and truly keep and fully and faithfully perform all of the terms and conditions of said AGREEMENT and of the "Contract Documents" referred to in said AGREEMENT (which collectively are hereinafter and in said AGREEMENT sometimes referred to as the "Contract") and all modifications thereof on the Principal's part to be performed, this obligation shall be void; otherwise it shall remain in full force and effect.

Whenever the said Principal shall be, and declared by the Owner to be, in default under the said Contract, the Owner having performed the Owner's obligations thereunder, the Surety, for value received, shall promptly, at the option of the Owner:

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

- (a) Complete the said AGREEMENT and/or Contract in accordance with its terms and conditions with replacement contractor(s) or supplier(s) consented to in writing by the Owner,

or

- (b) Obtain a bid or bids for submission to and the approval of the Owner for completing the said AGREEMENT and/or Contract and any modifications thereof in accordance with the terms and conditions thereof, and upon determination by the Owner and the Surety of the lowest responsible and acceptable bidder, arrange for a contract between such bidder and the Owner, and make available to the Owner as the Work progresses (even though there should be a default or a succession of defaults under this paragraph) sufficient funds to pay the cost of completion less a sum that shall be equal to the difference between the Contract price as fixed and provided in said AGREEMENT and/or Contract or any modifications thereof to be paid thereunder to the Principal and the amount previously paid by the Owner to and/or for the account of and/or chargeable against the Principal, but not exceeding (including other costs and damages for which the Surety may be liable hereunder) the amount set forth in the first paragraph hereof.

The Surety, for value received, agrees further that no changes in, omissions from, or alterations, modifications or additions to the terms and provisions of said AGREEMENT and/or Contract or the Work to be performed thereunder, and that no extensions of time given or changes made in the manner or time of making payments thereunder, shall in any way affect the Surety's obligations on this Bond, and the Surety hereby waives notice of any such changes, omissions, alterations, modifications, additions or extensions.

No right of action shall accrue on this Bond to or for the use of any persons other than the Owner named herein or the heirs, executors, administrators, successors and assigns of the Owner.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

IN WITNESS WHEREOF, we have hereunto set our hands and seal to _____
counterparts of this Bond, this _____ day of _____, in the
year Two Thousand and _____.

_____(Seal)

By: _____
(Signature and title)

(Signature and title)

(Signature and title)

_____(Seal)
Surety

By: _____(Seal)
(Signature and title)

By: _____
Attorney-In-Fact

(Note:

If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized officer or officers.

If this Bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his power of attorney showing his authority to sign such Bonds.

There should be executed an appropriate number of counterparts of the Bond corresponding to the number of counterparts of the AGREEMENT.)

Date of Bond shall not be prior to date of Contract.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

IMPORTANT:

Surety Companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

The attention of the Surety Companies and Principal executing this Performance Bond is directed to the fact that said Bond shall remain in full effect throughout the life of any guaranty or warranty periods stipulated in the Contract Documents and/or Agreement.

LABOR AND MATERIALS BOND

(Note: This Bond is issued simultaneously with the attached Performance Bond in favor of the Narragansett Bay Commission ("Owner".))

KNOW ALL MEN BY THESE PRESENTS:

That we,

(an individual, a partnership, a corporation)

duly organized under the Laws of the State of _____,

and having a usual place of business at

as Principal, and _____, a corporation duly organized under the Laws of the State of _____ and duly authorized to do business in the State of Rhode Island, and having a usual place of business at _____, as Surety, are holden and stand firmly bound and obligated unto the Owner, Narragansett Bay Commission, as obligee, in the sum of _____ Dollars (\$_____) lawful money of the United States of America, to and for the true payment whereof we bind ourselves and, each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal, by means of a written AGREEMENT (where together with the Contract Documents in said AGREEMENT referred to are collectively sometimes referred to as the "Contract") dated _____, has entered into a contract with the said Obligee for CSO Phase IIIA-4, OF-210/213/214 Facilities, NBC Contract No. 308.04C, in Pawtucket, Rhode Island, a copy of which AGREEMENT is attached hereto and by reference made a part hereof.

NOW, THEREFORE, THE CONDITION of this obligation is such that if the Principal shall promptly make payments to all Claimants as hereinafter defined, for all labor performed or furnished and for all materials and equipment furnished for or used in or in connection with the Work called for by said AGREEMENT and/or Contract and any modifications thereof, including lumber used but not incorporated in said Work, and for the rental or hire of vehicles, tools and other appliances and equipment furnished for or used in connection with said Work, this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- (a) A Claimant is defined as one having a direct contract with the Principal or with subcontractor of the Principal for labor, materials and/or equipment used or reasonably required for use in the performance of the said Work, labor and materials being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the said AGREEMENT and/or Contract and any modifications thereof.
- (b) The above named Principal and Surety hereby jointly and severally agree with the Owner that every Claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such Claimant's work or labor was done or performed,

or materials or equipment were furnished by such Claimant, may sue on this bond after for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due Claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

(c) No suit or action shall be commenced hereunder by any Claimant:

- (i) Unless Claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the Owner, or the Surety above named, within ninety (90) days after such Claimant did or performed the last of the work or labor, or furnished the last of the materials or equipment for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials or equipment were furnished, or for whom the work or labor was done or performed. Such notice shall be served by any means which provides written third party verification of delivery to the Principal, Owner, or Surety at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the said Work is located, save that such service need not be made by a public officer;
- (ii) After the expiration of one (1) year following the date on which the Principal ceased Work on said AGREEMENT and/or Contract and any modifications thereof, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law;
- (iii) Other than in any court of competent jurisdiction in the location in which the said Work on said AGREEMENT and/or Contract and any modifications thereof is located, and not elsewhere.

When a Claimant has satisfied the conditions of paragraph (c) above, the Surety shall promptly and at the Surety's expense take the following actions:

- (a) Send a written answer to the Claimant, with a copy to the Owner, within 60 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
- (b) Pay or arrange for payment of any undisputed amounts.

The Surety's failure to send a written answer within 60 days after receipt of the claim shall not be deemed to constitute a waiver of defenses the Surety or Principal may have or acquire as to a claim. However, if the Surety fails to timely send said written answer to the Claimant, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs to recover any sums found to be due and owing to the Claimant.

The Surety, for value received, agrees further that no changes in, commissions from, or alterations, modifications or additions to the terms and provisions of said AGREEMENT and/or Contract or the Work to be performed thereunder, and that no extensions of time given or changes made in the manner or time of making payments thereunder, shall in any way affect the Surety's obligations on this Bond, and the Surety hereby waives notice of any such changes, omissions, alterations, modifications, additions or extensions.

IN WITNESS WHEREOF, we have hereunto set our hands and seals to

_____ counterparts of this Bond, this _____ day of _____, in the year Two Thousand and _____.

_____ (Seal)
Principal

By: _____
(Signature and title)

(Signature and title)

(Signature and title)

_____ (Seal)
Surety

By: _____ (Seal)
(Signature and title)

By: _____
Attorney-In-Fact

(Note:

If the Principal (Contractor) is a partnership, the Bond should be signed by each of the partners.

If the Principal (Contractor) is a corporation, the Bond should be signed in its correct corporate name by its duly authorized officer or officers.

If this Bond is signed on behalf of the Surety by an attorney-in-fact, there should be attached to it a duly certified copy of his power of attorney showing his authority to sign such Bonds.

There should be executed an approximate number of counterparts of the Bond corresponding to the number of counterparts of the AGREEMENT.)

Date of Bond shall not be prior to date of Contract.

IMPORTANT:

Surety Companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

The attention of the Surety Companies and Principal executing this Labor and Materials Bond is directed to the fact that said Bond shall remain in full effect throughout the life of any guaranty or warranty periods stipulated in the Contract Documents and/or Agreement.

Certificate of Acknowledgment of Contractor if a Corporation

FOR CONTRACT BONDS

State of _____)

) ss:

County of _____)

On this _____ day of _____,

20_____, before me personally

came _____ to me known, who being by me duly sworn, did
depose and say as follow:

That he resides at _____

and is the _____

of _____,

the corporation described in and which executed the foregoing instrument; that he knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he signed thereto his name and official designation.

Notary Public (Seal)

My commission expires _____

END OF DOCUMENT

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DIVISION 01

SECTION 01000

GENERAL SPECIFICATIONS

1. Abbreviations
2. Handling and Distribution
3. Materials - Samples - Inspection
4. Access to the Work
5. Storage of Materials and Equipment
6. Inspection of Work Away From the Site
7. Occupying Private Land
8. Interference with and Protection of Streets
9. Traffic Control
10. Safety
11. Sanitary Regulations
12. Lines, Grades and Measurements
13. Dimensions of Existing Structures and Pipes
14. Work to Conform
15. Pipe Location
16. Limits of Normal Excavation
17. Computation of Quantities
18. Precautions During Adverse Weather
19. Installation of Equipment
20. Test Pits/Vacuum Excavations
21. Buried Utility Warning and Identification Tape
22. Architectural Coatings
23. Noise Limitations
24. Right to Know Law
25. Special Waste
26. Subsurface and Physical Conditions
27. Sales Tax Exemption
28. Hydraulic Uplift of Structures
29. Hours of Construction
30. Open Excavations
31. Protection and Relocation of Existing Structures and Utilities
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34. Construction Employment
35. Public Utilities
36. Provisions for Control of Erosion
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PART 1 GENERAL

1.01 ABBREVIATIONS

- A. Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth opposite each.

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
IEEE	Institute of Electrical and Electronics Engineers, Inc.
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANS	American National Standard
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood-Preservers' Association
AWWA	American Water Works Association
CEMA	Conveyor Equipment Manufacturer=s Association
CS	Commercial Standard
IBR	Institute of Boiler and Radiator Manufacturers
IPS	Iron Pipe Size
JIC	Joint Industry Conference Standards

NBS	National Bureau of Standards
NEC	National Electrical Code; latest edition
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Services Administration, Washington, D.C.
125-lb	ANS American National Standard for Cast-Iron Pipe 250-lb. ANS Flanges and Flanged Fittings, Designation B16.1-1975, for the appropriate class
AWG	American or Brown and Sharpe Wire Gage
NPT	National Pipe Thread
OS&Y	Outside screw and yoke
Stl. WG	U. S. Steel Wire, Washburn and Moen, American Steel and Wire or Roebling Gage
UL	Underwriters' Laboratories
USS Gage	United States Standard Gage
WOG	Water, Oil, Gas
WSP	Working steam pressure

1.02 HANDLING AND DISTRIBUTION

- A. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the Work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the Work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until the final completion and acceptance of the Work.
- B. Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

1.03 MATERIALS - SAMPLES - INSPECTION

- A. Unless otherwise expressly provided on the Drawings or in any of the other Contract Documents, only new materials and equipment shall be incorporated in the Work. All materials and equipment furnished by the Contractor to be incorporated in the Work shall be subject to the inspection of the Program Manager. No material shall be processed or fabricated for the Work or delivered to the Work site without prior concurrence of the Program Manager.

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- B. As soon as possible after execution of the Agreement, the Contractor shall submit to the Program Manager the names and addresses of the manufacturers and suppliers of all materials and equipment he proposes to incorporate into the Work. When shop and working drawings are required as specified below, the Contractor shall submit prior to the submission of such drawings, data in sufficient detail to enable the Program Manager to determine whether the manufacturer and/or the supplier have the ability to furnish a product meeting the Specifications. As requested, the Contractor shall also submit data relating to the materials and equipment he proposes to incorporate into the Work in sufficient detail to enable the Program Manager to identify and evaluate the particular product and to determine whether it conforms to the Contract requirements. Such data shall be submitted in a manner similar to that specified for submission of shop and working drawings.
- C. Facilities and labor for the storage, handling, and inspection of all materials and equipment shall be furnished by the Contractor. Defective materials and equipment shall be removed immediately from the site of the Work. See also Section 01600 – Materials and Equipment.
- D. If the Program Manager so requires, either prior to or after commencement of the Work, the Contractor shall submit samples of materials for such special tests as the Program Manager deems necessary to demonstrate that they conform to the Specifications. Such samples shall be furnished, taken, stored, packed, and shipped by the Contractor as directed. Except as otherwise expressly specified, the Owner shall make arrangements for, and pay for, the tests.
- E. All samples shall be packed so as to reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the building or work and location for which the material is intended, and the name of the Contractor submitting the sample. To ensure consideration of samples, the Contractor shall notify the Program Manager by letter that the samples have been shipped and shall properly describe the samples in the letter. The letter of notification shall be sent separate from and should not be enclosed with the samples.
- F. The Contractor shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection and testing before the materials and equipment are needed for incorporation in the Work. The consequences of his failure to do so shall be the Contractor's sole responsibility.
- G. In order to demonstrate the proficiency of workmen, or to facilitate the choice among several textures, types, finishes, surfaces, etc., the Contractor shall provide such samples of workmanship of wall, floor, finish, etc., as may be required.
- H. When required, the Contractor shall furnish to the Program Manager triplicate sworn copies of manufacturer's shop or mill tests (or reports from independent testing laboratories) relative to materials, equipment performance ratings, and concrete data.
- I. After review of the samples, data, etc., the materials and equipment used on the Work shall in all respects conform therewith.

1.04 ACCESS TO THE WORK

- A. The Contractor shall provide sufficient and proper facilities at all times for inspection of all work under this project in preparation or in progress, by the Owner, the agents and employees of the Owner, by authorized representatives of the State of Rhode Island, the Federal Government and by the Program Manager.

- B. The Contractor shall furnish the Program Manager or his authorized representative and other personnel mentioned above with such facilities and assistance as are necessary to ascertain performance of the work in accordance with the plans and specifications.

1.05 STORAGE OF MATERIALS AND EQUIPMENT

- A. The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements. The materials and equipment shall be placed as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. The Contractor shall assume full responsibility for any damage to any such land or area, or to the Owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such Owner or occupant because of the performance of the Work, the Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. See also Section 01600 – Materials and Equipment.
- B. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

1.06 INSPECTION OF WORK AWAY FROM THE SITE

- A. If work to be done away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, the Contractor shall give notice to the Program Manager of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Program Manager in ample time so that the necessary arrangements for the inspection can be made.

1.07 OCCUPYING PRIVATE LAND

- A. The Contractor shall not (except after written consent from the proper parties) enter or occupy with labor, tools, materials, or equipment, any land outside the rights-of-way or property of the Owner. A copy of the written consent shall be given to the Program Manager.

1.08 INTERFERENCE WITH AND PROTECTION OF STREETS

- A. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefor from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefor.

- C. The Contractor shall, at least 24 hours in advance, notify the Police and Fire Departments in writing, with a copy to the Program Manager, if the closure of a street or road is necessary. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

1.09 TRAFFIC CONTROL

- A. Whenever and wherever, in the opinion of the Program Manager, traffic is sufficiently congested or public safety is endangered, the Contractor will furnish uniformed special officers to direct traffic and to keep traffic off the roadway area affected by construction operations. If police details are required, the direct cost for the detail will be paid directly by the Narragansett Bay Commission provided that slips are collected by Contractor and submitted to Narragansett Bay Commission.
- B. The employment or presence of uniformed special officers or police shall in no way relieve the Contractor of any responsibility or liability which is his under the terms of the contract.

1.10 SAFETY

- A. The Contractor shall take all necessary precautions and provide all necessary safeguards to prevent personal injury and property damage. The Contractor shall provide protection for all persons, including but not limited to his employees and employees of other contractors or subcontractors; members of the public; and employees, agents, and representatives of the Owner, the Program Manager, and regulatory agencies that may be on or about the Work. The Contractor shall provide protection for all public and private property including but not limited to structures, pipes, and utilities, above and below ground.
- B. The Contractor shall provide and maintain all necessary safety equipment such as fences, barriers, signs, lights, walkways, guards and fire prevention and fire-fighting equipment and shall take such other action as is required to fulfill his obligations under this subsection.
- C. The Contractor shall comply with all applicable Federal, State and local laws, ordinances, rules and regulations and lawful orders of all authorities having jurisdiction for the safety of persons and protection of property.
- D. The Contractor shall designate a responsible member of his organization at the site whose duty shall be responsible for all matters of safety. This responsible person shall have the authority to take immediate action to correct unsafe or hazardous conditions and to enforce safety precautions and programs.
- E. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until Final Completion and Program Manager has issued a notice to Owner and Contractor that the Work is acceptable.

1.11 SANITARY REGULATIONS

- A. The Contractor shall provide adequate sanitary facilities for the use of those employed on the Work. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points and in such manner as may be required.

- B. The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the Owner, or on adjacent property.

1.12 LINES, GRADES AND MEASUREMENTS

- A. The Contractor shall employ a competent land surveyor, registered within the State of Rhode Island as a Professional Land Surveyor. The Contractor shall require said surveyor to establish all lines, elevations, reference marks, batter boards, etc., needed by the Contractor during the progress of the Work, and from time to time to verify such marks by instrument or other appropriate means.
- B. The Program Manager shall be permitted at all times to check the lines, elevations, reference marks, batter boards, etc., set by the surveyor, who shall correct any errors in lines, elevations, reference marks, batter boards, etc., disclosed by such check. Such a check shall not be construed to be an approval of the surveyor's work and shall not relieve or diminish in any way the responsibility of the Contractor for the accurate and satisfactory construction and completion of the entire Work.
- C. The Contractor shall make, check, and be responsible for all measurements and dimensions necessary for the proper construction of and the prevention of misfittings in the Work.

1.13 DIMENSIONS OF EXISTING STRUCTURES AND PIPES

- A. Where the dimensions and locations of existing structures and pipes are of importance in the installation or connection of any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.14 WORK TO CONFORM

- A. During its progress and on its completion, the Work shall conform truly to the lines, levels, and grades indicated on the Drawings or given by the Program Manager and shall be built in a thoroughly substantial and workmanlike manner, in strict accordance with the Drawings, Specifications, and other Contract Documents and the directions given from time to time by the Program Manager.
- B. All work done without instructions having been given therefor by the Program Manager, without proper lines or levels, or performed during the absence of the Program Manager, will not be estimated or paid for except when such work is authorized by the Program Manager in writing. Work so done may be ordered uncovered or taken down, removed, and replaced at the Contractor's expense.

1.15 PIPE LOCATION

- A. Exterior pipelines will be located substantially as indicated on the Drawings, but the right is reserved to the Owner, acting through the Program Manager, to make such modifications in location as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings, etc., 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.

- B. Small interior piping is indicated diagrammatically on the Drawings, and the exact location is to be determined in the field. Piping shall be arranged in a neat, compact, and workmanlike manner, with a minimum of crossing and interlacing, so as not to interfere with equipment or access ways, and, in general, without diagonal runs.

1.16 LIMITS OF NORMAL EXCAVATION

- A. In determining the quantities of excavation to which unit prices shall apply, the limits of normal width and depth of excavation shall be as described below, unless other limits are indicated on the Drawings or specified.
- B. For pipes in trench, the normal width of the trench shall be measured between vertical planes and as shown on the project details. Payment width of trenches shall be as shown on the project details, unless otherwise indicated in Section 01025 - Measurement and Payment. The normal depth shall be measured to a distance of 0.5-foot below the bottom of the pipe in earth and 1.0-foot in rock, unless there be a cradle underneath the pipe, in which case the normal depth shall be measured to the underside of the bedding. The width of trench for the bedding shall be assumed to be that specified above for pipes in trench.
- C. For concrete placed directly against undisturbed earth, the normal width and depth of the excavation for such concrete shall be measured to the neat lines of the concrete as indicated on the Drawings or as ordered.
- D. For concrete placed against rock surfaces resulting from rock excavation, the normal width and depth of the excavation shall be measured to 4 inches outside the neat lines of the concrete as indicated on the Drawings or as ordered.
- E. For other structures, except manholes as noted below, the normal width shall be measured between vertical planes 1-foot outside the neat lines of the several parts of the structure, except that the width at any elevation shall be measured as not less than the width at a lower elevation. The normal depth shall be measured to the underside of that part of the structure for which the excavation is made.
- F. No additional width or depth of trenches excavated in earth or rock shall be allowed at standard circular manholes.
- G. Wherever bell holes are required for jointing pipe, they shall be provided without additional compensation over and above that resulting from measurements as above described.

1.17 COMPUTATION OF QUANTITIES

- A. For estimating quantities in which the computation of areas by geometric methods would be comparatively laborious, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of such areas.
- B. It is further agreed that the computation of the volume of prisms shall be by the method of average end areas.

1.18 PRECAUTIONS DURING ADVERSE WEATHER

- A. During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.
- B. During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected. Ingredients for concrete and mortar shall be sufficiently heated so that the mixture will be warm throughout when used.

1.19 INSTALLATION OF EQUIPMENT

- A. Special care shall be taken to ensure proper alignment to all equipment with particular reference to the pumps, drives, shafts and motors. 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. Equipment manufacturer instructions shall be complied with fully. The anchor bolts shall be set in place and the nuts tightened against the shims. After the foundation alignments have been completed, the bed plates 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 firmly grouted in place. The Contractor shall be responsible for the exact alignment of equipment with associated piping.
- B. All wedges, shims, filling pieces, keys, packing, red or white lead 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. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.

1.20 TEST PITS/VACUUM EXCAVATION

- A. Test pits or vacuum excavations for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor at locations shown on the drawings or in areas where the Contractor deems it necessary to obtain subsurface information. Test pits or vacuum excavations shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Program Manager. There shall be no direct reimbursement for test pits/vacuum excavations unless a payment item is specifically indicated elsewhere in the Contract Documents.

1.21 BURIED UTILITY WARNING AND IDENTIFICATION TAPE

- A. Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping, in accordance with project details. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be CAUTION BURIED PIPING BELOW or similar. Use permanent code and letter coloring unaffected by moisture and other substances contained in

trench backfill material. Bury tape with printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

1.22 ARCHITECTURAL COATINGS

- A. Maintain coordination among all Sections requiring coatings. All coatings shall match to the satisfaction of the Program Manager with regard to color and texture. Items rejected by the Program Manager shall promptly be removed from the job site.

1.23 NOISE LIMITATIONS

- A. All equipment to be furnished under this Contract, unless specified otherwise in the technical specifications, shall be designed to insure that the sound pressure levels does not exceed 85 decibels over a frequency range of 37.8 to 9600 cycles per second at a distance of three feet 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 shop drawing submittals.

1.24 RIGHT TO KNOW LAW

- A. The Contractor shall submit Material Safety Data Sheets for all substances or mixture of substances used on the Project by him/her or his/her subcontractors prior to commencing any work in accordance with all Federal and State requirements.

1.25 SPECIAL WASTE (SEE DIVISION 2 SPECIFICATIONS)

1.26 SUBSURFACE AND PHYSICAL CONDITIONS

- A. In preparation of Drawings and Specifications, the Program Manager has relied upon existing record drawings made available by Owner and utility companies with service in the area of the project. This information is not guaranteed accurate or complete.

1.27 SALES TAX EXEMPTION

- A. Project is exempt from sales tax on products permanently incorporated in the work. Sales tax exemption certificate number shall be available from the Owner.
- B. Contractor shall place the tax exemption certificate number on invoices for materials incorporated in the work.
- C. Upon completion of work, Contractor shall file with Owner a notarized statement that all purchases made were entitled to be exempt. Contractor shall pay legally assessed penalties for improper use of Owner's tax exemption status.

1.28 HYDRAULIC UPLIFT OF STRUCTURES

- A. The Contractor shall be responsible for the protection of all new and existing structures against hydraulic uplift until such structures have been accepted final by the Owner.

1.29 HOURS OF CONSTRUCTION

- A. Except as otherwise specifically allowed elsewhere in the Contract Documents, normal construction activity shall take place only between the hours of 7:00 am to 5:00 pm excluding, Saturdays, Sundays and legal holidays. The Contractor shall plan the Work so as to avoid working beyond these hours. However, if despite the Contractor's diligent efforts, the Contractor believes that overtime work is necessary in order for the Contractor to complete the Work, the Contractor may apply to the Program Manager and to the Owner for approval to perform overtime work, which approval may be withheld in their sole discretion. No additional compensation or time extension shall be due to the Contractor whether approval is granted or denied.
- B. If the Contractor believes that overtime work is necessary, it shall obtain prior approval from the Program Manager and the Owner. The Contractor shall file a request for such approval in writing and shall include the specific reasons therefore and the time that the overtime work is expected to be concluded. Overtime work will normally be limited to evening hours (5:00 p.m. to 8:00 p.m.) Monday through Friday and daytime hours (7:00 a.m. to 5:00 p.m.) on Saturdays except in special circumstances approved by the Program Manager and the Owner.

1.30 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property.
- B. For trench excavation, the Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access during construction shall be removed when no longer required. The length or size of trench excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Program Manager. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Program Manager may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in certain areas and requiring that the trench shall not remain open overnight.
- C. The Contractor shall take precautions to prevent injury to the public due to open excavations. All trenches, excavations, excavated material, equipment, or other obstacles which could be dangerous to the public and treatment plant personnel shall be well lighted at night.

1.31 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall 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. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.
- B. Work shall be performed in accordance with National Grids, specifications, guidance, and policies for working near and around gas utilities as provided in Appendix and the Contract Documents.
- C. Assistance will be given to 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, sewers, electrical conduits and force mains). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.

Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract.

- D. If, in the opinion of the Program Manager, permanent location of a utility owned by the Owner is required, the Program Manager may direct the Contractor, in writing, to perform the work. If relocation of a privately owned utility is required, the Contractor will notify the Utility and the Contractor will perform the work as directed by the Utility. The Contractor shall fully cooperate with the Owner and the Utility and shall have no claim for delay due to such relocation. The Contractor shall notify all utility companies.

1.32 DUST CONTROL

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of water as necessary, so as to minimize the creation and dispersion of dust. If the Program Manager decides that it is necessary to use calcium chloride, and it is allowed by local authorities, for more effective dust control, the Contractor shall furnish and apply the material as directed.
- B. Calcium chloride shall be commercial grade, furnished in 100 lb, 5-ply bags, stored under weatherproof cover and stacked alternately for ventilation. Application for dust control shall be at the rate of about 1/2 pound per square yard, unless otherwise directed by the Program Manager.

1.33 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and neat a condition as is possible. The Program Manager and the Owner reserve the right to direct site clean-up if deemed necessary. The Contractor shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor shall and his subcontractors shall 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 elsewhere in the Specifications.
- C. The Contractor is advised that the 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. Therefore, the Contractor will be required to remove the fill at his own expense and restore the area impacted.

1.34 CONSTRUCTION EMPLOYMENT

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- A. The Contractor shall advertise for and give preference in hiring to qualified workers from the Cities and Towns serviced by the Narragansett Bay Commission (Providence, Pawtucket, East Providence, Cranston, Central Falls, Cumberland, Lincoln, Johnston and North Providence) for any available positions associated with the work included in this Contract. The Contractor shall undertake positive efforts to meet this requirement which shall include, but not be limited to, placing employment advertisements in newspapers serving the communities within these communities, interviewing persons from within these communities who may apply for positions, and hiring subcontractors and suppliers from within these communities.

1.35 PUBLIC UTILITIES

- A. The Contractor shall comply with the following requirements for excavations in public and private property. Compliance shall include the following:
1. The Contractor shall notify public utility companies in writing at least 72 hours (excluding Saturdays, Sundays and legal holidays) but not more than 30 days before excavating in areas where underground utility plant (pipes, cables, manholes, etc.) exist.
 2. The Contractor shall be responsible for providing the Utility Companies with a schedule of his activities in areas where the utilities exist.
 3. The Contractor shall immediately notify utility companies of any damage to their utilities resulting from construction operations.
- B. The Contractor shall contact DIGSAFE at 1-800-225-4977 at least 72 hours before digging, trenching, blasting, demolishing, boring, backfilling, grading, landscaping or other earth moving operations in any public ways, rights of way and easements.

1.36 PROVISIONS FOR CONTROL OF EROSION

- A. The Contractor shall take sufficient precautions during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens and calcium chloride into the supplies and surface waters of the State. Special precautions shall be taken in the use of the construction equipment to prevent operations which promote erosion.
- B. Disposal of drainage shall be in an area approved by the Owner. The Contractor shall prevent the flow or seepage of drainage back into the drainage area. Drainage shall not be disposed of until silt and other sedimentary materials have been removed. Particular care shall be taken to prevent the discharge of unsuitable drainage to a water supply or surface water body.
- C. As a minimum, the following shall apply:
1. In open areas brush and stumps shall not be removed until no more than 1 week prior to the start of excavation in that area. The existing ground surface shall be disturbed as little as possible until no more than one week prior to the start of excavation.
 2. Silt fence shall be provided at points where drainage from the work site leaves the site, to reduce the sediment content of the water. Sufficient silt fence shall be provided such that all flow will filter through the hay. Other methods which reduce the sediment content to an equal or greater degree may be used as approved by the Program Manager.
 3. Drainage leaving the site shall flow to water courses in such a manner to prevent erosion.
 4. Loaming and seeding or mulching of cross county areas shall take place as soon after excavation as practicable. This shall be considered part of the work and full payment for the work need not be made until it has been completed.

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- D. Measures for control of erosion must be adequate to assure that turbidity in the receiving water will not be increased more than 10 standard turbidity units (s.t.u.), or as otherwise required by the State or other controlling body, in waters used for public water supply unless limits have been established for the particular water. In surface water used for other purposes, the turbidity must not exceed 25 s.t.u. unless otherwise permitted.

1.37 HURRICANE PREPAREDNESS PLAN

- A. Within 30 days of the date of the Notice To Proceed, submit to the Program Manager and the Owner, for approval, a Hurricane Preparedness Plan. The Plan shall describe in detail the necessary measures which the Contractor will perform, at no additional cost to the Owner, in case of a hurricane warning. Revise Plan as required by the Program Manager and Owner.

1.38 DISTURBANCE OF ALL EXISTING SURVEY MARKERS

- A. The Contractor shall replace all bounds and survey markers disturbed by his operations at his own expense. The bounds shall be relocated by a land surveyor registered in the State of Rhode Island.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF GENERAL SPECIFICATIONS

SECTION 01010

SUMMARY OF WORK AND CONTRACT MILESTONES

PART 1 GENERAL

1.01 LOCATION OF WORK

A. The work of this Contract is located in the City of Pawtucket, Rhode Island at the following locations:

1. Taft Street, Roosevelt Avenue Extension, and Main Street.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and construct the project complete and ready for operation in its entirety as shown on the Drawings and specified herein.

B. The work herein specified to be done (herein sometimes referred to as the "Work") consists generally of the construction of new large diameter conduits, manholes, and diversion structures contained in the Contract Documents.

C. The work includes construction of the following major elements as further described in the Contract Documents. All lengths, sizes, and dimensions given are approximate:

1. 6-ft by 6-ft Concrete channel: 35 feet
2. 72-inch RCP Consolidation Conduit: 47 feet
 - Utility Tunneling: 40 feet
3. 60-inch RCP Consolidation Conduit
 - Open Cut Construction: 160 feet
4. 54-inch RCP Consolidation Conduit
 - Open Cut Construction: 205 feet
5. 48-inch RCP Consolidation Conduit: 1,330 feet
 - Open Cut Construction: 850 feet
 - Pipe Jacking: 480 feet
6. 60-inch Outfall: 50 feet
 - Remove and dispose existing 39-inch outfall pipe
 - Wall demolition and reconstruction
7. Concrete structures
 - (7x) 8' Diameter Precast Manholes
 - (1x) 10' Diameter Manhole
 - (1x) Junction Chamber
 - (1x) Gate and Screening Structure
 - (1x) Precast Control Building
 - (1x) Diversion Structure 210 (DS-210)
 - (1x) Diversion Structure 213 (DS-213)
 - (1x) Diversion Structure 214 (DS-214)
8. Gate and Screening Structure Gates and Controls
9. Water Main Replacement
 - 20" – 60 Linear Feet, (1x) 20" Insertion Valve

- 12" – 990 Linear Feet, (2x) 12" Gate Valves
- 8" – 20 Linear Feet, (1x) 8" Gate Valve
- 10. Water Service Replacement
 - 6" – 30 Linear Feet, (2x) Gate Valves
 - 2" – 10 Linear Feet
- 11. (2x) Water Hydrant Assemblies, (3x) 6" Gate Valves, 6" Lateral – 35 Linear Feet
- 12. Removal and disposal of existing utilities
 - Water Main (active): 991 Linear Feet
 - Gas Main (abandoned): 235 Linear Feet
 - 3 Light Poles
 - Electrical Ductbank: 30 Linear Feet
 - Gas Main
- 13. Replacement of existing utilities:
 - Drain Pipe: 304 Linear Feet
 - 12 Catch Basins, 2 Drain Manholes
- 14. Surface restoration – grade to match existing.
- 15. Other miscellaneous tasks contained in the Contract Documents.

1.03 WORK BY OTHERS

- A. The Contractor's occupation of the work site or portions thereof and its operations throughout the course of the Work may be affected by the operations of others adjacent to and within the work site.
- B. In addition to those activities detailed hereinbefore the Contractor shall also coordinate its operations in the public rights-of-way with other utilities including National Grid (Gas and Electric), Pawtucket Water Supply, RIDOT and the City of Pawtucket, as provided elsewhere in the Contract Documents.
- C. The Contractor's use of the premises shall be within the limits shown on the Drawings, in accordance with schedule milestones specified by the Contract Documents and as defined in the Agreement for the performance of the Work.
- D. The Contractor shall maintain access and utilities to the adjacent businesses and residents at all times.
- E. The Contractor shall assume full responsibility for security of all its subcontractor's materials and equipment stored on site.
- F. If directed by the Owner, the Contractor shall move any stored items which interfere with operations of the Owner or other contractors, without an increase to Contract Price or Contract Time.
- G. The Contractor shall obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.04 CONTRACT MILESTONES

- A. FINAL COMPLETION

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1. Final Completion, as defined in the Contract Agreement Article 1.2.x, shall be achieved within 1,000 calendar days from the Notice to Proceed date.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SUMMARY OF WORK AND CONTRACT MILESTONES

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. The following subsections describe the measurement of, and payment for, the work to be done under the items listed in the Bid Schedule.
- B. Each unit or lump sum price stated in the Bid Schedule shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications, including cleaning up.
- C. The prices for those items that involve excavation shall include compensation for disposal of all excavated material, handling of all water in accordance with the Contract Documents, installation of all necessary excavation and support elements, and the removal and disposal of excavation support elements as required.
- D. The retainage specified in the **Contract Agreement** shall apply to all payments to the Contractor, except for Allowances, as applicable.
- E. The Contractor shall take no advantage of any apparent error or omission on the Contract Documents, and the Program Manager/Construction Manager shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.
- F. All portions of the Work required by the Contract Documents are either in an applicable allowance, a lump sum, or a unit price item listed in the Bid Schedule. Work for which there is not a separate item will be considered incidental to the Contract Documents and no additional compensation shall be allowed.
- G. Related Work Described Elsewhere:
 - 1. Information for Bidders, Section IB.
 - 2. Contract Agreement, Section CA.
 - 3. Submittals, Section 01300.
 - 4. Materials and Equipment, Section 01600.

1.02 SUBMITTALS

- A. Submit to the Program Manager/Construction Manager for approval, a Schedule of Values allocating subcomponent costs within the various portions of the Work.
- B. Upon the request of the Program Manager/Construction Manager, support the Schedule of Values with data that will substantiate their correctness.
- C. Submit each Application for Payment on a form approved by the Program Manager/Construction Manager showing allowances, lump sum Schedule of Value items, and approved work performed for each unit price item in accordance with the Bid Schedule.

1.03 ALLOWANCES

- A. Payment will be made for invoices submitted by the Contractor subject to the conditions and limitations in the Contract Documents.
- B. The Contractor shall add overhead and profit to allowances in accordance with Extra Work.
- C. The allowance will be adjusted to the actual amount paid for such services and supported by invoice and no retainage will be withheld from this amount.
- D. The Contractor shall be responsible for the prompt payment for these allowance services to the appropriate payee providing said service and shall submit evidence to the Program Manager/Construction Manager of payments to the payee prior to its inclusion in the invoice.

1.04 LUMP SUM ITEMS

- A. Payment of the lump sum items established in the Contractor's Bid under the various line items in the Bid Schedule incorporated into the Agreement shall be full compensation for all labor, materials, and equipment required to furnish, deliver, install, construct, and test the Work covered under the lump sum bid item.
- B. Payment of the lump sum items established in the Contractor's Bid shall also fully compensate the Contractor for any other work that is not specified or shown, but which is necessary to complete the Lump Sum Work items.
- C. Payments for Lump Sum Work will be based upon measured and approved physical progress for each activity in accordance with the breakdown of the lump sum prices agreed to in the Schedule of Values.

1.05 UNIT PRICE ITEMS

- A. Payment for all work shall be in accordance with the unit price bid items in the Bid Schedule and shall be full compensation for all labor, materials, and equipment required to furnish, deliver, install, construct and test the Work covered under the unit price bid item. Work for which there is not a price schedule item will be considered incidental to the Work and no additional compensation shall be allowed.
- B. Payment will be made only for the actual approved quantities of work performed in compliance with the Contract Documents. The Contractor will receive reimbursement equal to the approved quantity times applicable unit price.
- C. Owner reserves the right to remove select bid items and to increase or decrease the unit quantity of bid items. The successful bidder is made aware that the unit price so stated on the Bid Schedule constitutes full compensation for that item, regardless of any increase or decrease in the unit quantity of that bid item. There is no guarantee of any minimum or maximum quantity for any bid item. Standards of the industry (e.g., renegotiation of the bid price due to a 25% increase or decrease in the unit quantity of the bid item) shall not be enforceable under this contract

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- D. Measurement of all quantities of items listed in the Bid shall be done by the Contractor and verified by Owner. The measurement will include proper and complete documentation of all items to the satisfaction of the Owner prior to submission for payment. The measurement submitted shall be in the same unit description listed in the Bid Schedule.
- E. Measurement of bid items made for unit quantities will be subject to the maximum permissible excavation trench width and depth allowed by the contract for payment purposes, as stipulated on the Drawings and Contract Documents. Excavations that are made deeper or cut wider due to Contractor's means and methods or for the Contractor's convenience will not be subject to additional payment. As such, the actual quantity used will not necessarily reflect the payable quantity, unless otherwise authorized by Owner. Contractor shall adjust their unit prices accordingly.

1.06 ALLOWANCE ITEMS

- A. Under these items, the Contractor shall be reimbursed for certain charges, authorized by Owner, for work not included in, or incidental to, other bid items but that is otherwise required in the course of completing the work of this Contract.
- B. The allowance price for these items established in the Bid is an estimated figure to facilitate comparison of bids only. The actual amount to be paid under these items shall constitute full compensation for wages paid, premiums on Workman's Compensation Insurance, payment on account for Social Security and other direct assessments on payroll, as may be required, and all other costs incidental to the services rendered.
- C. The allowance price for these items shall NOT include any costs associated with services rendered for routine utility markings, repair of damages incurred as a result of the Contractor's operations, relocations or dismantling and reassembling of utilities done at the Contractor's request and/or convenience or other utility relocation specifically covered under any other bid item, or any other unauthorized services rendered by utility companies. The purpose of this item is strictly for the Contractor's reimbursement for those unforeseen services authorized by Owner prior to the work being performed.
- D. Any work proposed to be paid for under these items shall be approved by the Owner in advance of performing the work.

1.07 PRICES INCLUDE

- A. The prices stated in the Proposal include full compensation not only for furnishing all the labor, equipment and material needed for, and for performing the work and building the structures contemplated by, the Contract, but also for assuming all risks of any kind for expenses arising by reason of the nature of the soil, groundwater, or the action of the elements; for all excavation and backfilling; for the removal of and delay or damage occasioned by trees, stumps, tracks, pipes, ducts, timber, masonry or other obstacles; for removing, protecting, repairing, or restoring, without cost to the Owner, all pipes, ducts, drains, sewers, culverts, conduits, curbs, gutters, walks, fences, tracks, or other obstacles, road pavements and other ground surfacing whether shown on plans or not; for draining, damming, pumping or otherwise handling and removing, without damage to the work or to other parties, and without needless nuisance, all water or sewage from whatever source which might affect the work or its progress, or be encountered in excavations made for the work; for furnishing, inserting and removing all sheeting, shoring, staging, cofferdams, etc.; for all signs, fencing, lighting, watching, guarding, temporary surfacing, bridging, snow removal,

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- etc., necessary to maintain and protect travel on streets, walks and private ways; for making all provisions necessary to maintain and protect buildings, fences, poles, trees, structures, pipes, ducts and other public or private property affected or endangered by the work; for the repair or replacement of such things if injured by neglect of such provisions for removing all surplus or rejected materials as may be directed; for replacing, repairing and maintaining the surfaces of streets, highways, public and private lands if and where disturbed by work performed under the Contract or by negligence in the performance of work under the Contract; for furnishing the requisite filling materials in case of any deficiency or lack of suitable materials; for obtaining all permits and licenses and complying with the requirements thereof, including the cost of furnishing any security needed in connection therewith; for any and all expense on account of the use of any patented device or process; for protection against inclement or cold weather; for all expenses incurred by or on account of the suspension, interruption, or discontinuance of work; for the cost of the surety bond and adequate insurance; for all taxes, fees, union dues, etc., for which the Contractor may be or become liable, arising out of his operations incidental to the Contract; for providing equipment on the site and off site; for providing a field office and its appurtenances and for all general and incidental expenses; for tools, implements and equipment required to build and put into good working order all work contemplated by the Contract; for maintaining and guaranteeing the same as provided; and for fulfilling all obligations assumed by the Contractor under the Contract and its related documents.
- B. The Owner shall pay and the Contractor shall receive the prices stipulated in the Bid made a part hereof as full compensation for everything performed and for all risks and obligations undertaken by the Contractor under and as required by the Contract.
- C. The prices for those Items which involve excavation shall include compensation for disposal of surplus excavated material and handling water.
- D. In all Items involving excavation, the price shall be based on doing the entire excavation in earth. Where rock is excavated, the price, therefore, shall be in addition to the cost of excavating earth and no deduction will be made in the amount for earth excavation.
- E. The prices for all pipe Items (i.e. sewers, service connections, drains, etc.) shall constitute full compensation for furnishing, laying, jointing and testing; earth excavation, backfill and compaction; materials for bedding pipe as specified; and cleaning up.
- F. Payment for boulder excavation less than one (1) cubic yard in size, including hauling boulders offsite and furnishing and installing appropriate backfill material, is included in the various items of work on the Bid Schedule and no separate payments shall be made thereof.
- G. Payment for stripping topsoil, including stockpiling, and clearing and grubbing, including disposal, is included in the prices for the various items of work on the Bid Schedule and no separate payment shall be made thereof.
- H. Payment for bituminous concrete pavement excavation and disposal, including saw cutting and excavation and disposal of temporary trench patches placed by Contractor, is incidental to the items provided on the Bid Schedule and no separate payment shall be made thereof.
- I. Payment for permits and bonds required by the contract is included in the prices for the various items in the Bid Schedule and no separate payment shall be made thereof.

- J. Payment for all signage required for this project is included in the prices for the various items in the Bid Schedule and no separate payment shall be made thereof.
- K. No separate payment will be made for work or items associated with Division 1 – General Requirements unless otherwise specified herein. This includes Professional Engineer design fees incurred by the Contractor where this is required for submittals. Contractor shall incorporate the cost for these items into the prices submitted on the Bid Schedule.
- L. Owner shall pay the direct cost of police details in the event they are required, but Contractor shall be responsible for coordinating and scheduling police details assigned to the project. Cancellation charges imposed due to changes or errors in Contractor’s scheduling shall be paid for solely by the Contractor.

PART 2 PRODUCTS

2.01 PARTIAL PAYMENT FOR PRODUCTS

- A. Contractor may request partial payment for Products (supplies, material and/or equipment) as defined in Section 01600 - Materials and Equipment, which will be incorporated into the Work and which are delivered and stored off-site. The request may only be made when submitting Contractor’s proposal for a Schedule of Values. In order for this request to be considered, the Contractor must comply with the requirements of this sub-section and the Agreement. Any payments approved pursuant to this sub-section shall not exceed sixty-five percent (65%) of the Product’s invoiced value and shall be subject to retainage as set forth in the Agreement. Contractor shall obtain prior approval since NBC reserves the right to refuse approval for payment for any equipment or materials suitably stored off-site in its sole discretion, regardless of whether all conditions contained herein have been met.
- B. Partial payment may be made for Products eligible for off-site delivery and storage only upon presentation by the Contractor of a Bill of Sale, an invoice or an Affidavit certifying that the material is received by NBC free and clear of all liens, encumbrances and security interests of any kind and including for off-site delivery evidence acceptable to NBC that “all risks” property insurance in an amount sufficient to protect the interests of NBC is in effect at the approved site and that NBC is a loss payee equal to or greater than its percentage of ownership.
- C. Partial payment for Products delivered and stored off-site shall be contingent upon Contractor’s compliance with the storage and protective maintenance requirements set forth in Section 01600 and all other requirements necessary to preserve equipment warranties for the benefit of NBC.
- D. All costs associated with delivery to and storage at an off-site facility shall be assumed by the Contractor notwithstanding the Contractor’s request for and obtaining of NBC approval to so deliver and store the materials.
- E. Contractor shall provide written evidence to NBC of having made arrangements for unrestricted access by NBC and its authorized representatives to the materials wherever stored, including provision for NBC to take control and possession of such materials at any time and without restriction.
- F. Contractor must provide NBC, upon request and prior to any partial payment, documentation that transfers absolute legal title to such material to NBC conditional only upon receipt of

final payment. Neither such transfer of this nor any partial payment shall constitute acceptance by NBC of the materials nor void the right to reject materials subsequently found to be unsatisfactory, or in any way relieve the Contractor of any obligation arising under the Contract Documents.

PART 3 EXECUTION (NOT USED)

PART 4 COMPENSATION

4.01 MISCELLANEOUS UTILITY ALLOWANCE (BID ITEM NO. 1)

A. Measurement

1. Under this Item, the Contractor shall be reimbursed for certain charges for services provided by utility companies associated with required utility relocations due to unavoidable conflicts with the new constructed facilities, as authorized by the Program Manager/Construction Manager.

B. Payment

1. The allowance price for these Items established in the BID is an estimated figure to facilitate comparison of bids only. The actual amount to be paid under this item shall constitute full compensation for services rendered.
2. The allowance price for these Items shall NOT include any costs associated with services rendered for routine utility markings, repair damages incurred as a result of the Contractor's operations, relocations or dismantling and reassembling of utilities done at the Contractor's request and/or convenience or other utility relocation specifically covered under any other bid item, or any other unauthorized services rendered by utility companies. The purpose of this item is strictly for the Contractor's reimbursement for those unforeseen services authorized by the Program Manager/Construction Manager prior to the work being performed.
3. The Contractor will be paid based on the actual PAID invoiced amount from the Utility Company in question, as approved by the Program Manager/Construction Manager in accordance with Article 7.2 of the Contract Agreement. If the total cost for such charges is greater or less than the allowance amount stated under this item of the BID, a debit or credit of the difference in cost shall be to the Owner.
4. Costs for supporting of poles required and performed by the appropriate utility shall also be included for payment under this item.
5. Costs for isolation of power and/or shielding of overhead wires by the appropriate utility shall also be included for payment under this item.
6. Costs for proper handling and disposal of abandoned gas pipes that are potentially contaminated with polychlorinated biphenyls (PCBs) as identified by the gas utility company shall be included for payment under this item.

4.02 HAZARDOUS MATERIALS MANAGEMENT / DISPOSAL ALLOWANCE (BID ITEM NO. 2)

A. Measurement

1. Under this Item, the Contractor shall be reimbursed for certain charges associated with the proper handling, management, and disposal of hazardous materials identified and/or uncovered during the prosecution of the Work as authorized by the Program Manager/Construction Manager.

B. Payment

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1. The allowance price for these Items established in the BID is an estimated figure to facilitate comparison of bids only. The actual amount to be paid under this item shall constitute full compensation for services rendered.
2. The Contractor will be paid on a time and materials basis for labor, equipment, and materials provided by the Contractor, as approved by the Program Manager/Construction Manager in accordance with Article 7.2 of the Contract Agreement. If the total cost for such charges is greater or less than the allowance amount stated under this item of the BID, a debit or credit of the difference in cost shall be to the Owner.
3. Management and/or disposal of hazardous materials generated through the Contractor's operations or brought to the project site are not eligible for compensation through this item.
4. Proper handling, management, and disposal of Category 3 and Category 4 soil, as defined in Specification Section 02075, shall be included for payment under this item.

4.03 MOBILIZATION AND DEMOBILIZATION (BID ITEM NO. 3)

A. Measurement

1. The work of this section shall be measured on a percentage basis. The payable quantity will be for preparatory work and operations, which must be performed or for costs which must be incurred prior to beginning work, final clean-up and demobilization of temporary facilities and equipment, restoration of impacted areas, permit fees, and the cost of payment and performance bonds. Mobilization shall include but is not limited to movement of personnel, equipment, supplies, and incidentals to the project site for the establishment of all Contractor's field offices, utilities, temporary fencing, installation, maintenance, and removal of tracking pads, temporary access roadways, equipment/machinery pads, and other facilities necessary for work on the project. Demobilization shall include but is not limited to moving out of personnel and equipment, cleaning entire site, and removing debris and rubbish.

B. Payment

1. Payment for this item shall be made as a percentage of the Lump Sum price listed in the Bid Schedule. The prices so-stated constitute full and complete compensation for all work included in this item. The bid price shall be no more than 5% of total bid with payment as follows:
 - a. 50% will be paid upon Notice to Proceed
 - b. 50% will be paid for demobilization.

4.04 EARTH EXCAVATION AND BACKFILL FOR TEST PITS (BID ITEM NO. 4)

A. Measurement

1. The work of this section will be measured by the number of cubic yards excavated and backfilled, measured to the extent of the work done as directed by the Program Manager/Construction Manager.

B. Payment

1. The unit price for this item shall constitute full compensation for saw cutting and removal and disposal of pavement, excavation and handling of material, temporary stockpiling, stockpile management (including but not limited to perimeter erosion controls, stockpile covering, dust mitigation, etc.), design and construction of excavation support, dewatering, utility support, backfill and compaction for test pits.
2. The unit price shall also include collection and recording of data and existing conditions discovered as a result of the test pit.

4.05 ROCK EXCAVATION AND DISPOSAL (BID ITEM NO. 5)

A. Measurement

1. The Work of this section shall be measured by the cubic yard quantity of in-place rock or boulders that are larger than 1 cubic yard in size and require removal.
2. When rock is encountered, the material shall be uncovered and the Program Manager/Construction Manager notified. The Program Manager/Construction Manager shall determine quantities by volumetric computation determined from measurements performed before rock excavation begins and measurements performed after completion of rock excavation. If the Contractor fails to uncover the rock and notify the Program Manager/Construction Manager to allow ample time for cross sectioning the undisturbed material, the Contractor shall have no right-of-claim to any classification other than that allowed by the Program Manager/Construction Manager.
3. Measurements of rock excavation within a trench shall be as indicated on the trench limits shown on the project drawing details. The depth of rock removal will be limited to 12" below the bottom of the pipe or structure. No compensation will be made for rock excavated beyond the limits shown on the Drawings and in these Specifications, unless specifically authorized in writing by the Owner. The Contractor should include in this bid item any and all costs associated with over excavation of rock beyond pay limits that they deem necessary for construction purposes.

B. Payment

1. The accepted quantity of the work in this section will be paid for at the contract unit price per cubic yard as listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment and for all other incidentals required to finish the work, complete and accepted by the Program Manager/Construction Manager.
2. This work shall include excavation, breaking (mechanical removal), hauling off site and legal disposal of rock in accordance with the requirements of Section 02210 Rock Excavation and providing screened gravel for any deficiency of trench backfill and all work incidental thereto, for which payment is not provided under other items.
3. Rock encountered and/or removed during the installation of pipes by microtunneling shall not be included for payment under this item.

4.06 ADDITIONAL GRAVEL BORROW (BID ITEM NO. 6)

A. Measurement

1. The work of this section will be measured by the number of cubic yards of additional gravel borrow actually furnished and installed as directed by the Program Manager/Construction Manager.

B. Payment

1. The accepted quantity of the work in this section will be paid for at the contract unit price per cubic yard as listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment and for all other incidentals required to finish the work, complete and accepted by the Program Manager/Construction Manager.
2. Gravel borrow ordered by the Engineer for backfill of trenches as shown on the Contract Documents shall be paid for under this item. The quantity of gravel used as backfill for trenches as shown on the Contract Documents shall be measured by the cubic yard to the

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depth and length ordered by the Engineer and to the width between payment limits for normal excavation as indicated on the Drawings.

3. Gravel borrow furnished, placed, and compacted outside the limits of excavation as detailed in the Contract Documents not directed by the Program Manager/Construction Manager shall be at the Contractor's expense, and shall not be measured for payment under this Item.
3. Gravel borrow ordered to be used at other locations shall be measured after compaction and paid for under this item as the number of cubic yards of gravel actually placed and compacted as directed.
4. Gravel borrow used to backfill rock excavations will not be measured for payment under this item but shall be included as part of the unit price for "Rock Excavation and Disposal".
5. Gravel borrow used to backfill and/or fill around and/or beneath structures will not be measured for payment under this item but shall be included as part of the appropriate lump sum price for the structures.

4.07 **ADDITIONAL CRUSHED STONE (BID ITEM NO. 7)**

A. **Measurement**

1. The work of this section will be measured by the number of cubic yards of additional crushed stone actually furnished and installed as directed by the Program Manager/Construction Manager.

B. **Payment**

1. The accepted quantity of the work in this section will be paid for at the contract unit price per cubic yard as listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment and for all other incidentals required to finish the work, complete and accepted by the Program Manager/Construction Manager.
2. Additional crushed stone ordered by the Engineer to be used at other locations shall be paid for under this item. The quantity to be paid for shall be the number of cubic yards measured in place after compaction, of additional crushed stone within the limits directed by the Engineer.
3. Crushed stone used for bedding pipe, to backfill authorized excavations, for any drainage purpose, or as indicated on the Drawings for work for which appropriate payment items have been provided shall not be measured for payment under this item.
4. Crushed stone used to backfill rock excavations will not be measured for payment under this item but shall be included as part of the unit price for "Rock Excavation and Disposal".
5. Crushed stone used to backfill and/or fill around and/or beneath the structures will not be measured for payment under this item, but shall be included as part of the appropriate lump sum price for the structures.

4.08 **ADDITIONAL CONCRETE (BID ITEM NO. 8)**

A. **Measurement**

1. The work of this section will be measured by the number of cubic yards of additional concrete actually furnished and installed as directed by the Program Manager/Construction Manager.

B. **Payment**

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1. The accepted quantity of the work in this section will be paid for at the contract unit price per cubic yard as listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment and for all other incidentals required to finish the work, complete and accepted by the Program Manager/Construction Manager.
2. The unit price shall constitute full compensation for furnishing and placing additional concrete regardless of class or strength, as directed by the Engineer.
3. No measurement shall be made under this item for concrete used as indicated on the Drawings for work for which appropriate payment items have been provided or for concrete used to backfill unauthorized excavations.

4.09 CONTROLLED LOW STRENGTH MATERIAL (BID ITEM NO. 9)

A. Measurement

1. The work of this section will be measured by the number of cubic yards of controlled low strength material actually furnished and installed in accordance with the Plans and/or as directed by the Program Manager/Construction Manager.

B. Payment

1. The accepted quantity of the work in this section will be paid for at the contract unit price per cubic yard as listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment and for all other incidentals required to finish the work, complete and accepted by the Program Manager/Construction Manager.
2. The unit price shall constitute full compensation for furnishing and placing of controlled low strength material, and procedures, materials and equipment to protect same until set-up.

4.10 DISPOSAL OF EXCESS SOIL – CATEGORY #1 (BID ITEM NO. 10)
DISPOSAL OF EXCESS SOIL – CATEGORY #2 (BID ITEM NO. 11)

A. Measurement

1. The work of this section will be measured by the number of tons of soil actually disposed in accordance with the Contract Documents and/or as directed by the Program Manager/Construction Manager.

B. Payment

1. The accepted quantity of the work in this section will be paid for at the contract unit price per ton disposed, as measured by the calibrated scale at the receiving facility, certified by the receiving facility, as listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, and equipment and for all other incidentals required to finish the work, complete and accepted by the Program Manager/Construction Manager.
2. The work shall include all costs associated with the disposal of categorized soil, as defined in Specification Section 02075, including completing and furnishing the appropriate material shipping record forms to the satisfaction of the Program Manager/Construction Manager.
3. All costs associated with excavation and handling of material, temporary stockpiling, stockpile management (including but not limited to perimeter erosion controls, stockpile covering, dust mitigation, etc.), waste characterization sampling and analysis, costs associated with obtaining acceptance for materials from appropriate licensed facilities (if required), and loading and hauling of material for disposal at appropriate licensed

facilities shall not be included for payment under this Item, but shall be included in Bid Item No. 12.

4. Soil placed within the project limits shall not be measured for payment under this Item.
- 4.11 ALL REMAINING WORK (BID ITEM NO. 12)
- A. Measurement
 1. The work of this section will be measured by the percent complete of all remaining work, not otherwise measured and paid through other Bid items, complete, in accordance with the Plans and/or as directed by the Program Manager/Construction Manager.
 - B. Payment
 1. Payment for this item shall be in accordance with an approved Schedule of Values developed from the price listed in the Bid Schedule. The price so-stated constitutes full and complete compensation for all labor, materials, equipment, and incidentals for constructing OF-210/213/214 Facilities, Contract No, 308.04C, including construction of the new consolidation conduit, structures, and outfall piping, complete and accepted by the Program Manager/Construction Manager, as indicated on the Drawings and specified in the Bidding and Contract Requirements and Divisions 1 through 17, except for the requirements of Bid Item Nos. 1 thru 11.

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SECTION 01040
COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for coordinating the various parts of Work under this Contract.

1.02 REQUIREMENTS

- A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Contractor shall maintain access to electrical substation infrastructure by national grid employees at all times during the performance of the work.
 - 1. Contractor shall coordinate with national grid electric to temporarily isolate power or support distribution and transmission poles when excavation is performed adjacent to this electrical infrastructure.
- C. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.
- D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- E. Coordinate work with all utility companies necessary for completion of work under this contract.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION NOT USED

END OF SECTION

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SECTION 01045

CUTTING, CORING AND PATCHING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the cutting, coring, and rough and finish patching of holes and openings in existing structures (manholes, pipes, etc.).
- B. The Contractor shall see that all such cuts, cores, and openings are located accurately and are of proper size and shape and shall consult with the Program Manager and the contractors and subcontractors concerned in reference to this work.
- C. In case of his failure to leave or cut all such openings or have all such sleeves provided and set in proper time, Contractor shall cut them or set them afterwards at his own expense, but in so doing he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the written consent of the Program Manager.
- D. The Contractor shall not cut or alter the work of any subcontractor or any other contractor, nor permit any of his subcontractors to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered or with the written consent of the Program Manager. All cutting and patching or repairing made necessary by the negligence, carelessness, or incompetence of the Contractor or any of his subcontractors shall be done by or at the expense of the Contractor and shall be the responsibility of the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- B. All holes cut through concrete, existing or proposed manholes, and existing or proposed pipes shall be core drilled unless otherwise approved. No structural members shall be cut without approval of the Program Manager. No holes may be drilled in/through structural members or supports without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.
- C. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.
- D. Prior to coring and cutting, rebar shall be located using a Rebar Locator. If possible relocate to avoid rebar.

3.02 CORING

- A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- B. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
- C. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.
- D. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

3.03 CUTTING

- A. Cutting shall be performed with a concrete wall saw and diamond saw blades of proper size.
- B. Provide for control of slurry generated by sawing operation on both sides of wall.
- C. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- D. 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.
- E. Provide equipment of adequate size to remove cut panel.

END OF CUTTING, CORING AND PATCHING

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Survey work and other field engineering responsibilities of the Contractor.

1.02 REQUIREMENTS

- A. The Contractor shall be responsible for layout of the work and the establishing of lines and grades.
- B. Establish elevations, lines, levels, reference marks, batter boards, etc., required during the progress of the Work. Verify such marks by instrument to confirm accuracy.
- C. Locate and protect survey control and reference points.
- D. Make, check, and be responsible for all measurements and dimensions necessary for the proper construction of the Work.
- E. The Program Manager will be permitted to check the lines, elevations, reference marks, batter boards, etc., set by the Contractor. The Contractor shall correct any errors found in lines, elevations, reference marks, batter boards, etc. Such a check shall not be construed as approval of the Contractor's work and shall not relieve or diminish the responsibility of the Contractor for the accurate construction and completion of the Work.
- F. Control datum for survey as shown on Drawings.

1.03 QUALITY ASSURANCE

- A. Qualifications
 - 1. Employ a Civil Engineer or Land Surveyor registered within the State of Rhode Island, acceptable to the Program Manager.
- B. Certifications
 - 1. Submit certificate signed by the Contractor's Engineer or Land Surveyor stating elevations and locations of the Work are in conformance with the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF FIELD ENGINEERING

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SECTION 01060

PERMITS AND REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 The Contractor is responsible for obtaining all federal, state and local permits required to complete the work and to comply with all regulatory requirements. The Contractor shall fill out all forms and furnish all drawings required to obtain the permits. A copy of the approved permit shall be submitted to the Program Manager. All fees associated with these permits shall be paid by the Contractor as part of the project. Work shall not commence on any phase of the work requiring a permit until the permit is obtained.

- A. The Work specified in this section includes permits and regulatory requirements. Specific requirements are also included in other specification areas.
- B. Related Work Described Elsewhere:
 - 1. Agreement, Section CA
 - 2. General Specifications, Section 01000
 - 3. Miscellaneous and Special Project Requirements, Section 01100
 - 4. Construction Facilities and Temporary Services, Section 01500
 - 5. Traffic Regulation, Section 01570

1.02 SUBMITTALS

- A. Submit draft copies of all permit applications to the Program Manager a minimum of five (5) days before the permit application is submitted to the permitting agency.
- B. Submit a copy of all permits obtained by the Contractor.

1.03 REGULATORY AGENCIES

- A. Contractor shall comply with all laws, rules, regulations, and ordinances promulgated by any authority having jurisdiction over the Work, including, but not limited to:
 - 1. RI Department of Environmental Management;
 - 2. RI Coastal Resources Management Council;
 - 3. City of Pawtucket;
 - 4. Permit for Discharge of Construction Water into NBC Sewer System in accordance with the Rules and Regulations for the Use of Wastewater Facilities within the Narragansett Bay Water Quality Management District Commission.
Contact: Narragansett Bay Commission

1.04 PERMITS OBTAINED BY OWNER:

- A. Contractor shall comply with all permits and Orders of Conditions obtained by Owner.
 - 1. Application for RIPDES General Permit for Stormwater Discharge associated with Construction Activity was submitted on XX.
 - 2. CRMC Assent

1.05 PERMITS OBTAINED BY CONTRACTOR

- A. Prior to performing the Work, Contractor shall be responsible for obtaining and paying for all other permits required for the work of this Contract including but not limited to permits required of his equipment, work force, and of particular operations (such as fuel storage, air emissions, disposal of excavated material). Such permits may include those listed above. Contractor shall determine and obtain all necessary permits to enable Contractor and Program Manager occupation of the construction trailers at the work site.
- B. The Contractor shall be solely responsible for obtaining and paying for at no additional cost to the NBC, all permits, licenses, mitigation, certifications or approvals required for either transportation, off-loading, stockpiling, storage and final use or off-site disposal of excavated material and construction and demolition material generated during the performance of the Work.
- C. At no additional cost to the NBC, the Contractor shall be responsible for collecting representative samples of materials to be disposed of off-site and providing any analyses as may be required to receive agency approvals for use or off-site disposal of material and for scheduling and coordinating inspections necessary for receipt of local or state permits, approvals or certifications.
- D. The Contractor shall be responsible for providing to the NBC in a timely and acceptable manner copies of all permits, licenses, certifications or approvals or other applicable information required to demonstrate receipt of required permits.
- E. Should the Contractor propose construction or means and methods which are not allowed by the permits included herein, the Contractor shall be solely responsible for obtaining any permit amendments or new permits which would allow compliance with Contractor's proposed means and methods at no additional cost to the NBC. The Contractor shall be constrained from commencing construction within the affected areas until applicable permit amendments or new permits have been received.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PERMIT COSTS AND FINES

- A. Any and all costs, including NBC and Program Manager costs, or fines levied by regulatory agencies for violations of permit requirements which are a direct result of the Contractor's performance or lack thereof shall be paid by the Contractor at no additional cost to the NBC.

PART 4 ATTACHMENTS

RIPDES General Permit for Stormwater Discharge associated with Construction Activity is provided as Appendix c (Pending)

CRMC Assent is provided as Appendix D (Pending)

END OF PERMITS AND REGULATORY REQUIREMENTS

SECTION 01065

PROJECT SAFETY AND HEALTH SPECIFICATIONS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section includes health and safety requirements for the Phase III Narragansett Bay Commission Combined Sewer Overflow Control Facilities Program. Requirements included in this section are in addition to Local, State, and Federal requirements. Where conflicts or discrepancies exist between requirements, the more stringent requirement shall govern.
- B. Related Work Described Elsewhere:
 - 1. Agreement, Section CA.
 - 2. General Specifications, Section 01000
 - 3. Miscellaneous and Special Project Requirements, Section 01100

1.02 COMPLIANCE

- A. In prosecuting the work of this Contract, the Contractor and Sub-Contractors shall provide working conditions on each operation that shall be as safe and healthful as the nature of that operation permits. The various operations connected with the Work shall be so conducted that they will not be injurious to safety or health and shall otherwise conform to the requirements of the Contract Documents. The Contractor and Sub-contractors shall comply at a minimum with all requirements of the Contract Documents and provisions, regulations and recommendations issued pursuant to the Occupational Safety and Health Act of 1970, and the Construction Safety Act of 1969, as amended, and with laws, rules and regulations of other authorities having jurisdiction, with regard to all matters relating to the safety and health of workers and the general public. Compliance with government requirements is mandated by law and considered only a minimum level of safety performance. All work shall therefore be performed in accordance with best safe work practices recognized by the construction industry and the requirements of the Contract Documents.
- B. The Contractor shall stop work whenever a work procedure or a condition at a work site is deemed unsafe.
- C. On Site Employees: 10-Hour OSHA Construction Safety Program: All personnel shall be trained in and bear certification of satisfactory completion of training in an approved 10 Hour OSHA Construction Safety Program as outlined in RIGL 28-20-35.
- D. Reference Codes, Standards and other applicable Documents
 - 1. OSHA - U.S. Department of Labor, Occupational Safety and Health Administration, Construction Standards and Interpretations, 29 CFR Part 1926, Subpart S, Section 1926.800, "Underground Construction", final rule dated June 2, 1989.
 - 2. OSHA - U.S. Department of Labor, Occupational Safety and Health Administration, Construction Standards and Interpretations, 29 CFR Part 1910.120 "Hazardous Waste Operations and Emergency Response"
 - 3. FEMA – Federal Emergency Management Agency, Emergency Operations Plan Requirements

4. CERCLA - Comprehensive Environmental Response, Compensation and Liability Act, National Contingency Plan, Section 105
5. U.S. Department of Labor, Occupational Safety and Health Act of 1970, as amended.
6. NFPA Standard for Fire Prevention During Welding, Cutting, and Other Hotwork, 1994 edition
7. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations, 1996 Edition
8. U.S. Department of Labor, Construction Safety Act of 1969, as amended.
9. Rhode Island Fire Laws and Rules, Annotated, 2000-2001
10. Rhode Island Fire Prevention Code (NFPA 1 Fire Prevention Code, 1997 Edition as amended)
11. All applicable Rhode Island State Health and Safety Regulations, including:
 - a. Rhode Island Department of Environmental Management (RIDEM) Air Pollution Control (APC) Regulation No. 5, Fugitive Dust
 - b. RIDEM APC Regulation No. 17, Odors
 - c. RIDEM APC Regulation No. 22, Air Toxics
 - d. RIDEM, Rules and Regulations for Hazardous Waste Management (“Hazardous Waste Regulations”, current edition/
12. City of Pawtucket Code of Ordinances, current edition
13. All other Federal, State and Local requirements and regulations in effect at the time of construction, including new regulations or modifications to existing regulations introduced during the Contract Time.

1.03 SUBMITTALS

A. CONTRACTORS HEALTH AND SAFETY MANUAL - GENERAL REQUIREMENTS:

1. The Contractor shall submit its Health and Safety Manual to the Program Manager no later than 30 days after the issuance of a Notice to Proceed. No work shall be performed until the Health and Safety Manual has been accepted by the Program Manager.
2. The Contractor’s Health and Safety Manual shall be reviewed and stamped by a third-party Certified Industrial Hygienist (CIH) engaged by the Contractor.
3. The Health and Safety Manual shall be appropriate to the scope of work to be performed. General policies and procedures will be supplemented and updated appropriately to address the specific conditions, methods, and equipment to be used for the work. The Manual shall include as a framework for safety and health programming the following basic elements and plans in sufficient detail to provide a clear guideline for a safe working environment:
 - a. A statement signed by an Officer of the Firm of the Contractor’s commitment to (1) provide a safe and healthful project and (2) to implement its Safety and Health Program.
 - b. Specific assignments of safety and health-related roles and responsibilities. An explanation of the procedures that safety and project management personnel will follow to rectify unsafe working conditions or hazards when they are identified.
 - c. Detailed procedures for:
 1. Training of site supervision.
 2. Safety and Health Project Orientation for workers.
 3. On-going Safety and Health training for workers.

4. Providing safety and health information to the Contractor's employees.
5. Safety and health inspections on the project.
6. Disciplinary action.
7. Safety and Health Project Orientation for visitors.
8. Accident-related record keeping, investigation and surveillance.
- d. An Emergency Action plan addressing all types of emergencies, with which the Contractor may reasonably and predictably be confronted.
- e. A list of required health and safety related permits for specific construction operations.
- f. Job hazard analyses:
 1. A procedure for identifying how and under what circumstances job hazard analyses shall be conducted.
 2. Guidelines for the preparation and review of job hazard analyses and handling recommendations resulting from the analyses.
 3. Job hazard analyses as they are developed and updated.
- g. Reporting formats for required reports and submissions.
- h. All detailed site-specific procedures shall include requirements for mandatory eye and head protection and adherence to 6-foot fall protection requirements. Site-specific procedures shall require all chainsaws used on-site to be equipped with kickback guards/breaks and require all other power tools to be equipped with all protective features as provided by the manufacturer. Detailed Site Specific Procedures for conducting safe working conditions (including the designation of "competent persons" as required by OSHA) associated with:
 1. Blasting
 2. Compressed air and gases
 3. Concrete work
 4. Confined spaces/permit-required confined spaces
 5. Crane operations and maintenance
 6. Rigging operations, equipment inspection and testing
 7. Electrical hazards
 8. Excavation and excavation support
 9. Fall Protection
 10. Fire Protection and Prevention
 11. First aid, CPR and Blood borne Pathogens
 12. Hand and power tools
 13. Hazard Communication
 14. Housekeeping
 15. Scaffolding, Ladders and Walking and Working Surfaces
 16. Lockout/Control of Energy Sources
 17. Materials handling and storage
 18. Mechanized equipment
 19. Construction Health Hazard Monitoring
 20. Personal Protective Equipment and clothing
 21. Hearing protection
 22. Respiratory Protection
 23. Sanitation
 24. Welding and cutting
 25. Confined Space Procedures
 26. Underground Excavation

- 27. Underground Construction
- 28. Traffic Control Program
- i. Hazardous material handling.
 - 1. A silica exposure plan to limit exposure of workers to silica dust. The plan shall include the applicable preventative measures recommended and contained in NIOSH ALERT: 1996 Publication 96-112 "Preventing Silicosis and Deaths in Construction Workers".
 - 2. The Contractor shall develop a written chemical safety plan to address all chemicals used during construction, including Contractor's construction water treatment systems. This safety plan shall include detailed procedures to prevent chemical accidents to the maximum extent possible during chemical transport, transfer, storage, use and disposal. Include appropriate MSDS sheets.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SAFETY PROGRAM ADMINISTRATION

- A. The Contractor shall be fully responsible for the safety and health of its employees, its subcontractors, and lower tier subcontractors during the performance of the Work. The Contractor shall be directly responsible for establishing and implementing the project-specific Contractor Safety and for the protection of its workers, the workers of its Subcontractors, the Program Manager/Construction Manager, Program Manager, NBC and the general public.
- B. The Contractor shall be directly responsible for ensuring the work is performed in a safe and healthful manner.

END OF PROJECT SAFETY AND HEALTH SPECS

SECTION 01068

FEDERAL AND STATE REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL STATE AND FEDERAL REQUIREMENTS

- A. The Contractor shall comply with all applicable Federal and State Requirements. See Information for Bidders IB.22 for additional information.
- B. The following documents are included as part of this specification
 - 1. State Revolving Fund (SRF) Program Contract Specification Package
 - 2. SRF Project Sign Requirements
 - 3. EPA Good Faith Efforts and EPA DBE Forms
 - 4. Davis-Bacon Prevailing Wage Requirements
 - 5. Prevailing Wage Rates
 - 6. American Iron and Steel (AIS) Requirements
 - 7. Water Infrastructure Financing and Innovation Act (WIFIA) Requirements.

1.02 STATE REVOLVING FUND (SRF) PROGRAM

- A. State Revolving Fund (SRF) Program contract Specification Package (1 Page)
- B. Federal Requirements
 - 1. Employment Standards Administration Office of Federal Contract Compliance Programs - Executive Order 11246.
 - a. OFCCP fact sheet. (2 pages)
 - b. Equal Opportunity Clause and the Standard Federal Equal Employment Specifications. (6 pages)
 - c. Non-discrimination in employment notice. (1 page)
 - 2. Assurance of compliance with Title VI of the Civil Rights Act of 1964 and Section 13 of the FWPCA Amendments of 1972 (EPA form 4700-1). (1 page)
 - 3. Affirmative steps for soliciting MBE/WBE (40 CFR 31.36(e)) (1 page)
- C. State Requirements
 - 1. RIGL Title 37
 - a. Chapter 2.1 - Domestic Steel (2 pages)
 - b. Chapter 12 - Contractor's Bonds (4 pages)
 - c. Chapter 12.1 - Substitution of Security for Retained Earnings of Architects and Engineers (1 page)
 - d. Chapter 13 - Labor and Payment of Debts by Contractors (9 pages)
 - e. Chapter 14.1 - Minority Business Enterprise (7 pages)
 - f. Chapter 16 - Public Works Arbitration (7 pages)
 - 2. RIGL Title 45
 - a. Chapter 55 - Award of Municipal Contracts (6 pages)

3. Project Signs (2 pages)

D. EPA Good Faith Efforts

1. Good Faith Efforts (2 pages)
2. EPA Form 6100-2 DBE Subcontractor Participation Form (2 pages)
3. EPA Form 6100-3 DBE Subcontractor Performance Form (2 pages)
4. EPA Form 6100-4 DBE Subcontractor Utilization Form (2 Pages)

E. Davis-Bacon Prevailing Wage Requirements (9 Pages)

F. Prevailing Wages (Current wage rates – pages vary)

G. Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014 (20 pages)

H. American Iron & Steel (AIS) Requirements of the Consolidated Appropriations Act of 2014 (Public Law 113-76) Q&A Part 2 Questions/Answers (7 pages)

I. Debarment & Suspension Executive Order 1259 – Debarment and Suspension (2 pages)

J. Certification Regarding Debarment & Suspension and Other Responsibility Matters (1 page)

K. State Revolving Fund Sign (2 pages)

1.03 WATER INFRASTRUCTURE FINANCE AND INNOVATION ACT

A. WIFIA Requirements and Loan Agreement

B. WIFIA Specifications Package and Bid Contract Language (December 2020)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 ATTACHMENTS

Attachment 1: STATE REVOLVING FUND PROGRAM (CONTRACT SPECIFICATIONS PACKAGE, PROJECT SIGNAGE)

Attachment 2: EPA GOOD FAITH EFFORTS

Attachment 3: DAVIS-BACON PREVAILING WAGE REQUIREMENTS

Attachment 4: WIFIA LOAN AGREEMENT FLOW DOWN (PASS THROUGH) PROVISIONS

Attachment 5: WIFIA Specifications Package and Bid Contract Language (December 2020)

END OF FEDERAL AND STATE REQUIREMENTS



**Rhode Island Department of Environmental Management
Office of Water Resources**

**Clean Water State Revolving Fund Program
Contract Specifications Package**

A. Federal

- 1) Equal Employment Opportunity and Affirmative Action (Executive Order 11246)
 - i) OFCCP fact sheet.
 - ii) Equal Opportunity Clause and the Standard Federal Equal Employment Specifications.
 - iii) Notice of Non-Discrimination in Employment.
- 2) Non-discrimination in employment notice.
- 3) Assurance of compliance with Title VI of the Civil Rights Act of 1964 and Section 13 of the FWPCA Amendments of 1972 (EPA form 4700-1).
- 4) Affirmative steps for soliciting MBE/WBE (40 CFR 31.36(e))
- 5) Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects (Executive Order 13202)

Applicable cross-cutting Federal authorities for projects funded through SRF programs are made available at http://water.epa.gov/grants_funding/dwsrf/xcuts.cfm. Additional information is provided in the United States Environmental Protection Agency's cross-cutting handbook available at <http://www.epa.gov/owm/cwfinance/cwsrf/enhance/DocFiles/Other%20Docs/CrosscutterHandbook.pdf>.

B. State of Rhode Island

- 1) RIGL 37-2.1, Domestic Steel
- 2) RIGL 37-12, Contractors Bonds
- 3) RIGL 37-12.1, Substitution of Security for Retained Earnings of Architects and Engineers.
- 4) RIGL 37-13, Labor and Payment of Debts by Contractors
 - i) Prevailing Wage Rates
- 5) RIGL 37-14.1, Minority Business Enterprise
 - i) Regulations Governing Participation by Minority Business Enterprises in State Funded and Directed Public Construction Projects, Construction Contracts and Procurement Contracts Goods and Services.
- 6) RIGL 37-16, Public Works Arbitration
- 7) RIGL 45-55, Award of Municipal Contracts

NOTE: This package is prepared by RIDEM as a service of the CWSRF program. While every attempt at accuracy has been made, these are not certified true copies of the laws presented. **The responsibility for compliance with all applicable provisions of Federal and State laws and regulations relating to the bidding, award, and performance of contracts is the applicant's and the bidder's.** Certified true and complete copies of any Rhode Island laws and regulations may be obtained from the Office of the Secretary of State.

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Employment Standards Administration Office of Federal Contract Compliance Programs

Fact Sheet EXECUTIVE ORDER 11246

EEO and Affirmative Action Guidelines for Federal Contractors Regarding Race, Color, Gender, Religion, and National Origin.

BASIC PROVISIONS

Since 1965, the U.S. Department of Labor's Office of Federal Contract Compliance Programs (OFCCP) has been committed to ensuring that Government contractors comply with the equal employment opportunity (EEO) and the affirmative action provisions of their contracts.

OFCCP administers and enforces Executive Order 11246, as amended, which prohibits federal contractors and federally-assisted construction contractors and subcontractors, who do over \$10,000 in Government business in one year from discriminating in employment decisions on the basis of race, color, religion, sex, or national origin.

The Executive Order also requires Government contractors to take affirmative action to insure that equal opportunity is provided in all aspects of their employment.

AFFIRMATIVE ACTION REQUIREMENTS

Each Government contractor with 50 or more employees and \$50,000 or more in government contracts is required to develop a written affirmative action program (AAP) for each of its establishments.

A written affirmative action program helps the contractor identify and analyze potential problems in the participation and utilization of women and minorities in the contractor's workforce.

If there are problems, the contractor will specify in its AAP the specific procedures it will follow and the good faith efforts it will make to provide equal employment opportunity.

Expanded efforts in outreach, recruitment, training and other areas are some of the affirmative steps contractors can take to help members of the protected groups compete for jobs on equal footing with other applicants and employees.

Affirmative action is not preferential treatment. It does not mean that unqualified persons should be hired or promoted over other people. What affirmative action does mean is that positive steps must be taken to ensure equal employment opportunity for traditionally disadvantaged groups.

ENFORCEMENT AND COMPLIANCE

Compliance Reviews

OFCCP conducts compliance reviews to investigate the employment practices of Government contractors. During a compliance review, a compliance officer examines the contractor's affirmative action program; checks personnel, payroll, and other employment records; interviews employees and company officials; and investigates virtually all aspects of employment in the company.

The investigator also checks to see whether the contractor is making special efforts to achieve equal opportunity through affirmative action. If problems are discovered, OFCCP will recommend corrective action and suggest ways to achieve equal employment opportunity.

Complaint Investigations

Individuals may file complaints if they believe they have been discriminated against by federal contractors or subcontractors. Complaints also may be filed by organizations on behalf of the person or persons affected.

Complaints must be filed within 180 days from the date of the alleged discrimination, although filing time can be extended for a good reason.

If a complaint filed under Executive Order 11246 involves discrimination against only one person, OFCCP will normally refer it to the EEOC. Cases involving groups of people or indicating patterns of discrimination are generally investigated and resolved by OFCCP. Complaints may be filed directly with any of OFCCP's regional or district offices throughout the country, or with OFCCP in Washington, D.C.

Compliance Assistance

To help contractors understand their contractual obligations for EEO and affirmative action, OFCCP provides technical assistance. District office staff offers guidance to contractors on how to develop an affirmative program through company seminars, training programs held in conjunction with industry liaison groups, and one-on-one consultations on affirmative action practices and procedures.

Enforcing Contract Compliance

When a compliance review discloses problems, OFCCP attempts to work with the contractor, often entering into a conciliation agreement. A conciliation agreement may include back pay, job offers, seniority credit, promotions or other forms of relief for victims of discrimination. It may also involve new training programs, special recruitment efforts, or other affirmative action measures.

When conciliation efforts are unsuccessful, OFCCP refers the case to the Office of the Solicitor for enforcement through administrative enforcement proceedings. A contractor cited for violating EEO and affirmative action requirements may have a formal hearing before an administrative law judge.

If conciliation is not reached before or after the hearing, sanctions may be imposed. For example, a contractor could lose its government contracts or subcontracts or be debarred, i.e., declared ineligible for any future government contracts.

Further Information

For more information about contract compliance, filing complaints, or compliance assistance, contact any of OFCCP's regional or district offices. All offices are listed in telephone directories under U.S. Department of Labor, Employment Standards Administration, Office of Federal Contract Compliance Programs.

EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION

Executive Order 11246

(Excerpts from 41 CFR 60 Parts 1 and 4)

41 CFR 60-1.4 - Equal opportunity clause

(b) Federally assisted construction contracts. 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:

- (1) 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 forms 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.
- (2) 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.
- (3) 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.
- (4) 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.
- (5) 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, or pursuant thereto, and will permit access to 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.
- (6) In the event of the contractor's noncompliance 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.
- (7) 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 interests 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 compliance.

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.

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

(d) 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.

(e) 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.

(f) 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.

41 CFR 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 non-construction 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 Contract Compliance Programs, United States Department of Labor, or any person to whom 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 of 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 is 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 an 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 7 a 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 or 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 its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor 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. 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 therefor, along with whatever 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 meet 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 compiled under 7b above.
 - f. Disseminate the Contractor's EEO 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 news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom 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 obligations 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 a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of 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 workforce 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 of 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 Contractor fails to comply with the requirements of 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 in 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 1977 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 be used after the regulations in 41 CFR Part 60-4 become effective.

[43 FR 49254, Oct. 20, 1978; 43 FR 51401, Nov. 3, 1978, as amended at 45 FR 65978, Oct. 3, 1980]

NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS

NON-DISCRIMINATION IN EMPLOYMENT

TO: _____
(Name of Union or Organization of Workers)

The undersigned currently holds contract(s) with _____
(Name of Applicant)

involving funds or credit of the U.S. Government of (a) subcontract(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with Executive Order 11246, dated September 24, 1965, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, age, handicap, veteran status, color, creed, or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

**HIRING, PLACEMENT, UPGRADING, TRANSFER, OR DEMOTION,
RECRUITMENT, ADVERTISING, OR SOLICITATION FOR
EMPLOYMENT TRAINING DURING EMPLOYMENT, RATES OF PAY
OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING
INCLUDING APPRENTICESHIP, LAYOFF, OR TERMINATION.**

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Order 11246.

COPIES OF THIS NOTICE WILL BE POSTED BY THE UNDERSIGNED IN CONSPICUOUS PLACES AVAILABLE TO EMPLOYEES OR APPLICANTS FOR EMPLOYMENT.

(Contractor or Subcontractor)

(Date)

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**UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY**

**ASSURANCE OF COMPLIANCE
FOR
TITLE VI OF THE CIVIL RIGHTS ACT OF 1964
AND
SECTION 13 OF THE FWPCA AMENDMENTS OF 1972**

NAME AND ADDRESS OF APPLICANT/RECIPIENT (<i>Hereinafter called ASSUROR</i>)	GRANT IDENTIFICATION NUMBER (<i>To be completed by EPA</i>)	GRANT AMOUNT REQUESTED \$
	TYPE OF GRANT <input type="checkbox"/> DEMONSTRATION <input type="checkbox"/> RESEARCH <input type="checkbox"/> TRAINING <input type="checkbox"/> OTHER (<i>Specify</i>):	
	CHECK ONE: <input type="checkbox"/> NEW <input type="checkbox"/> CONTINUATION	

HEREBY AGREES THAT IT will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and all requirements of the U.S. Environmental Protection Agency (*hereinafter called "EPA"*) issued pursuant to that title, to the end that in accordance with Title VI of that Act, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Assuror receives financial assistance from EPA and hereby gives assurance that it will now and hereafter take all necessary measures to effectuate this agreement.

HEREBY AGREES THAT IT will comply with all applicable requirements of Section 13 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) and all requirements of EPA issued pursuant to that section, to the end that in accordance with that section of that Act, no person in the United States shall, on the ground of sex be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity under the said Federal Water Pollution Control Act Amendments for which the Assuror receives assistance from EPA and hereby gives assurance that it will now and hereafter take all necessary measures to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of financial assistance extended to the Assuror by EPA, this Assurance obligates the Assuror, or, in the case of any transfer of such property, any transferee for the period during which the real property or structure is used for a purpose involving the provisions of similar services or benefits. If any personal property is so provided, this Assurance obligates the Assuror for the period during which it retains ownership or possession of the property. In all other cases, this Assurance obligates the Assuror for the period during which the financial assistance is extended to it by EPA.

THE ASSURANCE is given in consideration of and for the purpose of obtained any and all Federal grants, loans, contracts, property discounts or other financial assistance extended after the date hereof to the Assuror by EPA including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Assuror recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this Assurance and that the United States shall reserve the right to seek judicial enforcement of this Assurance. The Assurance is binding on the Assuror, its successors, transferees, and assignees, and the person or persons whose signature appear below are authorized to sign this Assurance on behalf of the Assuror.

The obligations assumed by the Assuror hereunder are in addition to any obligations which may be imposed to the Assuror by any applicable regulation now outstanding or which may hereafter be adopted by EPA to effectuate any provision or goal of the said Title VI and all applicable requirements of the said Section 13, and no part of this Assurance shall be read so as to in any way detract from or modify any obligation which may be imposed on the Assuror by any such regulation standing alone.

SIGNATURE OF ASSUROR BY PRESIDENT, CHAIRMAN OF BOARD OR COMPARABLE AUTHORIZED OFFICIAL	DATE
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CONTRACTING WITH SMALL AND MINORITY FIRMS, WOMEN'S BUSINESS ENTERPRISE

40 CFR 31.36(e)

40 CFR 31.36(e) – Contracting with small and minority firms, women's business enterprise and labor surplus area firms.

(1) The grantee and sub-grantee will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

(2) Affirmative steps shall include:

- (i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (ii) Assuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (iii) Dividing the total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
- (iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
- (v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce; and
- (vi) Requiring the prime contractor, if subcontracts are to be let, to take affirmative steps listed in paragraphs (e)(2)(i) through (v) of this section.

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EXECUTIVE ORDER

PRESERVATION OF OPEN COMPETITION AND GOVERNMENT NEUTRALITY TOWARDS GOVERNMENT CONTRACTORS' LABOR RELATIONS ON FEDERAL AND FEDERALLY FUNDED CONSTRUCTION PROJECTS

By the authority vested in me as President by the Constitution and laws of the United States of America, including the Federal Property and Administrative Services Act, 40 U.S.C. 471 et seq., and in order to (1) promote and ensure open competition on Federal and federally funded or assisted construction projects; (2) maintain Government neutrality towards Government contractors' labor relations on Federal and federally funded or assisted construction projects; (3) reduce construction costs to the Federal Government and to the taxpayers; (4) expand job opportunities, especially for small and disadvantaged businesses; and (5) prevent discrimination against Government contractors or their employees based upon labor affiliation or lack thereof; thereby promoting the economical, nondiscriminatory, and efficient administration and completion of Federal and federally funded or assisted construction projects, it is hereby ordered that:

Section 1. To the extent permitted by law, any executive agency awarding any construction contract after the date of this order, or obligating funds pursuant to such a contract, shall ensure that neither the awarding Government authority nor any construction manager acting on behalf of the Government shall, in its bid specifications, project agreements, or other controlling documents:

(a) Require or prohibit bidders, offerors, contractors, or subcontractors to enter into or adhere to agreements with one or more labor organizations, on the same or other related construction project(s); or

(b) Otherwise discriminate against bidders, offerors, contractors, or subcontractors for becoming or refusing to become or remain signatories or otherwise to adhere to agreements with one or more labor organizations, on the same or other related construction project(s).

(c) Nothing in this section shall prohibit contractors or subcontractors from voluntarily entering into agreements described in subsection (a).

Sec. 2. Contracts awarded before the date of this order, and subcontracts awarded pursuant to such contracts, whenever awarded, shall not be governed by this order.

Sec. 3. To the extent permitted by law, any executive agency issuing grants, providing financial assistance, or entering into cooperative agreements for construction projects, shall ensure that neither the bid specifications, project agreements, nor other controlling documents for construction contracts awarded after the date of this order by recipients of grants or financial assistance or by parties to cooperative agreements, nor those of any construction manager acting on their behalf, shall contain any of the requirements or prohibitions set forth in section 1(a) or (b) of this order.

Sec. 4. In the event that an awarding authority, a recipient of grants or financial assistance, a party to a cooperative agreement, or a construction manager acting on behalf of the foregoing, performs in a manner contrary to the provisions of sections 1 or 3 of this order, the executive agency awarding the contract, grant, or assistance shall take such action, consistent with law and regulation, as the agency determines may be appropriate.

Sec. 5. (a) The head of an executive agency may exempt a particular project, contract, subcontract, grant, or cooperative agreement from the requirements of any or all of the provisions of sections 1 and 3 of this order, if the agency head finds that special circumstances require an exemption in order to avert an imminent threat to public health or safety or to serve the national security.

(b) A finding of "special circumstances" under section 5(a) may not be based on the possibility or presence of a labor dispute concerning the use of contractors or subcontractors who are nonsignatories to, or otherwise do not adhere to, agreements with one or more labor organizations, or concerning employees on the project who are not members of or affiliated with a labor organization.

Sec. 6. (a) The term "construction contract" as used in this order means any contract for the construction, rehabilitation, alteration, conversion, extension, or repair of buildings, highways, or other improvements to real property.

(b) The term "executive agency" as used in this order shall have the same meaning it has in 5 U.S.C. 105, excluding the General Accounting Office.

(c) The term "labor organization" as used in this order shall have the same meaning it has in 42 U.S.C. 2000e(d).

Sec. 7. With respect to Federal contracts, within 60 days of the issuance of this order, the Federal Acquisition Regulatory Council shall take whatever action is required to amend the Federal Acquisition Regulation in order to implement the provisions of this order.

Sec. 8. As it relates to project agreements, Executive Order 12836 of February 1, 1993, which, among other things, revoked Executive Order 12818 of October 23, 1992, is revoked.

Sec. 9. The Presidential Memorandum of June 5, 1997, entitled "Use of Project Labor Agreements for Federal Construction Projects" (the "Memorandum"), is also revoked.

Sec. 10. The heads of executive departments and agencies shall revoke expeditiously any orders, rules, regulations, guidelines, or policies implementing or enforcing the Memorandum or Executive Order 12836 of February 1, 1993, as it relates to project agreements, to the extent consistent with law.

Sec. 11. This order is intended only to improve the internal management of the executive branch and is not intended to, nor does it, create any right to administrative or judicial review, or any right, whether substantive or procedural, enforce-able by any party against the United States, its agencies or instrumentalities, its officers or employees, or any other person.

GEORGE W. BUSH

THE WHITE HOUSE, February 17, 2001.

TITLE 37

CHAPTER 2.1 DOMESTIC STEEL

Section

37-2.1-1.	Short Title
37-2.1-2.	Purpose
37-2.1-3.	Purchase of steel and steel products
37-2.1-4.	Payment
37-2.1-5.	Definitions

37-2.1-1. Short title.

This chapter shall be known and may be cited as the "Steel Products Procurement Act".

37-2.1-2. Purpose.

- (a) This chapter shall be deemed to be an exercise of the police powers of the state for the protection of the health, safety, and general welfare of the people of the state.
- (b) It is hereby determined by the general assembly of Rhode Island and declared as a matter of legislative findings that:
 - (1) The United States is one of the leading countries in the production and use of steel and its allied products;
 - (2) The use of steel products constitutes a major industry of the United States and, as such, provides the jobs and family incomes of millions of persons in the United States;
 - (3) The taxes paid to Rhode Island and the United States by employers and employees engaged in the production and sale of steel products are one of the largest single sources of public revenues in this country;
 - (4) It has, for many years, been the policy of the state to aid and support the development and expansion of industry in the United States in order to foster the economic well-being of the state and its people; and
 - (5) The economy, general welfare, and national security of the United States, are inseparably related to the preservation and development of the steel industry in the United States.
- (c) The general assembly therefore declares it to be the policy of the state that all public officers and agencies should, at all times, aid and promote the development of the steel industry of the United States in order to stimulate and improve the economic well-being of the state and its people.

37-2.1-3. Purchase of steel and steel products.

- (a) Every public agency shall require that every contract document for the construction, reconstruction, alteration, repair, improvement, or maintenance of public works contain a provision that, if any steel products are to be used or supplied in the performance of the contract, only steel products as herein defined shall be used or supplied in the performance of the contract or any subcontracts thereunder.
- (b) This section shall not apply in any case where the head of the public agency, in writing, determines that steel products as herein defined are not produced in, or readily available in the United States or that such steel products shall not exceed fifteen percent (15%) of the costs of any other steel products obtainable nationally or internationally.

37-2.1-4. Payment.

No public agency shall authorize, provide for, or make any payments to any person under any contract containing the provision required by 37-2.1-3 unless the public agency is satisfied that such person has fully complied with that provision. Any such payments made to any person by any public agency which should not have been made, as a result of this section, shall be recoverable directly from the contractor or subcontractor who did not comply with 37-2.1-3 by either such public agency or the attorney general upon suit filed in the court of any county.

37-2.1-5. Definitions.

The following words and phrases when used in this chapter shall have, unless the context clearly indicates otherwise, the meanings given to them in this section:

- (a) "Person" means natural persons as well as corporations, partnerships, business units, and associations;
- (b) "Public agency" means (1) the state and its departments, boards, commissions and agencies, (2) cities, towns, school districts, and any other governmental unit or district, (3) any and all other public bodies, authorities, officers, agencies, or instrumentalities, whether exercising a governmental or proprietary function;
- (c) "Public works" means steel to construct, frame or reinforce any public structure, building, highway, waterway, street, bridge, transit system, airport, or other betterment, work or improvement, whether of a permanent or temporary nature, and whether for governmental or proprietary use;
- (d) "Steel products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly processed, or processed by a combination of two or more of such operations, from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer, or other steel making process;
- (e) "United States" means the United States of America and includes all territory, continental or insular, subject to the jurisdiction of the United States.

TITLE 37

CHAPTER 12 CONTRACTORS' BONDS

Sections

- 37-12-1. Contractors required to give bond – Terms and conditions.
- 37-12-2. Rights of persons furnishing labor and materials.
- 37-12-3. Remedies of creditors and state – Priority of claims.
- 37-12-4. Intervention by creditor in suit brought by state.
- 37-12-5. Time limitation on creditors' actions.
- 37-12-6. Intervention in suit brought by creditor – Consolidation of suits.
- 37-12-7. Notice of Pendency of Suit
- 37-12-8. Certified copies of documents.
- 37-12-9. Payment into court by surety – Discharge.
- 37-12-10. Retainers relating to contracts for public works or sewer or water main construction.
- 37-12-11. Substitution of securities for retained earnings.

§ 37-12-1 Contractors required to give bond – Terms and conditions. – Every person (which word for the purposes of this chapter shall include a copartnership, a number of persons engaged in a joint enterprise, or a corporation), before being awarded a contract by the department of transportation or by the department of administration, as the case may be, and every person awarded such a contract as a general contractor or construction or project manager for the construction, improvement, completion, or repair of any public road or portion thereof or of any bridge in which the contract price shall be in excess of fifty thousand dollars (\$ 50,000), or for a contract for the construction, improvement, completion, or repair of any public building, or portion thereof, shall be required to furnish to the respective department a bond of that person to the state, with good and sufficient surety or sureties (hereafter in this chapter referred to as surety), acceptable to the respective department, in a sum not less than fifty percent (50%) and not more than one hundred percent (100%) of the contract price, conditioned that the contractor, principal in the bond, the person's executors, administrators, or successors, shall in all things, well and truly keep and perform the covenants, conditions, and agreements in the contract, and in any alterations thereof made as therein provided, on the person's part to be kept and performed, at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the state, the respective department, and all of its officers, agents, and employees, as therein stipulated, and shall also promptly pay for all such labor performed or furnished and for all such materials and equipment furnished, (which as to equipment shall mean payment of the reasonable rental value, as determined by the respective department, of its use during the period of its use), as shall be used in the carrying on of the work covered by the contract, or shall see that they are promptly paid for, whether or not the labor is directly performed for or furnished to the contractor or is even directly performed upon the work covered by the contract, and whether or not the materials are furnished to the contractor or become component parts of the work, and whether or not the equipment is furnished to the contractor or even directly used upon the work. The bond shall contain the provisions that it is subject to all such rights and powers of the respective department and such other provisions as are set forth in the contract and the plans, specifications, and proposal incorporated by reference in the contract, and that no extension of the time of performance of the contract or delay in the completion of the work thereunder or any alterations thereof, made as therein provided, shall invalidate the bond or release the liability of the surety thereunder. Waiver of the bonding requirements of this section is expressly prohibited.

37-12-2. Rights of persons furnishing labor and materials.

Every person who shall have performed labor and every person who shall have furnished or supplied labor, material, or equipment in the prosecution of the work provided for in the contract, in respect of which a payment bond is furnished under § 37-12-1, and who has not been paid in full therefor before the expiration of a period of ninety (90) days after the day on which the last of the labor was performed or furnished by him or her, or material or equipment furnished or supplied by him or her for which a claim is made, shall have the right to sue on the payment bond for the amount, or the balance thereof, unpaid at the time of institution of the suit and to prosecute the action to final execution and judgment for the sum or sums justly due him or her; provided, however, that any person having direct contractual relationship with a subcontractor but no contractual relationship express or implied with the contractor

furnishing the payment bond shall have a right of action upon the payment bond upon giving written notice to the contractor within ninety (90) days from the date on which the person furnished or performed the last of the labor, or furnished or supplied the last of the material or equipment for which the claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the labor was furnished or performed or the material or equipment was furnished or supplied. The notice shall be served by mailing the same by certified mail, postage prepaid, in an envelope addressed to the contractor at any place he or she maintains an office, conducts his or her business, or his or her residence.

37-12-3. Remedies of creditors and state - Priority of claims.

The remedy on the bond shall be by a civil action brought in the superior court for the counties of Providence and Bristol and in any suit brought on the bond the rights of the state shall be prior to those of all creditors. The rights of persons who shall have performed labor as aforesaid shall be prior to the rights of all other creditors, and there shall be no priorities among laborers or among other creditors under the bond. The state, either after having recovered a judgment against the contractor on the contract or without having recovered a judgment, may bring a suit on the bond against the contractor and surety on the bond, and may join as parties defendant in the suit any persons claiming to have rights under the bond as creditors; and, if it has not brought such a suit, it may at any time before a final and conclusive decree, intervene and become a party in any suit brought, as hereafter provided in this chapter, by any person claiming to be a creditor under the bond.

37-12-4. Intervention by creditor in suit brought by state.

Any person claiming to be a creditor under the bond may at any time intervene and become a party in any pending suit brought as aforesaid by the state on the bond, and by so intervening may have the rights to the person adjudicated in the suit.

37-12-5. Time limitation on creditors' actions.

No suit instituted under § 37-12-2 shall be commenced after the expiration of two (2) years, or under the maximum time limit as contained within any labor or material payment bond required under § 37-12-1, whichever period is longer, after the day on which the last of the labor was furnished or performed or material or equipment was furnished or supplied by any person claiming under the section.

37-12-6. Intervention in suit brought by creditor - Consolidation of suits.

When a suit has been so brought on the bond by a person claiming to be a creditor under the bond and is pending, any other person claiming to be a creditor under the bond may intervene and become a party in the first suit thus brought and pending and by so intervening may have the rights of the other person adjudicated in the suit. If two (2) or more of the suits be filed in the court on the same day, the one in which the larger sum shall be claimed shall be regarded as the earlier suit. All suits brought upon the bond as provided in this chapter shall be consolidated together by the court and heard as one suit.

37-12-7. Notice of pendency of suit.

In any suit brought under the provisions of this chapter such personal notice of the pendency of the suit as the court may order shall be given to all such known creditors and persons claiming to be creditors under the bond as shall not have entered their appearances in the suit and, in addition to the notice, notice of the pendency of the suit shall be given by publication in some newspaper published in this state of general circulation in the city or town or every city or town in which the work covered by the contract was carried on, once a week for three (3) successive weeks, in such form as the court may order. The court, however, may dispense with the notices if satisfied that sufficient notices shall have been given in some other suit brought under the provisions of this chapter.

37-12-8. Certified copies of documents.

Any person claiming to be a creditor under the bond and having filed a claim with the respective department, in accordance with the requirements of § 37-12-2, shall have the right, at any time when the person could under this chapter file a suit or intervene in a pending suit, to require the respective department to furnish to the person certified copies of the contract, proposal, plans specifications, and bond.

37-12-9. Payment into court by surety - Discharge.

The surety on the bond may pay into the registry of the court, for distribution among those who may be or become entitled thereto under the decree of the court, the penal sum named in the bond less any amount which the surety

may have paid to the state in satisfaction of the liability of the surety to the state under the bond, and then shall be entitled to be discharged from all further liability under the bond.

37-12-10. Retainers relating to contracts for public works or sewer or water main construction.

(a) Upon substantial completion of the work required by a contract aggregating in amount less than five hundred thousand dollars (\$ 500,000) with any municipality, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair, or improvement of sewers and water mains, or any public works project defined in § 37-13-1, the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the contract price unless otherwise agreed to by the parties. Upon substantial completion of the work required by a contract aggregating in an amount of five hundred thousand dollars (\$ 500,000) or greater with any municipality, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair, or improvement of sewers and water mains, or any public works project defined in § 37-13-1, the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the contract price. In the case of periodic payments with respect to contracts less than the aggregate amount of five hundred thousand dollars (\$ 500,000), the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the approved amount of any periodic payment unless otherwise agreed to by the parties. In the case of periodic payments with respect to contracts in the aggregate amount of five hundred thousand dollars (\$ 500,000) or greater, the awarding authority may deduct from its payment a retention to secure satisfactory performance of the contractual work not exceeding five percent (5%) of the approved amount of any periodic payment.

(b) The retainage shall be paid to any contractor or subcontractor within ninety (90) days of the date the work is accepted by the awarding authority unless a dispute exists with respect to the work. If payment is not made within ninety (90) days for any reason other than a dispute, which, if resolved and it is not the fault of the contractor, interest shall be assessed at the rate of ten percent (10%) per annum on all money which is to be paid to the contractor or subcontractor.

(c) The retainage shall be paid to any contractor or subcontractor within ninety (90) days of the date his or her work is completed and accepted by the awarding authority. If payment is not made, interest shall be assessed at the rate of ten percent (10%) per annum.

(d) There shall also be deducted and retained from the contract price an additional sum sufficient to pay the estimated cost of municipal police traffic control on any public works project. Municipalities shall directly pay the officers working traffic details and shall bill and be reimbursed by the withholding authority for which the contract is being performed every thirty (30) days until the project is complete.

(e) Notwithstanding the foregoing, with respect to projects located within the town of Warren, the withholding authority shall hold an amount from the contract price which shall be reasonably sufficient to pay the estimated cost of municipal police traffic control. The withholding authority shall pay to the town of Warren within seventy-two (72) hours of written demand the actual costs of police traffic control associated with said project on an ongoing basis.

37-12-11. Substitution of securities for retained earnings.

(a) Where any public works contract as defined by § 37-13-1 provides for the retention of earned estimates by the state of Rhode Island, the contractor may, from time to time, withdraw the whole or any portion of the amount retained for payments to the contractor pursuant to the terms of the contract, upon depositing with the general treasurer either; (1) United States treasury bonds, United States treasury notes, United States treasury certificates of indebtedness, or United States treasury bills; (2) Bonds or notes of the state of Rhode Island ; or (3) Bonds of any political subdivision in the state of Rhode Island.

(b) No amount shall be withdrawn in excess of the market value of the securities at the time of deposit or of the par value of the securities, whichever is lower. The general treasurer shall, on a regular basis, collect all interest or income on the obligations so deposited and shall pay the interest or income, when and as collected, to the contractor who deposited the obligations. If the deposit is in the form of coupon bonds, the general treasurer shall deliver each coupon as it matures to the contractor. Any amount deducted by the state, or by any public department or official thereof, pursuant to the terms of the contract, from the retained payments otherwise due the contractor, shall be

deducted, first from that portion of the retained payments for which no security has been substituted, then from the proceeds of any deposited security. In the latter case, the contractor shall be entitled to receive interest, coupons, or income only from those securities which remain after the amount has been deducted. The securities so deposited shall be properly endorsed by the contractor in such manner so as to enable the general treasurer to carry out the provisions of this section.

TITLE 37

CHAPTER 12.1 SUBSTITUTION OF SECURITY FOR RETAINED EARNINGS OF ARCHITECTS AND ENGINEERS

Sections

- 37-12.1-1. Definition of Terms.
- 37-12.1-2. Substitution of security for retained earnings by designers.
- 37-12.1-3. Deduction from retained earnings.
- 37-12.1-4. Endorsement on securities.
- 37-12.1-5. Applicability.

37-12.1-1. Definition of terms.

Terms used in this chapter shall be construed as follows:

- (a) "Designers", means any person, firm or corporation duly authorized pursuant to the laws of this state to engage in the practice of architecture and/or engineering within this state.
- (b) "Public works contract" means a contract to perform design or planning services by a designer with the state or any agency or governmental subdivisions thereof.
- (c) "Retained earnings" means any moneys or earned estimates withheld from a designer pursuant to the terms of a public works contract.

37-12.1-2. Substitution of security for retained earnings by designers.

(a) Where any public works contract provides for the holding of retained earnings from a designer, the designer may from time to time withdraw the whole or any portion of the amount retained upon either depositing with the general treasurer:

- (1) United States treasury bonds, United States treasury notes, United States treasury certificates of indebtedness, or United States treasury bills;
- (2) Bonds or notes of the state of Rhode Island; or
- (3) Bonds of any political subdivision of the state of Rhode Island.

(b) With respect to the deposit of securities, the general treasurer shall, on a regular basis, collect all interest or income on the securities so deposited and shall pay the interest or income when and as collected to the designer depositing the securities. If the security is in the form of coupon bonds, the general treasurer shall deliver each coupon as it matures to the designer.

37-12.1-3. Deduction from retained earnings.

In the event that pursuant to the terms of the public works contract it is necessary to deduct any sum from retained earnings, the state or governmental unit or agency thereof shall first apply such deduction against sums not withdrawn and thereafter from the proceeds of the sale of any securities deposited or from the income earned on such securities, whichever is applicable.

37-12.1-4. Endorsement on securities.

All securities deposited with the general treasurer pursuant to this chapter shall be properly endorsed by the designer in such manner as to enable the general treasurer to carry out the provisions of this chapter.

37-12.1-5. Applicability.

This chapter shall apply to all retained earnings held pursuant to any public works contract as of [June 16, 1991].

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TITLE 37

CHAPTER 13 LABOR AND PAYMENT OF DEBTS BY CONTRACTORS

Sections

- 37-13-1. "Public Works" defined
- 37-13-2. "Contractor" defined – information required.
- 37-13-3. Contractors subject to provisions – Weekly payment of employees.
- 37-13-3.1 State public works contract apprenticeship requirements
- 37-13-4. Provisions applicable to public works contracts – List of Subcontractors.
- 37-13-5. Payment for trucking or materials furnished – Withholding of sums due.
- 37-12-6. Ascertainment of prevailing rate of wages and other payments – Specification of rate in call for bids and in contract.
- 37-13-7. Specification in contract of amount and frequency of payment and wages.
- 37-13-8. Investigation and determination of prevailing wages – Filing of schedule.
- 37-13-9. Statutory provisions included in contracts.
- 37-13-10. Overtime compensation.
- 37-13-11. Posting of prevailing wage rates.
- 37-13-12. Wage records of contractors.
- 37-13-12.1. Obstruction of enforcement.
- 37-13-12.2. Subpoena powers.
- 37-13-12.3. Compelling obedience to subpoenas.
- 37-13-12.4. Penalty for violations.
- 37-13-13. Furnishing payroll record to director of labor.
- 37-13-13.1. Audits of wage records of out of state contractors and subcontractors.
- 37-13-14. Contractor's bond.
- 37-13-14.1. Enforcement – Hearings.
- 37-13-15. Review.
- 37-13-16. Termination of work on failure to pay agreed wages – Completion of work.
- 37-13-17. Private right of action to collect wages or benefits

37-13-1. "Public works" defined.

"Public works" as used in this chapter shall mean any public work consisting of grading, clearing, demolition, improvement, completion, repair, alteration, or construction of any public road or any bridge, or portion thereof, or any public building or portion thereof, or any heavy construction, or any public works projects of any nature or kind whatsoever.

37-13-2. "Contractor" defined - Information required.

The term "contractor" as used in this chapter shall mean the bidder whose bid has been accepted by an authorized agency or awarding authority as the bidder possessing the skills, ability, and integrity necessary to the faithful performance of the contract or work, and who shall certify that he or she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the contract or work. Essential information in regard to qualifications shall be submitted in such form to the awarding authority and the director of labor and training as the director of labor and training shall require. The authorized agency or awarding authority shall reserve the right to reject all bids, if it be in the public interest to do so.

37-13-3. Contractors subject to provisions - Weekly payment of employees.

All contractors, who have been awarded contracts for public works by an awarding agency or authority of the state or of any city, town, committee, or by any person or persons therein, in which state or municipal funds are used and of which the contract price shall be in excess of one thousand dollars (\$1,000) whether payable at the time of the signing of the contract or at a later date, and their subcontractors, on such public works shall pay their employees at weekly intervals and shall comply with the provisions set forth in 37-13-4 - 37-13-14, inclusive, and 37-13-16.

37-13-3.1. State public works contract apprenticeship requirements.

Notwithstanding any laws to the contrary, all general contractors and subcontractors who perform work on any public works contract awarded by the state after passage of this act and valued at one million dollars (\$ 1,000,000) or more shall employ apprentices required for the performance of the awarded contract. The number of apprentices shall comply with the apprentice to journeyman ratio for each trade approved by the apprenticeship council of the department of labor and training.

37-13-4. Provisions applicable to public works contracts - Lists of subcontractors.

All public works shall be done by contract, subject to the same provisions of law relating thereto and to the letting thereof, which are applicable to similar contracts of the awarding authority or authorized agency, hereinafter called the "proper authority," in the general location where the work is to be performed and which are not contrary to the provisions of 37-13-1 - 37-13-14, and 37-13-16. Each contractor after the award of a contract for public works shall submit to the proper authority a list of his or her subcontractors of any part or all of the work. The list shall be submitted in such manner or form as the proper authority shall uniformly require from contractors in all public works.

37-13-5. Payment for trucking or materials furnished - Withholding of sums due.

A contractor or subcontractor on public works authorized by a proper authority shall pay any obligation or charge for trucking and material which have been furnished for the use of the contractor or subcontractor, in connection with the public works being performed by him or her, within ninety (90) days after the obligation or charge is incurred or the trucking service has been performed or the material has been delivered to the site of the work, whichever is later. When it is brought to the notice of the proper authority in a city or town, or the proper authority in the state having supervision of the contract, that the obligation or charge has not been paid by the contractor or subcontractor, the proper authority may deduct and hold for a period not exceeding sixty (60) days, from sums of money due to the contractor or subcontractor, the equivalent amount of such sums certified by a trucker or material man creditor as due him or her, as provided in this section, and which the proper authority determines is reasonable for trucking performed or materials furnished for the public works.

37-13-6. Ascertainment of prevailing rate of wages and other payments - Specification of rate in call for bids and in contract.

Before awarding any contract for public works to be done, the proper authority shall ascertain from the director of labor and training the general prevailing rate of the regular, holiday, and overtime wages paid and the general prevailing payments on behalf of employees only, to lawful welfare, pension, vacation, apprentice training, and educational funds (payments to the funds must constitute an ordinary business expense deduction for federal income tax purposes by contractors) in the city, town, village, or other appropriate political subdivision of the state in which the work is to be performed, for each craft, mechanic, teamster, laborer, or type of worker needed to execute the contract for the public works. The proper authority shall, also, specify in the call for bids for the contract and in the contract itself the general prevailing rate of the regular, holiday, and overtime wages paid and the payments on behalf of employees only, to the welfare, pension, vacation, apprentice training, and education funds existing in the locality for each craft, mechanic, teamster, laborer, or type of worker needed to execute the contract or work.

37-13-7. Specification in contract of amount and frequency of payment of wages.

(a) Every call for bids for every contract in excess of one thousand dollars (\$ 1,000), to which the state of Rhode Island or any political subdivision thereof or any public agency or quasi-public agency is a party, for construction, alteration, and/or repair, including painting and decorating, of public buildings or public works of the state of Rhode Island or any political subdivision thereof, or any public agency or quasi-public agency and which requires or involves the employment of employees, shall contain a provision stating the minimum wages to be paid various types of employees which shall be based upon the wages that will be determined by the director of labor and training to be prevailing for the corresponding types of employees employed on projects of a character similar to the contract work in the city, town, village, or other appropriate political subdivision of the state of Rhode Island in which the work is to be performed. Every contract shall contain a stipulation that the contractor or his or her subcontractor shall pay all the employees employed directly upon the site of the work, unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment computed at wage rates not less than those stated in the call for bids, regardless of any contractual relationships which may be alleged to exist between the contractor or subcontractor and the employees, and that the scale of wages to be paid shall be posted by the contractor in a prominent and easily accessible place at the site of the work; and the further stipulation that there may be withheld from the contractor so much of the accrued payments as may be considered necessary to pay to the employees employed by the contractor, or any subcontractor on the work, the difference between the rates of wages required by the contract to be paid the employees on the work and the rates of wages received by the employees and not refunded to the contractor, subcontractors, or their agents.

(b) The terms "wages" , "scale of wages" , "wage rates" , "minimum wages" , and "prevailing wages" shall include:

(1) The basic hourly rate of pay; and

(2) The amount of:

(A) The rate of contribution made by a contractor or subcontractor to a trustee or to a third person pursuant to a fund, plan, or program; and

(B) The rate of costs to the contractor or subcontractor which may be reasonably anticipated in providing benefits to employees pursuant to an enforceable commitment to carry out a financially responsible plan or program which was communicated in writing to the employees affected, for medical or hospital care, pensions on retirement or death, compensation for injuries or illness resulting from occupational activity, or insurance to provide any of the foregoing, for unemployment benefits, life insurance, disability and sickness insurance, or accident insurance, for vacation and holiday pay, for defraying costs of apprenticeship or other similar programs, or for other bona fide fringe benefits, but only where the contractor or subcontractor is not required by other federal, state, or local law to provide any of the benefits ; provided, that the obligation of a contractor or subcontractor to make payment in accordance with the prevailing wage determinations of the director of labor and training insofar as this chapter of this title and other acts incorporating this chapter of this title by reference are concerned may be discharged by the making of payments in cash, by the making of contributions of a type referred to in subsection (b)(2), or by the assumption of an enforceable commitment to bear the costs of a plan or program of a type referred to in this subdivision, or any combination thereof, where the aggregate of any payments, contributions, and costs is not less than the rate of pay described in subsection (b)(1) plus the amount referred to in subsection (b)(2).

(c) The term "employees" , as used in this section, shall include employees of contractors or subcontractors performing jobs on various types of public works including mechanics, apprentices, teamsters, chauffeurs, and laborers engaged in the transportation of gravel or fill to the site of public works, the removal and/or delivery of gravel or fill or ready-mix concrete, sand, bituminous stone, or asphalt flowable fill from the site of public works, or the transportation or removal of gravel or fill from one location to another on the site of public works, and the employment of the employees shall be subject to the provisions of subsections (a) and (b) .

(d) The terms "public agency" and "quasi-public agency" shall include, but not be limited to, the Rhode Island industrial recreational building authority, the Rhode Island economic development corporation, the Rhode Island airport corporation, the Rhode Island industrial facilities corporation, the Rhode Island refunding bond authority, the Rhode Island housing and mortgage finance corporation, the Rhode Island resource recovery corporation, the Rhode Island public transit authority, the Rhode Island student loan authority, the water resources board corporate, the Rhode Island health and education building corporation, the Rhode Island higher education assistance authority, the Rhode Island turnpike and bridge authority, the Narragansett Bay water quality management district commission,

Rhode Island telecommunications authority, the convention center authority, the board of governors for higher education, the board of regents for elementary and secondary education, the capital center commission, the housing resources commission, the Quonset Point-Davisville management corporation, the Rhode Island children's crusade for higher education, the Rhode Island depositors economic protection corporation, the Rhode Island lottery commission, the Rhode Island partnership for science and technology, the Rhode Island public building authority, and the Rhode Island underground storage tank board.

37-13-8. Investigation and determination of prevailing wages - Filing of schedule.

The director of labor and training shall investigate and determine the prevailing wages and payments made to or on behalf of employees, as set forth in § 37-13-7, paid in the trade or occupation in the city, town, village, or other appropriate political subdivision of the state and keep a schedule on file in his or her office of the customary prevailing rate of wages and payments made to or on behalf of the employees which shall be open to public inspection. In making a determination, the director of labor may adopt and use such appropriate and applicable prevailing wage rate determinations as have been made by the secretary of labor of the United States of America in accordance with the Davis-Bacon Act, as amended, 40 U.S.C. § 276a; provided, however, that each contractor awarded a public works contract after July 1, 2007 shall contact the department of labor and training on or before July first of each year, for the duration of such contract to ascertain the prevailing wage rate of wages on a hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done each year and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee every July first.

37-13-9. Statutory provisions included in contracts.

A copy of 37-13-5, 37-13-6, and 37-13-7 shall be inserted in all contracts for public works awarded by the state or any city or town, committee, an authorized agency or awarding authority thereof, or any person or persons in their behalf in which state or municipal funds are used if the contract price be in excess of one thousand dollars (\$1,000).

37-13-10. Overtime compensation.

Labor performed under the provisions of 37-13-1 - 37-13-16, inclusive, during the period of forty (40) hours in any one week and during the period of eight (8) hours in any one day, shall be considered a legal week's work or a legal day's work, as the case may be, and any number of hours of employment in any one week greater than the number of forty (40) hours or in any one day greater than the number of eight (8) hours shall be compensated at the prevailing rate of wages for overtime employment; provided, however, when the director of labor and training has determined in the investigation provided for in 37-13-7 and 37-13-8 that there is a prevailing practice in a city, town, or other appropriate political subdivision to pay an overtime rate of wages for work of any craft, mechanic, teamster, laborer, or type of worker needed to execute the work other than hours worked in any one week greater than the number of forty (40) or in hours worked in any one day greater than the number of eight (8), then the prevailing practice shall determine the legal workday and the legal workweek in the city or town for the work and the prevailing rate of overtime wages shall be paid for such work in excess of that legal workday or week, as the case may be.

37-13-11. Posting of prevailing wage rates.

Each contractor awarded a contract for public works with a contract price in excess of one thousand dollars (\$ 1,000), and each subcontractor who performs work on those public works, shall post in conspicuous places on the project, where covered workers are employed, posters which contain the current, prevailing rate of wages and the current, prevailing rate of payments to the funds required to be paid for each craft or type of worker employed to execute the contract as set forth in §§ 37-13-6 and 37-13- 7, and the rights and remedies of any employee described in § 37-13-17 for nonpayment of any wages earned pursuant to this chapter. Posters shall be furnished to contractors and subcontractors by the director of labor and training, who shall determine the size and context thereof from time to time, at the time a contract is awarded. A contractor or subcontractor who fails to comply with the provisions of this section shall be deemed guilty of a misdemeanor and shall pay to the director of labor and training one hundred dollars (\$ 100) for each calendar day of noncompliance as determined by him or her. Contracts set forth in this section shall not be awarded by the state, any city, town, or any agency thereof until the director of labor and training has prepared and delivered the posters to the division of purchases, if the state or any agency thereof is the proper authority, or to the city, town, or an agency thereof, if it is the proper authority, and the contractor to whom the contract is to be awarded.

37-13-12. Wage records of contractors.

Each contractor awarded a contract with a contract price in excess of one thousand dollars (\$1,000) for public works, and each subcontractor who performs work on those public works, shall keep an accurate record showing the name, occupation, and actual wages paid to each worker employed by him or her and the payments to all the employee funds specified in sections 37-13-6 and 37-13-7 by him or her in connection with the contract or work. The director and his or her authorized representatives shall have the right to enter any place of employment at all reasonable hours for the purpose of inspecting the wage records and seeing that all provisions of this chapter are complied with.

37-13-12.1. Obstruction of enforcement.

Any effort of any employer to obstruct the director and his or her authorized representatives in the performance of their duties shall be deemed a violation of this chapter and punishable as such.

37-13-12.2. Subpoena powers.

The director and his or her authorized representatives shall have power to administer oaths and examine witnesses under oath, issue subpoenas, subpoenas duces tecum, compel the attendance of witnesses, and the production of papers, books, accounts, records, payrolls, documents, and testimony, and to take depositions and affidavits in any proceeding before the director.

37-13-12.3. Compelling obedience to subpoenas.

In case of failure of any person to comply with any subpoena lawfully issued, or subpoena duces tecum, or on the refusal of any witness to testify to any matter regarding which he may be lawfully interrogated, it shall be the duty of the superior court, or any judge thereof, on application by the director, to compel obedience by proceedings in the nature of those for contempt.

37-13-12.4. Penalty for violations.

Except as otherwise provided in this chapter, any employer who shall violate or fail to comply with any of the provisions of this chapter shall be guilty of a misdemeanor and shall be punished by a fine of not less than five hundred dollars (\$ 500) nor more than one thousand dollars (\$ 1,000) for each separate offense, or by imprisonment for not less than ten (10) nor more than ninety (90) days, or by both fine and imprisonment. Each day of failure to pay wages due an employee at the time specified in this chapter shall constitute a separate and distinct violation.

37-13-13. Furnishing payroll record to director of labor.

(a) Every contractor and subcontractor awarded a contract for public works as defined by this chapter shall furnish a certified copy of his or her payroll records of his or her employees employed upon the project to the director of labor and training on a monthly basis for the preceding month's work.

(b) The director of labor and training may promulgate reasonable rules and regulations to enforce the provisions of this section.

(c) Any contractor or subcontractor who fails to comply with the provisions of this section shall be deemed guilty of a misdemeanor and shall pay to the director of labor and training five hundred dollars (\$ 500) for each calendar day of noncompliance as determined by the director of labor and training. Any of those revenues shall be deposited as general revenues. Any person, firm, or corporation found to have willfully made a false or fraudulent representation in connection with reporting their certified payroll records shall be required to pay a civil penalty to the department of labor and training in an amount of no less than one thousand dollars (\$ 1,000) and not greater than three thousand dollars (\$ 3,000) per representation. For purposes of this subsection "willfully" shall mean representations that are known to be false, or representations made with deliberate ignorance or reckless disregard for their truth or falsity.

37-13-13.1. Audits of wage records of out of state contractors and subcontractors.

Out of state contractors or subcontractors who perform work on public works in this state authorize the director of labor and training to conduct wage and hour audits of their payroll records pursuant to the provisions of chapter 14 of title 28.

37-13-14. Contractor's bond.

The state or any city, town, agency, or committee therein awarding contracts for public works shall require the contractor awarded a contract with a contract price in excess of fifty thousand dollars (\$ 50,000) for public works to file with the proper authority good and sufficient bond with surety furnished by any surety company authorized to do business in the state, conditioned upon the faithful performance of the contract and upon the payment for labor performed and material furnished in connection therewith, a bond to contain the terms and conditions set forth in chapter 12 of this title, and to be subject to the provisions of that chapter. Waiver of the bonding requirements of this section is expressly prohibited.

37-13-14.1. Enforcement - Hearings.

(a) Before issuing an order or determination, the director of labor and training shall order a hearing thereon at a time and place to be specified, and shall give notice thereof, together with a copy of the complaint or the purpose thereof, or a statement of the facts disclosed upon investigation, which notice shall be served personally or by mail on any person, firm, or corporation affected thereby. The person, firm, or corporation shall have an opportunity to be heard in respect to the matters complained of at the time and place specified in the notice, which time shall be not less than five (5) days from the service of the notice personally or by mail. The hearing shall be held within ten (10) days from the order of hearing. The hearing shall be conducted by the director of labor and training or his or her designee. The hearing officer in the hearing shall be deemed to be acting in a judicial capacity, and shall have the right to issue subpoenas, administer oaths, and examine witnesses. The enforcement of a subpoena issued under this section shall be regulated by Rhode Island civil practice law and rules. The hearing shall be expeditiously conducted and upon such hearing the hearing officer shall determine the issues raised thereon and shall make a determination and enter an order within ten (10) days of the close of the hearing, and forthwith serve a copy of the order, with a notice of the filing thereof, upon the parties to the proceeding, personally or by mail. The order shall dismiss the charges or direct payment of wages or supplements found to be due, including interest at the rate of twelve percentum (12%) per annum from the date of the underpayment to the date of payment, and may direct payment of reasonable attorney's fees and costs to the complaining party.

(b) In addition to directing payment of wages or supplements including interest found to be due, the order shall also require payment of a further sum as a civil penalty in an amount up to three times the total amount found to be due. Further, if the amount of salary owed to an employee pursuant to this chapter but not paid to the employee in violation of thereof exceeds five thousand dollars (\$ 5,000), it shall constitute a misdemeanor and shall be referred to the office of the attorney general. The misdemeanor shall be punishable for a period of not more than one year in prison and/or fined not more than one thousand dollars (\$ 1,000). In assessing the amount of the penalty, due consideration shall be given to the size of the employer's business, the good faith of the employer, the gravity of the violation, the history of previous violations and the failure to comply with recordkeeping or other nonwage requirements. The surety of the person, firm, or corporation found to be in violation of the provisions of this chapter shall be bound to pay any penalties assessed on such person, firm, or corporation. The penalty shall be paid to the department of labor and training for deposit in the state treasury; provided, however, it is hereby provided that the general treasurer shall establish a dedicated "prevailing wages enforcement fund" for the purpose of depositing the penalties paid as provided herein. There is hereby appropriated to the annual budget of the department of labor and training the amount of the fund collected annually under this section, to be used at the direction of the director of labor and training for the sole purpose of enforcing prevailing wage rates as provided in this chapter.

(c) For the purposes of this chapter, each day or part thereof of violation of any provision of this chapter by a person, firm, or corporation, whether the violation is continuous or intermittent, shall constitute a separate and succeeding violation.

(d) In addition to the above, any person, firm, or corporation found in violation of any of the provisions of this chapter by the director of labor and training, an awarding authority, or the hearing officer, shall be ineligible to bid on or be awarded work by an awarding authority or perform any such work for a period of no less than eighteen (18) months and no more than thirty-six (36) months from the date of the order entered by the hearing officer. Once a person, firm, or corporation is found to be in violation of this chapter, all pending bids with any awarding authority shall be revoked, and any bid awarded by an awarding authority prior to the commencement of the work shall also be revoked.

(e) In addition to the above, any person, firm, or corporation found to have committed two (2) or more willful violations in any period of eighteen (18) months of any of the provisions of this chapter by the hearing officer, which violations are not arising from the same incident, shall be ineligible to bid on or be awarded work by an

awarding authority or perform any work for a period of sixty (60) months from the date of the second violation.

(f) The order of the hearing officer shall remain in full force and effect unless stayed by order of the superior court.

(g) The director of labor and training, awarding authority, or hearing officer shall notify the bonding company of any person, firm, or corporation suspected of violating any section of this chapter. The notice shall be mailed certified mail, and shall enumerate the alleged violations being investigated.

(h) In addition to the above, any person, firm, or corporation found to have willfully made a false or fraudulent representation on certified payroll records shall be referred to the office of the attorney general. The false or fraudulent representation shall be considered a misdemeanor and shall be punishable for a period of not more than one year in prison and/or fined one thousand dollars (\$ 1,000). Further, any person, firm, or corporation found to have willfully made a false or fraudulent representation on certified payroll records shall be required to pay a civil penalty to the department of labor and training in an amount of no less than two thousand dollars (\$ 2,000) and not greater than fifteen thousand dollars (\$ 15,000) per representation.

37-13-15. Review.

(a) There is hereby created an appeals board which shall be comprised of three (3) members who shall be appointed by the governor; provided, however, that each member of the appeals board shall have at least five (5) years experience with prevailing wage rates as they apply to the construction industry. The members of such appeals board shall serve without compensation. The members of the appeals board shall be appointed for terms of three (3) years except that of the three (3) members originally appointed by each of the appointing authorities; one (1) shall be appointed for a term of one (1) year, one (1) shall be appointed for a term of two (2) years and one (1) for a term of three (3) years.

(b) Any person aggrieved by any action taken by the director of labor and training or his or her designated hearing officer under the authority of this chapter, or by the failure or refusal of the director of labor and training to take any action authorized by this chapter, may obtain a review thereof for the purpose of obtaining relief from the action or lack of action by filing a petition for administrative review and relief, to the appeals board as provided herein. The petition for administrative review shall be filed within twenty (20) days of the action taken by the director of labor and training or designated hearing officer: The petition for administrative review shall be heard within ten (10) days of the date of filing. An aggrieved person under this section shall include:

- (1) Any person who is required to pay wages to his or her employees or make payments to a fund on behalf of his or her employees, as provided in this chapter;
- (2) Any person who is required to be paid wages for his or her labor or on whose behalf payments are required to be paid to funds, as provided by this chapter;
- (3) The lawful collective bargaining representative of a person defined in subdivision (2) above;
- (4) A trade association of which a person defined in subdivision (1) above is a member;
- (5) A proper authority as defined in this chapter;
- (6) A contractor who submitted a bid for work to be or which has been awarded under the provisions of this chapter or a trade association of which he or her is a member, and
- (7) A labor organization which has one or more written collective bargaining agreements with one or more employers or a trade association which sets forth the hours, wages, and working conditions of a craft, mechanic, teamster, or type of worker needed to execute the work, as provided in this chapter to the extent that it would be affected by the action or the failure to act of the director of labor and training or the hearing officer.

(c) Any aggrieved person as defined herein may obtain a review of a decision of the appeals board by filing a petition in the superior court in Providence county pursuant to the provisions of the administrative procedures act, praying for review and relief and the petition shall follow the course of and be subject to the procedures for causes filed in the court.

(d) The director is hereby empowered to enforce his or her decision and/or the decision of the appeals board in the superior court for the county of Providence.

37-13-16. Termination of work on failure to pay agreed wages - Completion of work.

Every contract within the scope of this chapter shall contain the further provision that in the event it is found by the director of labor and training that any employee employed by the contractor or any subcontractor directly on the site of the work covered by the contract has been or is being paid a rate of wages less than the rate of wages required by the contract to be paid as aforesaid, the awarding party may, by written notice to the contractor or subcontractor, terminate his or her right as the case may be, to proceed with the work, or such part of the work as to which there has been a failure to pay the required wages, and shall prosecute the work to completion by contract or otherwise, and the contractor and his or her sureties shall be liable to the awarding party for any excess costs occasioned the awarding authority thereby.

37-13-17. Private right of action to collect wages or benefits

(a) An employee or former employee, or any organization representing such an employee or former employee, of a contractor or subcontractor may bring a civil action for a violation of § 37-13-7 for appropriate injunctive relief, or actual damages, or both within three (3) years after the occurrence of the alleged violation. An action commenced pursuant to this section, may be brought in the superior court for the county where the alleged violation occurred, the county where the complainant resides, or the county where the person against whom in the civil complaint is filed resides or has their principal place of business. Any contractor or subcontractor who violates the provisions of § 37-13-7 shall be liable to the affected employee or employees in the amount of unpaid wages or benefits, plus interest. A civil action filed in court under this section may be instituted instead of, but not in addition to the director of labor and training enforcement procedures authorized by § 37-13-14.1, provided the civil action is filed prior to the date the director of labor and training issues notice of an administrative hearing.

(b) An employer's responsibility and liability is solely for its own employees.

(c) An action instituted pursuant to this section may be brought by one or more employees or former employees on behalf of himself/herself or themselves and other employees similarly situated, except that no employee shall be a party plaintiff to any such action unless he/she gives his/her consent in writing to become such a party and such consent is filed in the court in which such action is brought.

(d) In an action filed under this section in which the plaintiff prevails, the court shall, in addition to any judgment awarded to the plaintiff, require reasonable attorneys' fees and the costs of the action to be paid by the defendant.

(e) The court in an action filed under this section shall award affected employees or former employees liquidated damages in an amount equal to two (2) times the amount of unpaid wages or benefits owed. Unpaid fringe benefit contributions owed pursuant to this section in any form shall be paid to the appropriate benefit fund, however, in the absence of an appropriate fund the benefit shall be paid directly to the individual.

(f) The filing of a civil action under this section shall not preclude the director of labor and training from referring a matter to the attorney general as provided in § 37-13-14.1(b), from prohibiting a contractor or subcontractor from bidding on or otherwise participating in contracts as provided in § 37-13-14.1(d), (e) and (h), or from prohibiting termination of work on failure to pay agreed wages pursuant to § 37-13-16.

(g) Any person, firm, or corporation found to have willfully made a false or fraudulent representation in connection with wage obligations owed on a contract shall be required to pay a civil penalty to the department of labor and training in an amount of no less than one thousand dollars (\$ 1,000) and not greater than three thousand dollars (\$ 3,000) per representation. Such penalties shall be recoverable in civil actions filed pursuant to this section. For purposes of this subsection "willfully" shall mean representations that are known to be false, or representations made with deliberate ignorance or reckless disregard for their truth or falsity.

(h) An employer shall not discharge, threaten, or otherwise discriminate against an employee, or former employee, regarding compensation terms, conditions, locations or privileges of employment because the employee or former employee, or a person or organization acting on his or her behalf: (1) Reports or makes a complaint under this section; or otherwise asserts his or her rights under this section; and/or (2) Participates in any investigation, hearing or inquiry held by the director of labor and training under § 37-13-14.1. In the event a contractor or subcontractor retaliates or discriminates against an employee in violation of this section, the affected employee may file an action in any court of competent jurisdiction and the court shall order reinstatement and/or restitution of the affected employee, as appropriate, with back pay to the date of the violation, and an additional amount in liquidated damages equal to two (2) times the amount of back pay and reasonable attorneys' fees and costs.

(i) If any one or more subsections of this section shall for any reason be adjudged unconstitutional or otherwise invalid, the judgment shall not affect, impair, or invalidate the remaining subsections.

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PREVAILING WAGE RATES

(Appropriate wage rate to be inserted by bidder in specifications)

For a copy of the appropriate wage rate, contact:

**R.I. Department of Labor
Division of Labor Standards
610 Manton Avenue
Providence, RI 02909**

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TITLE 37

CHAPTER 14.1 MINORITY BUSINESS ENTERPRISE

Sections

37-14.1-1.	Purpose.
37-14.1-2.	Applicability.
37-14.1-3.	Definitions.
37-14.1-4.	Policy.
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37-14.1-6.	Minority business enterprise guidelines.
37-14.1-7.	Establishment of criteria and guidelines.
37-14.1-8.	Sanctions.

37-14.1-1. Purpose.

The purpose of this chapter is to carry out the state's policy of supporting the fullest possible participation of firms owned and controlled by minorities and women (MBE's), in state funded and state directed public construction programs and projects and in state purchases of goods and services. This includes assisting MBE's throughout the life of contracts in which they participate.

37-14.1-2. Applicability.

This chapter shall apply to any and all state purchasing, including, but not limited to the procurement of goods and services and construction projects or contracts funded in whole or in part by state funds, or funds which, in accordance with a federal grant or otherwise, the state expends or administers or in which the state is a signatory to the construction contract.

37-14.1-3. Definitions.

- (a) "Affirmative action" means taking specific steps to eliminate discrimination and its effects, to ensure nondiscriminatory results and practices in the future, and to involve minority business enterprises fully in contracts and programs funded by the state.
- (b) "Compliance" means the condition existing when a contractor has met and implemented the requirements of this chapter.
- (c) "Contract" means a mutually binding legal relationship or any modification thereof obligating the seller to furnish supplies or services, including construction, and the buyer to pay for them. For purposes of this chapter, a lease is a contract.
- (d) "Contractor" means one who participates, through a contract or subcontract, in any procurement or program covered by this chapter, and includes lessees and material suppliers.
- (e) "Minority" means a person who is a citizen or lawful permanent resident of the United States and who is:
 - (1) Black (a person having origins in any of the black racial groups of Africa);
 - (2) Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
 - (3) Portuguese (a person of Portuguese, Brazilian, or other Portuguese culture or origin, regardless of race);
 - (4) Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands);
 - (5) American Indian and Alaskan Native (a person having origins in any of the original peoples of North America.); or
 - (6) Members of other groups, or other individuals, found to be economically and socially disadvantaged by the Small Business Administration under section 8(a) of the Small Business Act, as amended [15 U.S.C. 637(a)].
- (f) "Minority business enterprise" or "MBE" means a small business concern, as defined pursuant to section 3 of the federal Small Business Act [15 U.S.C. 632] and implementing regulations, which is owned and controlled by one or more minorities or women. For the purposes of this chapter, owned and controlled means a business.

- (1) Which is at least fifty-one percent (51%) owned by one or more minorities or women or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by one or more minorities or women; and
- (2) Whose management and daily business operations are controlled by one or more such individuals.

(g) "MBE coordinator" means the official designated to have overall responsibility for promotion of minority business enterprise in his or her departmental element.

(h) "Noncompliance" means the condition existing when a recipient or contractor has failed to implement the requirements of this chapter.

37-14.1-4. Policy.

It is the policy of the state of Rhode Island that minority business enterprises (MBE's) shall have the maximum opportunity to participate in the performance of procurements and projects outlined in 37-14.1-2.

37-14.1-5. Discrimination prohibited.

No person shall be excluded from participation in, denied the benefits of, or otherwise discriminated against in connection with the award and performance of any project covered by this chapter, on the grounds of race, color, national origin, or sex.

37-14.1-6. Minority business enterprise participation.

Minority business enterprises shall be included in all procurements and construction projects under this chapter and shall be awarded a minimum of ten percent (10%) of the dollar value of the entire procurement or project. The director of the department of administration is further authorized to establish by rules and regulation formulas for giving minority business enterprises a preference in contract and subcontract awards.

37-14.1-7. Establishment of criteria and guidelines.

The director of the department of administration shall establish, by rule and regulations adopted in accordance with chapter 35 of title 42, standards which shall determine whether a construction project is covered by this chapter, compliance formulas, procedures for implementation, and procedures for enforcement which are not inconsistent with 49 CFR 23 of the federal regulations. As to Rhode Island department of transportation contracts, the director of administration may delegate this authority to the director of transportation.

37-14.1-8. Sanctions.

(a) The director of the department of administration shall have the power to impose sanctions upon contractors not in compliance with this chapter and shall include but not be limited to:

- (1) Suspension of payments;
- (2) Termination of the contract;
- (3) Recovery by the state of ten percent (10%) of the contract award price as liquidated damages; and
- (4) Denial of right to participate in future projects for up to three (3) years.

(b) As to Rhode Island department of transportation contracts, the director of the department of administration may delegate this authority to the director of transportation.

**REGULATIONS GOVERNING PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN STATE
FUNDED AND DIRECTED PUBLIC CONSTRUCTION PROJECTS, CONSTRUCTION CONTRACTS
AND PROCUREMENT CONTRACTS FOR GOODS AND SERVICES**

I. GENERAL

1. Purpose

(a) The purpose of these regulations is to carry out the state's policy of supporting the fullest possible participation of firms owned and controlled by minorities and women (MBEs) in state-funded and directed public construction programs and projects and in state purchases of goods and services. This includes assisting MBEs throughout the life of contracts in which they participate.

(b) These regulations implement, in part, R. I. Gen. Laws, Chapter 37-14.1. These regulations are effective immediately and supersede all Department of Administration regulations issued previously under these authorities insofar as such regulations affect minority business enterprise matters in the State.

2. Applicability

These regulations apply to any construction project, construction contract or procurement contract for goods and services funded in whole or in part by state funds, or funds which, in accordance with federal grant or otherwise, the state expends or administers or in which the state is a signatory. Quasi-independent state agencies, such as the Rhode Island Public Buildings Authority, the Narragansett Bay Commission and the Rhode Island Port Authority, are subject to the requirements outlined under these regulations. With respect to Department of Transportation contracts, The Director of Transportation may promulgate regulations consistent with R. I. Gen. Laws Sections 37-14.1-8 and 37-14.1-9, thereby exempting Department of Transportation contracts from the requirements of these regulations.

3. Definition

The terms "building" or "work" means construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvement of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, railways, airports, terminals, docks, piers, wharves, ways lighthouses, buoys, jetties, breakwaters, levees, and canals; dredging, shoring, scaffolding, drilling, blasting, excavating, clearing and landscaping. Unless conducted in connection with and at the site of such a building or work as described in the foregoing sentence, the manufacture or furnishing of materials, articles, supplies, or equipment (whether or not a Federal or State agency acquires title to such materials, articles, supplies, or equipment during the course of the manufacture or furnishing, or owns the materials from which they are manufactured or furnished) is not a "building" or "work" within the meaning of these regulations.

"Compliance" means the conditions existing when a prime contractor has met and implemented the requirements of these regulations.

"Construction" means all types of on-site work done on a particular building or work, including, without limitation, altering, remodeling, painting and decorating, the transporting of materials and supplies to or from the building or work by the employees of the construction contractor or construction subcontractor, and the manufacturing or furnishing of materials, articles, supplies, or equipment on the site of the building or work, by persons employed at the site by the contractor or subcontractor.

"Construction Project" means a contract or group of contracts for construction work that a prime contractor has agreed to perform, whether directly or through the use of subcontractors.

"Contract" means a mutually binding legal relationship or any modification thereof obligating the seller to furnish supplies or services, including construction, and the buyer to pay for them. For purposes of these regulations, a lease is a contract.

"Contractor" means one who participates, through a contract or subcontract, in any program covered by these regulations and includes lessees.

"Director" means the Director of the Department of Administration or any person whom he/she has designated to act for him/her.

"Goods" means materials or supplies of any kind provided by a vendor, his agents or employees.

"Services" means professional or non-professional activities requiring mental or physical labor to be performed by the contractor, vendor, his agents or employees.

"Minority" means a person who is a citizen or lawful permanent resident of the United States and who is:

- (a) Black (a person having origins in any of the black racial groups of Africa);
- (b) Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race);
- (c) Portuguese (a person of Portuguese, Brazilian or other Portuguese culture or origin, regardless of race);
- (d) Asian American (a person having origins in any of the original peoples of the Far East, South East Asia, the Indian Subcontinent, or the Pacific Islands);
- (e) American Indian and Alaskan Native (a person having origins in any of the original peoples of North America); or
- (f) Members of other groups or other individuals found to be economically and socially disadvantaged by the Small Business Administration under Section 8(a) of the Small Business Act, as amended (15 U.S.C. 637 (a)).

"Minority Business Enterprise" or "MBE" means a small business concern as defined pursuant to Section 3 of the Federal Small Business Act and implementing regulations, which is owned and controlled by one (1) or more minorities or women and which has been certified as a Minority Business Enterprise under these regulations by the Rhode Island Department of Administration. For the purposes of these regulations, an owned and controlled business means one:

- (a) which is at least 51% owned by one (1) or more minorities or women or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by one (1) or more minorities or women; and
- (b) whose management and daily business operations are controlled by one (1) or more such individuals.

"MBE Coordinator" means the official designated to have overall responsibility for promotion of minority business enterprises within each department and agency for each contract covered by these regulations. He or she shall be appointed not later than the time the Request for Proposal for each contract is submitted.

"Non-compliance" means the condition existing when a contractor has failed to implement the requirements of these regulations.

"Prime Contractor" means the contractor that is charged with total construction on a contract or group of contracts, portions of which are, or will be subcontracted to their parties.

"Specialty Contractor" means a contractor charged with total construction on a contract or group of contracts, portions of which will not be subcontracted to third parties.

"Vendor" means the party with which the State contracts to provide goods or services.

4. Policy

These regulations shall be construed in accordance with the policy of the State of Rhode Island that minority business enterprises (MBEs) shall have the maximum opportunity to participate in the performance of projects or provision of goods or services outlined hereunder.

5. Construction Contracts

(a) MBE Liaison Officer

The chief executive officer of each prime contractor shall designate an MBE Liaison Officer who will coordinate with the MBE Coordinator from the Department of Administration or other state department or agency responsible for monitoring the contract.

(b) Ten Percent (10%) Requirement

(i) Each Department shall structure its procedures for procuring construction contracts to attempt to achieve the result that a minimum of ten (10%) percent of the total dollar value of these procurements is made directly or indirectly from MBEs. This result shall be achieved through one of the two methods described in paragraphs 5(b) (ii) or 5 (b) (iii) below.

(ii) Prime Contractor Method. Each prime contractor shall ensure that a minimum of ten percent (10%) of the dollar value of work to be performed on a construction project will be performed by MBEs. The prime contractor must meet or exceed this requirement or demonstrate that it could not meet this requirement despite its good-faith efforts. A prime contractor that is an MBE will satisfy the ten percent (10%) requirement by ensuring that a least ten percent (10%) of the dollar volume of work performed under the contract is performed by its employees.

(iii) Construction Contracts not involving the use of prime contractors. In lieu of using the prime contractor method described in paragraph 5(b) (ii) above, a Department may meet the ten percent (10%) requirement under these regulations by ensuring that ten percent (10%) of the dollar value of construction contracts in the aggregate for each fiscal year is awarded to MBEs. MBEs may be solicited directly to accomplish this requirement.

(iv) The ten percent (10%) requirements set forth under these regulations can be satisfied concurrently with similar requirements mandated under federal law.

(v) Nothing in these regulations shall be construed to require the award of a contract to an MBE whose bid exceeds the lowest bid by five percent (5%). Nothing in these Regulations shall be construed to require the acceptance of non-conforming goods or services.

(c) Solicitation of Bids

All departments and agencies soliciting requests for proposals for construction projects identified as having subcontracting opportunities must include in the advertisements for the project the following language: "This project is subject to Chapter 37-14.1 of the Rhode Island General Laws, and regulations promulgated thereunder, which require that ten percent of the dollar value of work performed on the project be performed by minority business enterprises."

(ii) MBE Compliance Plan

A prospective prime contractor shall include in its bid on any construction project covered by these regulations, a simple statement acknowledging its obligation to meet the ten percent (10%) requirement under these regulations. After it has been identified as the apparent low bidder, the prime contractor shall, within ten (10) working days, prepare an MBE Compliance Plan and submit it to the Director or his designee for approval. The Plan shall identify by MBE name, subcontract dollar amount and type, each subcontract that the prime contractor projects will be awarded to MBEs over the period of the project.

(d) Approval or Disapproval of MBE Plan

(i) The Director or his designee will review and approve plans that reasonably ensure compliance with the ten percent (10%) requirement.

(ii) Where the prime contractor has proved that for reasons beyond the prime contractor's control, compliance with the ten percent (10%) requirement is impossible, the Director or his designee may approve a plan that ensures compliance with an MBE utilization rate of less than ten percent (10%). To prove impossibility of compliance, there shall be a hearing, which interested parties will be notified of and permitted to attend, during which the contractor shall demonstrate the following:

(1) The prime contractor is making all appropriate efforts, including those listed in paragraph 5 (e) of these regulations, to increase MBE participation in its construction project to the ten percent (10%) level.

(2) Despite the prime contractor's efforts, the prime contractor's plan represents a reasonable expectation for the participation of MBEs in state contracts given the availability of MBEs to work on the contract.

(iii) If the Director or his designee does not approve the plan the prime contractor has submitted, the prime contractor, after consulting with the Director or his designee, shall present a revised plan.

(iv) The Director may condition the approval or establishment of any adjusted requirement on any reasonable future action by the prime contractor.

(v) Each prime contract covered under these regulations shall include the following: "The contractor agrees to ensure that minority business enterprises as defined in R.I. Gen. Laws Section 37-14.1-3, shall have the maximum opportunity to participate in the performance of subcontracts performed under this agreement. The contractor will take all reasonable steps in accordance with regulations promulgated under Chapter 37-14.1 of the Rhode Island General Laws to ensure that minority business enterprises have the maximum opportunity to compete for and perform subcontracts under this agreement."

e. Compliance

(i) Each MBE coordinator will periodically conduct on-site inspections to determine compliance with the provisions of these regulations. The Division of Purchasing, the Director or the MBE Coordinator may require a prime contractor to furnish copies of purchase orders, subcontracts, cancelled checks, and other records that may indicate the number, names, dollar value of MBE subcontracts, dates, and schedule time for performance of work by an MBE subcontractor.

(ii) A prime contractor's failure to have an approved MBE Compliance Plan as required by these regulations constitutes non-compliance with these regulations.

(iii) If a prime contractor fails to meet the requirements outlined in its approved MBE Compliance Plan, it shall explain to the Director, in writing, why the requirements could not be met and why meeting the requirements was beyond the prime contractor's control.

(iv) To determine whether a prime contractor has a good faith reason for failing to meet its requirements, the Director may consider, among other factors:

(1) Whether the prime contractor attended any pre-solicitation or pre-bid meetings that were scheduled by the state contracting authority to inform MBEs of contracting or subcontracting opportunities;

(2) Whether the prime contractor advertised in general circulation, trade association, and minority focus media concerning the subcontracting opportunities;

(3) Whether the prime contractor provided written notice to a reasonable number of specific MBEs that their interest in a contract was being solicited, in sufficient time to allow the MBEs to participate effectively;

- (4) Whether the prime contractor followed up initial solicitations of interest by contacting MBEs to determine with certainty whether the MBEs were interested;
 - (5) Whether the prime contractor selected portions of work to be performed by MBEs in order to increase the likelihood of meeting MBE participation requirements (including, where appropriate, breaking down contracts into economically feasible units to facilitate MBE participation);
 - (6) Whether the prime contractor provided interested MBEs with adequate information about the plans, specifications and requirements of the contract;
 - (7) Whether the prime contractor negotiated in good faith with interested MBEs;
 - (8) Whether the prime contractor made suggestions to interested MBEs to assist them in obtaining bonding, lines of credit, or insurance required by the prime contractor;
 - (9) Whether the prime contractor effectively used the services of available minority community organizations, minority contractors' groups, local, state and Federal minority business assistance offices; and other organizations that provide assistance in the recruitment and placement of MBEs.
- (v) If the prime contractor does not make such an explanation, or if the Director determines that the prime contractor's explanation does not justify its failure to meet the requirements in its approved MBE Plan, the Director may direct the prime contractor to take appropriate remedial action. Failure to take remedial action directed by the Director is noncompliance with these regulations.
- (vi) In the event of non-compliance with these regulations, the Director may take appropriate enforcement action. Such action may include suspension of payments, termination of the contract, recovery by the state of 10% of the contract price as liquidated damages and/or denial of the right to participate in future projects for up to three (3) years.

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TITLE 37

CHAPTER 16 PUBLIC WORKS ARBITRATION

Sections

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37-16-26.	Satisfaction of award.
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37-16-1. Short title.

This chapter shall be known as the "Public Works Arbitration Act".

37-16-2. Contract provision for arbitration.

(a) A provision in a written contract executed on or after January 1, 1962, for the construction, alteration, repair, or painting of any public building, sewer, highway, bridge, water treatment or disposal projects one party to which is the state, a city, a town, or an authority, a board, a public corporation, or any similar body created by statute or ordinance or any committee, agency, or subdivision of any of them, to settle by arbitration any dispute or claim arising out of or concerning the performance or interpretation of the contract shall be valid, irrevocable, and enforceable, save upon grounds existing in law or equity for the revocation of the contract.

(b) (1) Every contract for the construction, alteration, repair, painting, or demolition of any public building, sewer, water treatment or disposal project, highway, or bridge one party to which is the state, a city, a town, or an authority, a board, a public corporation, or any similar body created by statute or ordinance or any committee, agency, or subdivision of any of them which has a contract price of ten thousand dollars (\$ 10,000) or more and which is executed on or after July 1, 1967, shall contain a provision for arbitration of disputes and claims arising out of or concerning the performance or interpretation of the contract as follows:

(2) "All claims, disputes, and other matters in question arising out of or relating to this contract or the performance or interpretation thereof shall be submitted to arbitration. Arbitration shall be commenced by a demand in writing made by one party to the contract upon the other within a reasonable time after the dispute, claim, or other matter in question arose but in no event after payment in full of the contract price has been made and accepted. The written demand shall contain a statement of the question to be arbitrated and a detailed statement of each item or matter in

dispute and the name of the arbitrator appointed by that party. The other party to the contract within ten (10) days of the receipt of the written demand shall appoint an arbitrator and give notice in writing thereof to the party who commenced arbitration. The two (2) arbitrators appointed by the parties shall within ten (10) days of the date of the appointment of the second arbitrator select a third arbitrator who shall be designated as chairperson and who immediately shall give written notice to the parties of his or her appointment. The third arbitrator shall select a time, date, and place for hearing and give each party five (5) days notice in writing thereof. The date for hearing shall not be more than fifteen (15) days after the date of appointment of the third arbitrator. The award shall be made promptly by the arbitrators and, unless otherwise agreed by the parties or specified by law, no later than thirty (30) days from the date of closing the hearing, or, if oral hearings have been waived, from the date of the transmittal of the final statements and proofs to the arbitrators. The award shall be in writing and shall be signed by a majority of the arbitrators. It shall be executed in the manner required by law. The arbitrator shall provide a written explanation of the reasoning for the award. In the event the party of whom arbitration is demanded shall fail to appoint his or her arbitrator within the time specified or the two (2) arbitrators appointed by the parties are unable to agree on an appointment of the third arbitrator within the time specified, either party may petition the presiding justice of the superior court to appoint a single arbitrator who shall hear the parties and make an award as provided herein. The petitioner shall give five (5) days notice in writing to the other party before filing his or her petition."

(c) Any dispute involving claims less than one hundred thousand dollars (\$ 100,000) and associated with construction of a highway or bridge as referred to in subsection (b) shall be submitted to arbitration. Any dispute involving claims of one hundred thousand dollars (\$ 100,000) or more and associated with construction of a highway or bridge as referred to in subsection (b) shall only be arbitrated with the consent of the parties. If the parties fail to consent to arbitration and the state of Rhode Island is a party to the dispute, then the claim will proceed in accordance with § 37-13.1-1.

(d) For the purposes of this section, the term "claims" shall not mean the aggregate amount sought under the contract or in the arbitration, but shall refer specifically to each item or matter in dispute for which additional compensation is sought or for each item for which a credit is sought.

(e) Notwithstanding subsection (a) or (b) of this section, if any contract except for highway and bridge contracts provides for an arbitration procedure, and a method of appointment of an arbitrator or arbitrators, that method shall be followed instead of the method provided in subsection (b) of this section.

(f) This section shall apply to all written contracts executed on or after January 1, 1986.

37-16-3. Application to subcontracts.

When a contract described in 37-16-2 is in effect and any party thereto has entered into a subcontract to perform part of the work and/or furnish any materials in connection with the work described in the contract and the terms of the subcontract provide for arbitration of a dispute or claim concerning the performance or interpretation thereof, or the subcontract, expressly or by reference to the terms of the contract, provides that the parties to the subcontract shall comply with the arbitration provisions of the contract, the following shall apply when a request is made or an order of court is entered for arbitration either under the terms of the contract or subcontract.

(a) When arbitration under the contract may adversely affect the interest of a party thereto because of the effect of an award of the arbitrator or arbitrators upon the performance or interpretation of the terms of a subcontract to which he or she is also a party, he or she may require any other party or all other parties to the subcontract to become a party or parties to the arbitration.

(b) When a party to a subcontract makes a demand or an order of court is entered for arbitration under the terms of the subcontract which comply with the provision of this chapter, any party thereto who is also a party to the contract and whose rights under the contract may be adversely affected by the effect of an award of the arbitrator or arbitrators upon the performance or interpretation of the contract, may require any other party to the contract to become a party to the arbitration.

(c) When a party to a contract or to a subcontract is made a party to arbitration by virtue of the provisions of this section, he or she shall have all the rights of a party to arbitration as provided in this chapter except the appointment of an arbitrator. Provided, however, he or she may object to the arbitrators appointed by the parties in which event a single arbitrator shall be appointed as provided in 37-16-2 in the petition of either of the original parties to arbitration. The award of the arbitrator or arbitrators shall be valid and shall be binding on him or her to

the extent that it affects the performance or interpretation of the contract and/or subcontract to which he or she is a party. The award of the arbitrator or arbitrators may be enforced, modified, or vacated as this chapter provides an award made in an arbitration of a contract described in 37-16-2 may be enforced, modified, or vacated.

37-16-4. Stay of legal proceedings pending arbitration.

If any suit or proceedings be brought upon any issue referable to arbitration under contract in writing providing for arbitration, the court in which the suit is pending upon being satisfied that the issue involved in the suit or proceedings is referable to arbitration under the contract, shall on application of one of the parties, stay the trial of the action until arbitration has been held.

37-16-5. Jurisdiction of superior court to enforce arbitration provision and awards.

The entering into a contract in writing providing for arbitration shall be deemed a consent of all parties, including those enumerated in 37-16-2, thereto to the jurisdiction of the superior court of this state to enforce the arbitration provision and any award made pursuant to that provision. A party aggrieved by the failure, neglect, or refusal of another to perform under a contract providing for arbitration, may petition the superior court, or a judge thereof, for an order directing that arbitration proceed in the manner provided for in the contract. Five (5) days' notice in writing of the application shall be served upon the part in default. Service thereof shall be made in the manner specified in the contract, and if no manner specified therein, then in the manner provided by law for personal service of a summons, within or without the state, or substituted service of a summons, or upon satisfactory proof that the party aggrieved has been or will be unable with due diligence to make service in any of the foregoing manners, then notice shall be served in such manner as the court or judge may direct. A judge of the superior court shall hear the parties and upon being satisfied that there is no substantial issue as to the making of the contract or the failure to comply therewith, the court, or the judge thereof, hearing the application, shall make an order directing the parties to proceed to arbitration in accordance with the terms of the contract.

37-16-6. Trial upon evidence of substantial issue.

If evidentiary facts are set forth raising a substantial issue as to the making of the contract or the failure to comply therewith, the court, or the judge thereof, shall proceed immediately to the trial of the issues. Whenever an immediate trial is ordered, the order therefor shall provide that, if the court finds that a written contract providing for arbitration was made, and that there was a failure to comply therewith, the parties shall proceed with the arbitration in accordance with the terms of the contract and the order shall provide that if the court finds that there was no contract or failure to comply with the contract, then the proceeding shall be dismissed.

37-16-7. Method of appointing arbitrators or umpire.

If in the contract providing for arbitration, provision is made for a method of naming or appointing an arbitrator or arbitrators or an umpire, that method shall be followed, but if no method be provided therein, then the parties to the contract shall agree to the method of naming or appointing an arbitrator or arbitrators or an umpire and if the parties shall fail to agree, then the court or the judge thereof upon application of either of the parties after due notice to the other party shall appoint an arbitrator to hear the dispute.

37-16-8. Scheduling and notice of arbitration hearing - Adjournment.

Subject to the terms of the contract, if any are specified therein, the arbitrators selected as prescribed in this chapter must appoint a time and place for the hearing of the matters submitted to them, and must cause notice thereof to be given to each of the parties. They, or a majority of them, may adjourn the hearing from time to time upon the application of either party for good cause shown or upon their own motion, but not beyond the day fixed if a date in the contract, if any, for rendering their award, unless the time so fixed is extended by the written consent of the parties to the contract or their attorney, or the parties have continued with the arbitration without objection to such adjournment.

37-16-9. Power of court to direct prompt hearing.

The court shall have power to direct the arbitrators to proceed promptly with the hearing and determination of the dispute, claim, or matter in question.

37-16-10. Arbitrator's oath - Waiver.

Before hearing any testimony, arbitrators selected as prescribed in this chapter must be sworn, by an officer authorized by law to administer an oath, faithfully and fairly to hear and examine the claim, dispute, or matter in question and to make a just award according to the best of their understanding, unless the oath is waived by the written consent of the parties to the contract or their attorneys or the parties have continued with the arbitration without objection to the failure of the arbitrators to take the oath.

37-16-11. Powers of arbitrators.

The arbitrator or arbitrators selected as prescribed in this chapter, may require any person to attend before them as a witness; and he or she and they have, and each of them has, the same powers with respect to all the proceedings before them which are conferred upon a board or a member of a board authorized by law to hear testimony. All the arbitrators selected as prescribed in this chapter must meet together and hear all the allegations and proofs of the parties; but an award by a majority of them is valid.

37-16-12. Fees.

In any proceeding under this chapter, unless the parties agree as to the arbitrator's or arbitrators' fees, such fees shall be fixed by the court or the judges thereof who shall require the payment equally by both parties of the arbitrators' fees.

37-16-13. Validity of awards.

An award shall be valid and enforceable according to its terms and under the provisions of this chapter, without previous adjudication of the existence of a contract to arbitrate, subject, nevertheless, to the provisions of this section:

- (a) A party who has participated in any of the proceedings before the arbitrator or arbitrators may object to the confirmation of the award only on one or more of the grounds hereinafter specified (provided that he did not continue with the arbitration with notice of the facts or defects upon which his objection is based) because of a failure to comply with 37-16-8 or with 37-16-10 or because of the improper manner of the selection of the arbitrators.
- (b) A party who has not participated in any of the proceedings had before the arbitrator or arbitrators and who has not made or been served with an application to compel arbitration under 37-16-5 may also put in issue the making of the contract or the failure to comply therewith, either by a motion for a stay of the arbitration or in opposition to the confirmation of the award. If a notice shall have been personally served upon such party of an intention to conduct the arbitration pursuant to the provisions of a contract specified in the notice, then the issues specified in this subdivision may be raised only by a motion for a stay of the arbitration, notice of which motion must be served within ten (10) days after the service of the notice of intention to arbitrate. The notice must state in substance that unless within ten (10) days after its service, the party served therewith shall serve a notice of motion to stay the arbitration, he or she shall thereafter be barred from putting in issue the making of the contract or the failure to comply therewith. The arbitration hearing shall be adjourned upon service of the notice pending the determination of the motion. Where the opposing party, either on a motion for a stay or in opposition to the confirmation of an award, sets forth evidentiary facts raising a substantial issue as to the making of the contract or the failure to comply therewith, an immediate trial of the same shall be had. In the event that the party is unsuccessful he or she may, nevertheless, participate in the arbitration if the same is still being carried on.

37-16-14. Arbitration under chapter deemed special proceeding - Jurisdiction of superior court.

Arbitration of a claim, dispute, or matter in question under a contract described in this chapter shall be deemed a special proceeding, of which the superior court for Providence County shall have jurisdiction.

37-16-15. Procedure for hearing of application to court.

Any application to the court, or a judge thereof, hereunder shall be made and heard in the manner provided by law for the making and hearing of motions, except as otherwise herein expressly provided.

37-16-16. Form of award.

To entitle the award to be enforced, as prescribed in this chapter, it must be in writing; and, within the time limited in the contract, if any, subscribed by the arbitrator or arbitrators making it and either filed in the office of the clerk of the court having jurisdiction as provided in 37-16-14 or delivered to one of the parties or his or her attorney.

37-16-17. Court order confirming award.

At any time within one year after the award is made, as prescribed in 37-16-16, any party to the contract by the terms of which arbitration was had, may apply to the court having jurisdiction as provided in 37-16-14 for an order confirming the award. Thereupon the court must grant the order unless the award is vacated, modified, or corrected, as prescribed in 37-16-18 and 37-16-19 or unless the award is unenforceable under the provisions of 37-16-13. Notice of the motion must be served upon the adverse party or parties or his or her or their attorneys, as prescribed by law for service of notice of a motion upon an attorney in an action in the same court.

37-16-18. Court order vacating award.

In any of the following cases, the court must make an order vacating the award, upon the application of any party to the controversy which was arbitrated

- (a) When the award was procured by fraud.
- (b) Where the arbitrator or arbitrators exceeded their powers, or so imperfectly executed them, that a mutual, final, and definite award upon the subject matter submitted was not made.
- (c) If there was no valid contract, and the objection has been raised under the conditions set forth in 37-16-13.

37-16-19. Rehearing after vacation of award.

Where an award is vacated, the court, in its discretion may direct a rehearing either before the same arbitrator or arbitrators or before a new arbitrator or arbitrators to be chosen in the manner provided in the contract for the selection of the original arbitrator or arbitrators or as provided for in 37-16-7 and any provision limiting the time in which the arbitrator or arbitrators may make a decision shall be deemed applicable to the new arbitration and to commence from the date of the court's order.

37-16-20. Court order modifying or correcting award.

In any of the following cases, the court must make an order modifying or correcting the award, upon the application of any party to the contract by the terms of which the arbitration was held.

- (a) Where there was an evident miscalculation of figures or an evident mistake in the description of any persons, thing, or property referred to in the award.
- (b) Where the arbitrator or arbitrators have awarded upon a matter not submitted to them, not affecting the merits of the decision upon the matter submitted.
- (c) Where the award is imperfect in a matter of form not affecting the merits of the controversy, and, if it had been a master's report the defect could have been amended or disregarded by the court.

37-16-21. Notice of motion to vacate, modify, or correct an award.

Notice of a motion to vacate, modify, or correct an award must be served upon all adverse parties, or their attorneys, within sixty (60) days after the award is filed or delivered, as prescribed by law for service of notice of a motion upon an attorney in an action; except that in opposition to a motion to confirm an award, any of the grounds specified in 37-16-18 may be set up. For the purpose of the motion, any judge who might make an order, to stay the proceedings in an action brought in the same court may make an order, to be served with the notice of motion, staying the proceedings of an adverse party or parties to enforce the award.

37-16-22. Entry of judgment - Costs.

Upon the granting of an order confirming, modifying, or correcting an award, judgment may be entered in conformity therewith, except as is otherwise prescribed in this chapter. Costs of the application and of the proceedings subsequent thereto, not exceeding twenty-five dollars (\$25.00) and disbursements, may be awarded by the court in its discretion. If awarded, the amount thereof must be included in the judgment.

37-16-23. Filing of papers after judgment.

(a) Immediately after entering judgment, the clerk must attach together and file the following papers:

- (1) The contract, and each written extension of the time, if any, within which to make the award.
- (2) The award.
- (3) Each notice, affidavit or other paper used upon an application to confirm, modify, or correct the award, and a copy of each order of the court upon the application.
- (4) A copy of the judgment.

(b) The judgment may be docketed as if it was rendered in an action.

37-16-24. Effect of judgment.

The judgment so entered has the same force and effect, in all respects as, and is subject to all the provisions of law relating to a judgment in an action. The judgment may be enforced as if it had been rendered in an action in the court in which it is entered.

37-16-25. Appeals.

An appeal may be taken from an order made in a proceeding under this chapter, or from a judgment entered upon an award. The proceedings upon the appeal, including the judgment thereupon and the enforcement of the judgment, are governed by the provisions of statute and rule regulating appeal in actions as far as they are applicable.

37-16-26. Satisfaction of award.

- (a) An award which requires the payment of a sum of money by a city, town, or the state or any body described in 37-16-2 created or organized by or through the authority of any of them, shall be satisfied to the extent of payment of that sum by payment thereof to the party to whom the award was made by the treasurer or officer exercising the duties of a treasurer thereof from its general funds.
- (b) An award which requires the payment of a sum of money to a city, a town, or the state or any body described in 37-16-2 created or organized by or through the authority of any of them shall be satisfied to the extent of payment of that sum by payment thereof to its treasurer or officer exercising the duties of a treasurer thereof who shall deposit the same in its general funds.

37-16-27. Application to sureties.

- (a) If a contractor principal on a bond furnished to guarantee performance or payment on a construction contract and the claimant are parties to a written contract with a provision to submit to arbitration any controversy thereafter arising under the contract, or subject to arbitration as provided in 37-16-2(b), the arbitration provisions shall apply to the surety for all disputes involving questions of the claimant's right of recovery against the surety. Either the claimant, the contractor principal, or surety may demand arbitration in accordance with the written contract or as provided in 37-16-2(b) if applicable in one arbitration proceeding, provided that the provisions of 37-16-3 shall be applicable to any such demand for arbitration. The arbitration award shall decide all controversies subject to arbitration between the claimant, on the one hand, and the contractor principal and surety on the other hand, including all questions involving liability of the contractor principal and surety on the bond, but a claimant must file suit for recovery against the surety within the time limits set forth in 37-12-2 and 37-12-5. The arbitration shall be in accordance with this chapter and the court shall enter judgment thereon as provided therein.
- (b) The arbitrator or arbitrators, if more than one, shall make findings of fact as to the compliance with the requirements for recovery against the surety, and those findings of fact shall be a part of the award binding on all parties to the arbitration.

TITLE 45

CHAPTER 55 AWARD OF MUNICIPAL CONTRACTS

SECTIONS

- 45-55-1 Legislative findings
- 45-55-2. Method of source selection
- 45-55-3. Purchasing agent - Appointment - Duties.
- 45-55-4. Definitions.
- 45-55-5. Competitive sealed bidding.
- 45-55-5.1. Business exempt.
- 45-55-5.2. Town of North Smithfield - Exemption.
- 45-55-6. Competitive negotiation.
- 45-55-7. Negotiations after unsuccessful competitive sealed bidding
- 45-55-8. Sole source procurement and emergency procurements.
- 45-55-8.1 Qualification based selection of architects and engineers.
- 45-55-9. Small purchases.
- 45-55-10. Cancellation of invitation for bids and requests for proposals.
- 45-55-11. Responsibilities of bidders and offerors
- 45-55-12. Prequalification of contractors - General.
- 45-55-13. Exclusion of state mandated costs.
- 45-55-13.1. Exclusion of multi-cities or towns insurance corporations and cooperative risk management programs.
- 45-55-13.2. Exclusion of multi-cities or towns energy aggregation programs.
- 45-55-13.3. [Exclusion of multi-school district combined purchasing consortia](#)
- 45-55-14. Staff consultants.
- 45-55-15. Severability.
- 45-55-16 Prohibition against the use of lead based paints.

45-55-1. Legislative findings.

It is hereby declared that a need exists to establish a uniform system for the award of contracts by municipalities, utilizing open cooperative bids.

45-55-2. Method of source selection.

Except as otherwise authorized by law, all municipal contracts shall be awarded by:

- (1) Competitive sealed bidding, pursuant to 45-55-5;
- (2) Competitive negotiations, pursuant to 45-55-6;
- (3) Non-competitive negotiations, pursuant to 45-55-7 and 45-55-8;
- (4) Small purchase procedures, pursuant to 45-55-9.
- (5) Qualification based selection (QBS) process for architects/engineers pursuant to 45-55-8.1

45-55-3. Purchasing agent - Appointment - Duties.

Within each city or town or quasi public agency there shall be designated a person or persons to act as purchasing officer to exercise the powers and duties as set forth in this chapter.

45-55-4. Definitions.

The words defined in this section have the following meanings whenever they appear in this chapter, unless the context in which they are used clearly requires a different meaning or a different definition is prescribed for a particular section, group of sections or provision.

(1) "Business" means any corporation, partnership, individual, sole proprietorship, joint stock company, joint venture, or any other legal entity through which business is conducted.

(2) "Change order" means a written order signed by the purchasing agent, or contractor directing or allowing the contractor to make changes which the changes clause of the contract authorizes the purchasing agent or contractor to order without the consent of the contractor or purchasing agent.

(3) "Construction" means the process of building, altering, repairing, improving, or demolishing any public structures or building, or other public improvements of any kind to any public real property. It does not include the routine maintenance or repair of existing structures, buildings, or real property performed by salaried employees of the municipality in the usual course of their job.

(4) "Contract" means all types of agreements, including grants and orders, for the purchase or disposal of supplies, services, construction, or any other item. It includes awards; contracts of a fixed-price, cost, cost-plus-a-fixed-fee, or incentive type; contracts providing for the issuance of job or task orders; leases; letter contracts, purchase orders, and construction management contracts. It also includes supplemental agreements with respect to any of the preceding. "Contract" does not include labor contracts with employees of the municipality.

(5) "Contract modification" means any written alteration in the specifications, delivery point, rate of delivery, contract period, price, quantity, or other contract provisions of any existing contract, whether accomplished by unilateral action in accordance with a contract provision, or by mutual action of the parties to the contract. It includes bilateral actions, as supplemental agreements, and unilateral actions, as change orders, administrative changes, notices of termination, and notices of the exercise of a contract option.

(6) "Contractor" means any person having a contract with a municipality.

(8) "Data" means recorded information, regardless of form or characteristic.

(8) "Designee" means a duly authorized representative of a person holding a superior position.

(9) "Employee" means an individual drawing a salary from a municipality, whether elected or not, and any nonsalaried individual performing personal services for any municipality.

(10) "May" means permissive.

(11) "Municipality" means the individual cities and towns of the state of Rhode Island.

(12) "Negotiation" means contracting by either of the methods described in §§ 45-55-6, 45-55-7, and 45-55-8.

(13) "Person" means any business, individual, organization, or group of individuals.

(14) "Procurement" means the purchasing, buying, renting, leasing, or otherwise obtaining of any supplies, services, or construction. It also includes all functions that pertain to the obtaining of any supply, service, or construction item, including description of requirements, selection and solicitation of sources, preparation and award of contract, and all phases of contract administration.

(15) "Purchasing officer" means the person designated in each municipality or quasi public agency pursuant to section 45-55-3.

(16) "Regulations" means rules and regulations adopted by the individual cities or towns, concerning the implementation of the provisions of this chapter.

(17) "Services" means the rendering, by a contractor, of its time and effort rather than the furnishing of a specific end product, other than reports which are merely incidental to the required performance of services. "Services" does not include labor contracts with employees of governmental agencies.

(18) "Shall" means imperative.

(19) "Supplemental agreement" means any contract modification which is accomplished by the mutual action of the parties.

(20) "Supplies" means all property, including, but not limited, to leases of real property, printing and insurance, except land or permanent interest in land.

45-55-5. Competitive sealed bidding.

(a) Contracts exceeding the amount provided by 45-55-9 shall be awarded by competitive bidding unless they are professional engineering/architectural services pursuant to 45-55-8.1 and it is determined in writing that this method is not practicable. Factors to be considered in determining whether competitive sealed bidding is practicable shall include whether:

- (1) Specifications can be prepared that permit award on the basis of either the lowest qualified bid price or the lowest qualified evaluated bid price; and
 - (2) The available sources, the time and place of performance, and other relevant circumstances as are appropriate for the use of competitive sealed bidding.
- (b) The invitation for bids shall state whether award shall be made on the basis of the lowest bid price or the lowest evaluated or responsive bid price. If the latter basis is used, the objective measurable criteria to be utilized shall be stated in the invitation for bids, if available.
- (c) Adequate public notice of the invitation for bids shall be given a sufficient time prior to the date stated in the notice for the opening of bids. Notice may include publication in a newspaper of general circulation in the state as determined by the purchasing officer for the municipality not less than seven (7) days nor more than twenty-one (21) days before the date set for opening of the bids. The purchasing officer may make a written determination that the twenty-one (21) day limitation needs to be waived. The written determination shall state the reason why the twenty-one (21) day limitation is being waived and shall state the number of days, giving a minimum and maximum, before the date set for the opening of bids when public notice is to be given.
- (4) Bids shall be opened publicly in full view of the public at the time and place designated in the invitation for bids. Each bid, together with the name of the bidder, shall be recorded and an abstract made available for public inspection. Subsequent to the awarding of the bid, all documents pertinent to the awarding of the bid shall be made available and open to public inspection and retained in the bid file.
- (5) The contract shall be awarded with reasonable promptness by written notice to the responsive and responsible bidder whose bid is either the lowest bid price, or lowest evaluated or responsive bid price.
- (6) Correction or withdrawal of bids may be allowed only to the extent permitted by regulations issued by the purchasing officer.

45-55-5.1. Business exempt.

The North Kingstown Bus Contractors Association and the Scituate School Bus Owners Club shall be exempt from the provisions of this chapter.

45-55-5.2. Town of North Smithfield - Exemption.

The town of North Smithfield is exempt from the provisions of this chapter with regard to the contracting for fire and rescue services with the Primrose Volunteer Fire Department and/or North Smithfield Fire Department and/or their respective successors and assigns.

45-55-6. Competitive negotiation.

- (a) When, under regulations adopted by the city or town council, the purchasing agent determines in writing that the use of competitive sealed bidding is not practicable, and except as provided in 45-55-8, 45-55-9, and 45-55-10 a contract may be awarded by competitive negotiation.
- (b) Adequate public notice of the request for proposals shall be given in the same manner as provided in 45-55-5(c).
- (c) Contracts may be competitively negotiated when it is determined, in writing, by the purchasing agent that the bid prices received by competitive sealed bidding either are unreasonable as to all or part of the requirements, or were not independently reached in open competition, and for which:
 - (1) Each competitive bidder has been notified of the intention to negotiate and is given reasonable opportunity to negotiate; and
 - (2) The negotiated price is lower than the lowest rejected bid by any competitive bidder; and
 - (3) The negotiated price is the lowest negotiated price offered by a competitive offeror.
- (d) The request for proposals shall indicate the relative importance of price and other evaluation factors.
- (e) Award shall be made to the responsible offeror whose proposal is determined in writing to be the most advantageous to the municipality taking into consideration price and the evaluation factors set forth in the request for proposals.
- (f) Written or oral discussions shall be conducted with all responsible offerors who submit proposals determined, in writing, to be reasonably susceptible of being selected for award. Discussions shall not disclose any information derived from proposals submitted by competing offerors. Discussions need not be conducted:
 - (1) With respect to prices, where such prices are fixed by law or regulation, except that consideration shall be given to competitive terms and conditions; or
 - (2) Where time of delivery or performance will not permit discussions; or
 - (3) Where it can be clearly demonstrated and documented from the existence of adequate competition or accurate prior cost experience with the particular supply, service, or construction item, that acceptance of an initial offer without discussion would result in fair and reasonable prices, and the request for proposals notifies all offerors of the possibility that award may be made on the basis of the initial offers.

45-55-7. Negotiations after unsuccessful competitive sealed bidding.

- (a) In the event that all bids submitted pursuant to competitive sealed bidding under 45-55-5 result in bid prices in excess of the funds available for the purchase, and the purchasing officer determines in writing:
 - (1) That there are no additional funds available from any source so as to permit an award to the lowest responsive and responsible bidder, and
 - (2) The best interest of the municipality will not permit the delay attendant to a resolicitation under revised specifications, or for revised quantities, under competitive sealed bidding as provided in 45-55-5, then a negotiated award may be made as stated in subsection (b) or (c) of this section.
- (b) Where there is more than one bidder, competitive negotiations pursuant to 45-55-6, shall be conducted with the three (3) (two (2) if there are only two (2)) bidders determined in writing, to be the lowest responsive and responsible bidders to the competitive sealed bid invitation. Competitive negotiations shall be conducted under the following restrictions:
 - (1) If discussions pertaining to the revision of the specifications or quantities are held with any potential offeror, all other potential offerors shall be afforded an opportunity to take part in the discussions; or

(2) A request for proposals, based upon revised specifications or quantities, shall be issued as promptly as possible, shall provide for an expeditious response to the revised requirements, and shall be awarded upon the basis of the lowest bid price, or lowest evaluated bid price submitted by any responsive and responsible offeror.

(c) When after competitive sealed bidding, it is determined in writing, that there is only one responsive and responsible bidder, a noncompetitive negotiated award may be made with such bidder in accordance with 45-55-8.

45-55-8. Sole source procurement and emergency procurements.

(a) A contract may be awarded for a supply, service, or construction item without competition when, under published regulations, the purchasing officer determines, in writing, that there is only one source for the required supply, service, or construction item.

(b) Notwithstanding any other provision of this chapter, the purchasing agent may make or authorize others to make emergency procurements when there exists a threat to public health, welfare, or safety under emergency conditions as defined in regulations or where the procurement will be in the best interest of the city as established by properly promulgated rules and regulations; provided, that such emergency procurements shall be made with such competition as is practicable under the circumstances. A written determination of the basis for the emergency, and for the selection of the particular contractor, shall be included in the contract file.

45-55-8.1. Qualification based selection of architects and engineers.

When the purchasing agent determines that the city or town needs the services of a professional architect or engineer, the purchasing agent shall follow the qualification based selection process for the procurement of architectural and engineering consulting services.

45-55-9. Small purchases.

Procurements, not to exceed an aggregate amount of ten thousand dollars (\$10,000) for construction and five thousand dollars (\$5,000) for all other purchases may be made in accordance with small purchase regulations promulgated by the municipality. These amounts shall be increased or decreased annually hereafter at the same rate as the Boston Regional Consumer Price Index. Procurement requirements shall not be artificially divided so as to constitute a small purchase under this section. A municipality may further reduce the aggregate purchase amount, as provided for in this section by ordinance.

45-55-10. Cancellation of invitation for bids and requests for proposals.

An invitation for bids, a request for proposals, or other solicitation may be canceled, or all bids or proposals rejected, if it is determined, in writing, that such action if taken is not in the best interest of the municipality and approved by the chief purchasing officer.

45-55-11. Responsibilities of bidders and offerors.

(1) A written determination of responsibility of a bidder or offeror shall be made and it shall be made in accordance with regulations issued by the municipality.

A reasonable inquiry to determine the responsibility of a bidder or offeror may be conducted. The failure of a bidder or offeror to promptly supply information in connection with a reasonable inquiry may be grounds for a determination of nonresponsibility with respect to a bidder or offeror.

(2) Except as otherwise provided, by law, information furnished by a bidder or offeror pursuant to this section may not be disclosed outside of the purchasing department administering the contract without prior written consent of the bidder or offeror.

45-55-12. Prequalification of contractors - General.

The municipality may provide for prequalification of suppliers as responsible prospective contractors for particular types of supplies, services, and construction. Municipalities which choose to provide for prequalification of suppliers shall adopt regulations for prequalification in the same manner provided for in the adoption of ordinances in the manner provided for in the legislative or home rule charter of the municipality. Solicitation

mailing lists of potential contractors of supplies, services, and construction shall include but need not be limited to prequalified contractors. Prequalification shall not foreclose a written determination:

- (1) Between the time of the bid opening or receipt of offers and the making of an award, that a prequalified supplier is not responsible; or
- (2) That a supplier who is not prequalified at the time of bid opening or receipt of offers is responsible.

45-55-13. Exclusion of state mandated costs.

The provisions of 45-13-7 through 45-13-10 do not apply to this section.

45-55-13.1. Exclusion of multi-cities or towns insurance corporations and cooperative risk management programs.

The provisions of this chapter shall not apply to entities organized pursuant to section 45-5-20.1. Those entities are exempt from all of the provisions of this chapter .

45-55-13.2. Exclusion of multi-cities or towns energy aggregation programs.

The provisions of this chapter do not apply to entities organized for the purpose of negotiating the purchase of electric power pursuant to § 39-3-1.1, or energy or energy related services. Those entities are exempt from all provisions of this chapter.

45-55-13.3. Exclusion of multi-school district combined purchasing consortia

The provisions of this chapter do not apply to purchases and contracts entered into by those consortia established pursuant to § 16-2-9.2, and such entities shall be exempt from all provisions of this chapter.

45-55-14. Staff consultants.

The procurement of the service of an attorney, physician or dentist by a municipality, is exempt from the provisions of this chapter.

45-55-15. Severability.

If any one or more sections, clauses, sentences or parts of this chapter are for any reason be adjudged unconstitutional or otherwise invalid in any court, that judgment shall not affect, impair or invalidate the remaining provisions of this chapter but shall be confined in its operation to the specific provisions so held unconstitutional or invalid and the inapplicability or invalidity of any section, clause or provisions of this chapter in any one or more instances or circumstances shall not be taken to affect or prejudice in any way its applicability or validity in any other instance.

45-55-16. Prohibition against the use of lead based paints.

When purchasing paint products or contracting or subcontracting for painting, construction, improvement, completion, or repair of any public buildings, public road, public bridge, or public construction, all municipalities, as defined by 45-55-4(11), shall be prohibited from the use of lead based paint.



Black

THIS PROJECT IS FUNDED BY THE

STATE REVOLVING FUND

JOINTLY ADMINISTERED BY THE

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State of Rhode Island
Dept. of Environmental
Management



Gina M. Raimondo
Governor
Janet L. Coit
Director - RIDEM



Rhode Island
Infrastructure Bank

Merrill W. Sherman
Chair
Jeffrey R. Diehl
Executive Director



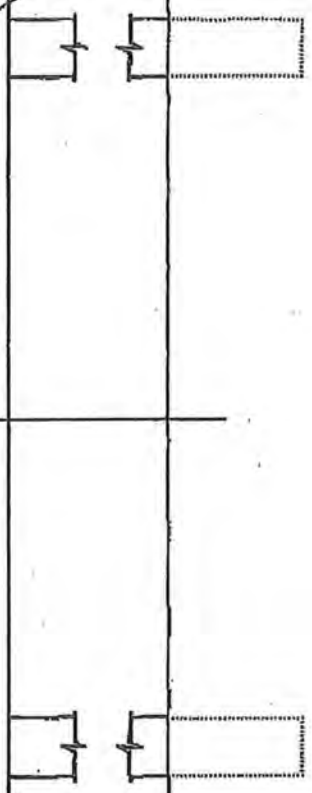
"Dedicated To Protecting And Preserving Our State's Most Important Resource... Clean Water"

Black

Black

Grade

Black



8' - 0"

EPA Logo
(12" x 5")



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Director - RI DEM



"Dedicated To Protecting And Preserving Our State's Most Important Resource... Clean Water"



Provide adequate supports for sign as site conditions may require & keep sign a proper distance above prevailing grade to permit public viewing.

Sign to be extension type high density overlaid plywood or other approved material suitable for signs.

Grade



Good Faith Efforts

What is the Purpose of the Good Faith Efforts?

The Good Faith Efforts are methods employed by all EPA financial assistance agreement recipients to ensure that disadvantaged business enterprises (DBEs) have the opportunity to compete for procurements funded by EPA financial assistance funds.

What Are the Good Faith Efforts?

- ❖ Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and local government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
- ❖ 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.
- ❖ 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.
- ❖ Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
- ❖ Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
- ❖ If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

What are the New Contract Administration Provisions?

When the DBE rule goes into effect, there are a number of new provisions designed to prevent unfair practices that adversely affect DBEs. Those provisions are as follows:

- ❖ 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.
- ❖ 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.

- ❖ 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 if soliciting a replacement subcontractor.
- ❖ A recipient must require its prime contractor to employ the Six Good Faith Efforts even if the prime contractor has achieved its fair share objectives.

What are the New Forms Associated With the New Contract Administration Provisions?

EPA Form 6100-2 - DBE Program Subcontractor Participation Form. This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have.

EPA Form 6100-3 - DBE Program Subcontractor Performance Form. This form captures an intended subcontractor's description of work to be performed for the prime contractor and the price of the work submitted to the prime.

EPA Form 6100-4 – DBE Program Subcontractor Utilization Form. This form captures the prime's intended use of an identified DBE subcontractor, and the estimated dollar amount of the subcontract.

Form	Requirement	Provided By	Completed By	Submitted To
EPA Form 6100-2	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	EPA DBE Coordinator
EPA Form 6100-3	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Recipients as part of bid or proposal package
EPA Form 6100-4	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	Recipients as part of bid or proposal package

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form**

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE¹ subcontractor² the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form**

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form**

This form is intended to capture the DBE¹ subcontractor's² description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: ___ DOT ___ SBA ___ Other: _____		Meets/ exceeds EPA certification standards? ___ YES ___ NO ___ Unknown

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	Date

Subcontractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form**

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE¹ subcontractors² and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Issuing/Funding Entity:			

I have identified potential DBE certified subcontractors	__ YES	__ NO	
If yes, please complete the table below. If no, please explain:			
Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?

Continue on back if needed

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

DAVIS-BACON PREVAILING WAGE REQUIREMENTS

(a) GENERAL CONTRACT AND SUBCONTRACT PROVISIONS

For 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 2010 appropriation, the following clauses shall be inserted in full:

(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.

Wage determinations may be obtained from the U.S. Department of Labor's website, www.dol.gov.

(ii)(A) The Owner, on behalf of the 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 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 Owner 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 Owner 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 action 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 Owner 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 questions, 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 and so advise the State award official or will notify the State award official 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 Owner, 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 Owner, 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 Owner 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 submitted 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 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/esa/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 owner 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 Owner.

(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.

(iii) *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 (write in the name of the Federal agency) may by appropriate instructions require, 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 the Owner, the 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.

(b) CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

For 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, the following clauses set forth in paragraphs (b) (1), (2), (3) and (4) of this section shall be inserted in full. These clauses shall be inserted in addition to the clauses required in Section (a), 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 therefor 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 Owner, 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 (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.

(c) MAINTENANCE OF RECORDS

In addition to the clauses contained in Section (a), 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 §5.1 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. 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 Owner, the State, EPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

(d) COMPLIANCE VERIFICATION

(1) The Owner 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 Owner 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.

(2) The Owner 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. At a minimum, the Owner should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Owners must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . Owners shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(3) The Owner 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 Owner 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 Owner 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 . Owners 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 Owner shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(4) The Owner 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.

(5) Owners 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/esa/contacts/whd/america2.htm>.

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WIFIA Specification Package and Bid and Contract Language

The "Specification Package and Bid and Contract Language" packet is a document that includes everything that must be in the specification package as a requirement of the WIFIA program. The package provides all necessary language for WIFIA funded projects. Please note that some of the language is required and must be included verbatim and some is suggested. For suggested language, you may use your own language so long as it still ensures that provisions are included to guarantee compliance with the Federal requirements.

EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THE FEDERAL LANGUAGE PROVISIONS WITH RESPECT TO STATE OR LOCAL LAW.

Economic and Miscellaneous Authorities

Debarment and Suspension, Executive Order 12549, 51 FR 6370, February 21, 1986

Suggested Contract Language: Contractor certifies that it will not knowingly enter into a contract with anyone who is ineligible under the 40 CFR Part 32 to participate in the Project. Suspension and debarment information can be accessed at <http://www.sam.gov>. Contractor represents and warrants that it has or will include a term or conditions requiring compliance with this provision in all of its subcontracts under this Agreement.

Demonstration Cities and Metropolitan Development Act, 42 USC 3301 et seq., as amended and Executive Order 12372, 47 FR 30959, July 16, 1982

{None required for the contractor}

New Restrictions on Lobbying, 31 USC 1352

Suggested Contract Language: FEDERAL LOBBYING RESTRICTIONS. Recipients of federal financial assistance may not pay any person for influencing or attempting to influence any officer or employee of a federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress with respect to the award, continuation, renewal, amendment, or modification of a federal grant, loan, or contract. These requirements are implemented for USEPA in 40 CFR Part 34, which also describes types of activities, such as legislative liaison activities and professional and technical services, which are not subject to this prohibition. Upon award of this contract, Contractor shall complete and submit to the City the certification and disclosure forms in Appendix A and Appendix B to 40 CFR Part 34. Contractor shall also require all subcontractors and suppliers of any tier awarded a subcontract over \$100,000 to similarly complete and submit the certification and disclosure forms pursuant to the process set forth in 40 CFR 34.110.

Prohibitions relating to violations of CWA and CAA with respect to Federal contracts, grants, or

loans under 42 USC 7606 and 33 USC 1368 and EO 11738, 38 FR 25161, September 12, 1973

{None required for the contractor}

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, 42 USC 4601 et seq

{None required for the contractor}

Civil Rights, Nondiscrimination, EEO Authorities

General Introductory Language

Suggested Contract Language: CIVIL RIGHTS OBLIGATIONS. Contractor shall comply with the following federal non- discrimination requirements:

- a. Title VI of the Civil Rights Act of 1964, which prohibits discrimination based on race, color, and national origin, including limited English proficiency (LEP).
- b. Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination against persons with disabilities.
- c. The Age Discrimination Act of 1975, which prohibits age discrimination.
- d. Section 13 of the Federal Water Pollution Control Act Amendments of 1972, which prohibits discrimination on the basis of sex.
- e. 40 CFR Part 7, as it relates to the foregoing.
- f. Executive Order No. 11246

Title VI of the Civil Rights Act of 1964, 42 USC 2000d et seq

Incorporated by reference in introductory language only. No additional language.

Section 504 of the Rehabilitation Act, 29 USC 794, supplemented by EO 11914, 41 FR 17871, April 29, 1976 and 11250, 30 FR 13003, October 13, 1965

Incorporated by reference in introductory language only. No additional language.

Age Discrimination Act, 42 USC 6101 et seq

Incorporated by reference in introductory language only. No additional language.

40 CFR Part 7

Incorporated by reference in introductory language only. No additional language.

****EEO Required Contract Language****

Equal Employment Opportunity Obligations Under EO 11246:

The Contractor shall comply with Executive Order 11246, entitled 'Equal Employment Opportunity,' as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60).

Contractor's compliance with Executive order 11246 shall be based on implementation of the Equal Opportunity Clause, and specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4.

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

- 1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, 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, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- 2) The contractor will, in all solicitations or advancements 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, religion, sex, sexual orientation, gender identity, or national origin.
- 3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
- 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 by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, 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 No. 11246 of Sept. 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 No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting 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 noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 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 provisions of paragraphs (1) through (8) 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 No. 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 may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States. [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966-1970 Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230, EO 13665 of April 8, 2014, 79 FR 20749, EO 13672 of July 21, 2014, 79 FR 42971]

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246) located at 41 CFR 60-4.3:

- 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 Contract Compliance Programs, United States Department of Labor, or any person to whom 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 of 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 is 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 an 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 7 a 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 or 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 its goals in each craft during the period specified.
- 5) Neither the provisions of any collective bargaining agreement, nor 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 nonworking 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. 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 therefor, along with whatever 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 meet 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 compiled under 7b above.
- f) Disseminate the Contractor's EEO 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 news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom 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 obligations under these specifications are being carried out.
 - n) Ensure that all facilities and company activities are non-segregated 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 a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of 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 workforce 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 of 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, sexual orientation, gender identity, 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 Contractor fails to comply with the requirements of 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 in 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 1977 and the Community Development Block Grant Program).

Segregated Facilities, 41 CFR 60-1.8

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensuring that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. This obligation extends to all contracts containing the equal opportunity clause regardless of the amount of the contract. The term "facilities," as used in this section, means waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, wash rooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees; Provided, That separate or single-user restrooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity

(Executive Order 11246) located at 41 CFR § 60-4.2:

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 workforce in each trade on all construction work in the covered area, are as follows:

Time-tables	Goals for minority participation for each trade	Goals for female participation in each trade
	Insert goals for each year ¹	6.9% ²

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 non-federally 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 specifications 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 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 subcontract 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 of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract 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).

¹ Goals can be found at: https://www.dol.gov/ofccp/TAGuides/TAC_FedContractors_JRF_QA_508c.pdf

² Nationwide goal for all covered areas

Participation by Disadvantaged Business Enterprises in Procurement under EPA Financial Assistance Agreements. 73 FR 15904

**Note: Minimal requirement of the WIFIA program is to incorporate six good faith efforts during contract and subcontract procurement and maintain documentation of efforts. State may require additional DBE reporting.*

Contractor agrees to comply with the requirements of USEPA's Program for Utilization of Small, Minority and Women's Business Enterprises. The DBE rule can be accessed at www.epa.gov/osbp. Contractor shall comply with 40 CFR Section 33.301, and retain all records documenting compliance with the six good faith efforts. The Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the Contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

American Iron and Steel and Federal Labor Standards

American Iron and Steel Requirement

The Contractor acknowledges to and for the benefit of _____ ("Purchaser") and the United States Environmental Protection Agency ("EPA") that it understands the goods and services under this Agreement are being funded with monies made available by the Water Infrastructure Finance and Innovation Act program of the EPA that has 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 ("American Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents, warrants and covenants to and for the benefit of the Purchaser and the EPA 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 Purchaser or the EPA. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or the EPA to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or the EPA resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the EPA or any damages owed to the EPA by the Purchaser). While the Contractor has no direct contractual privity with the EPA, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the EPA 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 EPA.

Compliance with Davis Bacon and related acts

(a) 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 public building or public work, or building or work 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, the following clauses (or any modifications thereof to meet the particular needs of the agency, provided that such modifications are first approved by the Department of Labor):

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), 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.

(ii)

(A) The contracting officer 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 contracting officer shall approve 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 contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer 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 contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt 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 (write in name of Federal Agency or the loan or grant recipient) shall upon its own action or upon written request of 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 (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), 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 (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). 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) {no text here}

(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted 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 weekly transmittals. 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/esa/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 (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), 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 sponsoring government agency (or the applicant, sponsor, or owner).

(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 (write the name of the agency) 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 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 wagedetermination. 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.

- (iii) 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 (write in the name of the Federal agency) may by appropriate instructions require, 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 the contracting agency, 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.

(b) Contract Work Hours and Safety Standards Act. The following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section shall be inserted 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 § 5.5(a) or § 4.6 of part 4 of this title. 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 therefor 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 \$25 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 (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of 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 (b)(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.
- (c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in § 5.1, 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 Agency Head shall cause or require the contracting officer to 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.

WIFIA LOAN AGREEMENT FLOW DOWN (PASS THROUGH) PROVISIONS

Attached is the loan agreement (certain exhibits omitted) between the Narragansett Bay Commission (the "NBC") and the Environment Protection Agency (the WIFIA Loan Agreement").

Be advised that sections of the WIFIA Loan Agreement including, but not necessarily limited to sections 12(j), 12(q), 12 (r), 14 (h) and Exhibit E of the WIFIA Loan Agreement provide that the NBC, and each of its contractors and subcontractors at all tiers, have and will comply with all applicable federal laws, rules, regulations and requirements relating to [operation and management of the NBC's wastewater treatment system and] the project being bid, including:

- (i) 40 U.S.C. §§ 3141-3144, 3146, and 3147 and regulations relating thereto (Davis-Bacon Act Requirements),
- (ii) 33 U.S.C. § 3914 (relating to American iron and steel products), and
- (iii) those set forth in **Exhibit E** (*Compliance With Laws*).

To ensure such compliance, the NBC will include in all contracts with respect to the project requirements that its contractor(s) shall comply with such applicable federal laws, rules, regulations, and requirements and follow applicable federal guidance, and will require that the contractor(s) incorporate in all subcontracts (and cause all subcontractors to include in lower tier subcontracts) such terms and conditions as are required to be incorporated therein by the WIFIA Loan Agreement and by applicable federal laws, rules, regulations and requirements. With respect to the Davis-Bacon Act Requirements, the NBC will insert in full in all contracts relating to the project the contract clauses set forth in the Code of Federal Regulations, Title 29 Part 5.5, and will require and ensure that its contractor(s) insert such clauses in all subcontracts and also will required a clause requiring all subcontractors to include these clauses in any lower tier subcontracts.

EXECUTION VERSION

**UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY**

WIFIA LOAN AGREEMENT

For an Original Principal Amount of Up to \$268,710,610

With

NARRAGANSETT BAY COMMISSION

For the

**CSO PHASE III PROJECT
(WIFIA – N18132RI)**

Dated as of August 27, 2019

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~~SCHEDULE 12(r) – Environmental Matters~~

~~EXHIBIT A – Form of WIFIA Bond~~
~~EXHIBIT B – Anticipated WIFIA Loan Disbursement Schedule~~
~~EXHIBIT C – Certification Regarding Debarment, Suspension and other Responsibility Matters~~
~~EXHIBIT D – Requisition Procedures~~
EXHIBIT E – Compliance With Laws
~~EXHIBIT F – WIFIA Debt Service~~
~~EXHIBIT G-1 – Opinions Required from Counsel to Borrower~~
~~EXHIBIT G-2 – Opinions Required from Bond Counsel~~
~~EXHIBIT H – Form of Certificate of Trustee~~
~~EXHIBIT I – Form of Borrower’s Officer’s Certificate~~
~~EXHIBIT J – Form of Certificate of Substantial Completion~~
~~EXHIBIT K – Form of Quarterly Report~~
~~EXHIBIT L – Form of Public Benefits Report~~
~~EXHIBIT M – Form of Non-Lobbying Certificate~~

WIFIA LOAN AGREEMENT

THIS WIFIA LOAN AGREEMENT (this “**Agreement**”), dated as of August 27, 2019, is by and between **NARRAGANSETT BAY COMMISSION**, a public corporation organized and existing under the laws of the State of Rhode Island (the “**State**”), with an address at One Service Road, Providence, RI 02905 (the “**Borrower**” or the “**Commission**”), and the **UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**, an agency of the United States of America, acting by and through the Administrator of the Environmental Protection Agency (the “**Administrator**”), with an address at 1200 Pennsylvania Avenue NW, Washington, DC 20460 (the “**WIFIA Lender**”).

RECITALS:

WHEREAS, the Congress of the United States of America enacted the Water Infrastructure Finance and Innovation Act, as amended by Section 1445 of the Fixing America’s Surface Transportation Act of 2015, as further amended by Section 5008 of the Water Infrastructure Improvements For the Nation Act of 2016, as further amended by Section 4201 of America’s Water Infrastructure Act of 2018 (collectively, as the same may be amended from time to time, the “**Act**” or “**WIFIA**”), which is codified as 33 U.S.C. §§ 3901-3914;

WHEREAS, the Act authorizes the WIFIA Lender to enter into agreements to provide financial assistance with one or more eligible entities to make secured loans with appropriate security features to finance a portion of the eligible costs of projects eligible for assistance;

WHEREAS, the Borrower has requested that the WIFIA Lender make the WIFIA Loan (as defined herein) in an original principal amount not to exceed \$268,710,610 (excluding interest that is compounded and capitalized in accordance with the terms hereof) to be used to pay a portion of the Eligible Project Costs (as defined herein) related to the Project (as defined herein) pursuant to the application for WIFIA financial assistance dated February 28, 2019 (the “**Application**”);

WHEREAS, as of the date hereof, the Administrator has approved WIFIA financial assistance for the Project to be provided in the form of the WIFIA Loan, subject to the terms and conditions contained herein;

WHEREAS, based on the Application and the representations, warranties and covenants set forth herein, the WIFIA Lender proposes to make funding available to the Borrower through the purchase of the WIFIA Bond (as defined herein), upon the terms and conditions set forth herein;

WHEREAS, the Borrower agrees to repay any amount due pursuant to this Agreement and the WIFIA Bond in accordance with the terms and provisions hereof and of the WIFIA Bond; and

WHEREAS, the WIFIA Lender has entered into this Agreement in reliance upon, among other things, the information and representations of the Borrower set forth in the Application and the supporting information provided by the Borrower.

NOW, THEREFORE, the premises being as stated above, and for good and valuable consideration, the receipt and sufficiency of which are acknowledged to be adequate, and intending to be legally bound hereby, it is hereby mutually agreed by and between the Borrower and the WIFIA Lender as follows:

ARTICLE I DEFINITIONS AND INTERPRETATION

Section 1. Definitions.

Unless the context otherwise requires, capitalized terms used in this Agreement shall have the meanings set forth below in this Section 1 (*Definitions*) or as otherwise defined in this Agreement. Any term used in this Agreement that is defined by reference to any other agreement shall continue to have the meaning specified in such agreement (as amended from time to time), whether or not such agreement remains in effect.

“**Act**” means the Act as defined in the recitals hereto.

“**Additional Obligations**” means Additional Senior Obligations and Additional Subordinated Obligations.

“**Additional Principal Project Contracts**” means (a) any contract, agreement, letter of intent, understanding or instrument listed in Part B of **Schedule 12(n)** (*Principal Project Contracts*) and (b) any other contract, agreement, letter of intent, understanding or instrument entered into by (or on behalf of) the Borrower after the Effective Date with respect to the Project, in the case of this clause (b), (i) pursuant to which the Borrower has payment obligations in excess of \$50,000,000 in the aggregate or (ii) the termination of which could reasonably be expected to have a Material Adverse Effect, but excluding, in the case of this clause (b), any (A) insurance policies, (B) Governmental Approvals and (C) agreements, documents and instruments (1) providing for, governing or evidencing any Permitted Debt and any related Permitted Lien for such Permitted Debt or (2) entered into to consummate any Permitted Investment.

“**Additional Security**” has the meaning set forth in Section 208 (*Additional Security*) of the Indenture.

“**Additional Senior Obligations**” means any Senior Obligations permitted under Section 15(a) (*Negative Covenants – Indebtedness*) and under the Indenture, which Senior Obligations are issued or incurred after the Effective Date.

“**Additional Subordinated Obligations**” means any Subordinated Obligations permitted under Section 15(a) (*Negative Covenants – Indebtedness*) and under the Indenture, which Subordinated Obligations are issued or incurred after the Effective Date.

“**Administrator**” has the meaning provided in the preamble hereto.

“**Agency Bonds**” has the meaning set forth in the Indenture.

“**Agreement**” has the meaning provided in the preamble hereto.

“**Anticipated WIFIA Loan Disbursement Schedule**” means the schedule set forth in **Exhibit B** (*Anticipated WIFIA Loan Disbursement Schedule*), reflecting the anticipated disbursement of proceeds of the WIFIA Loan, as such schedule may be amended from time to time pursuant to Section 4(c) (*Disbursement Conditions*).

“**Application**” has the meaning provided in the recitals hereto.

“**Bank Secrecy Act**” means the Bank Secrecy Act of 1970, as amended, and the regulations promulgated thereunder.

“**Bankruptcy Related Event**” means, with respect to the Borrower, (a) an involuntary proceeding shall be commenced or an involuntary petition shall be filed seeking (i) liquidation, reorganization or other relief in respect of the Borrower or any of its debts, or of a substantial part of the assets thereof, under any Insolvency Laws, or (ii) the appointment of a receiver, trustee, liquidator, custodian, sequestrator, conservator or similar official for the Borrower or for a substantial part of the assets thereof and, in any case referred to in the foregoing subclauses (i) and (ii), such proceeding or petition shall continue undismissed for sixty (60) days or an order or decree approving or ordering any of the foregoing shall be entered; (b) the Borrower shall (i) apply for or consent to the appointment of a receiver, trustee, liquidator, custodian, sequestrator, conservator or similar official therefor or for a substantial part of the assets thereof, (ii) generally not be paying its debts as they become due unless such debts are the subject of a bona fide dispute, or become unable to pay its debts generally as they become due, (iii) fail to make a payment of WIFIA Debt Service in accordance with the provisions of Section 8 (*Payment of Principal and Interest*) and such failure is not cured within thirty (30) days following notification by the WIFIA Lender of failure to make such payment, (iv) make a general assignment for the benefit of creditors, (v) consent to the institution of, or fail to contest in a timely and appropriate manner, any proceeding or petition with respect to it described in clause (a) of this definition, (vi) commence a voluntary proceeding under any Insolvency Law, or file a voluntary petition seeking liquidation, reorganization, an arrangement with creditors or an order for relief, in each case under any Insolvency Law, (vii) file an answer admitting the material allegations of a petition filed against it in any proceeding referred to in the foregoing subclauses (i) through (v), inclusive, of this clause (b), or (viii) take any action for the purpose of effecting any of the foregoing, including seeking approval or legislative enactment by any Governmental Authority to authorize commencement of a voluntary proceeding under any Insolvency Law; (c) (i) any Person shall commence a process pursuant to which all or a substantial part of the Pledged Collateral may be sold or otherwise disposed of in a public or private sale or disposition pursuant to a foreclosure of the Liens thereon securing the Senior Obligations, or (ii) any Person shall commence a process pursuant to which all or a substantial part of the Pledged Collateral may be sold or otherwise disposed of pursuant to a sale or disposition of such Pledged Collateral in lieu of foreclosure; or (d) any receiver, trustee, liquidator, custodian, sequestrator, conservator or similar official shall transfer, pursuant to directions issued by the Bondholders, funds on deposit in any of the System Accounts upon the occurrence and during the continuation of an Event of Default under this Agreement or an event of default under the Related Documents for application to the prepayment or repayment of any

principal amount of the Senior Obligations other than in accordance with the provisions of the Indenture.

“**Base Case Financial Model**” means a financial model prepared by the Borrower forecasting the capital costs of the System (including the Project) and the rates, revenues, operating expenses and major maintenance requirements of the System for time periods through the Final Maturity Date and based upon assumptions and methodology provided by the Borrower and acceptable to the WIFIA Lender as of the Effective Date, which model shall be provided to the WIFIA Lender as a fully functional Microsoft Excel – based financial model or such other format requested by the WIFIA Lender.

“**Bond**” has the meaning set forth in the Indenture.

“**Bondholder**” or “**Holder**” has the meaning set forth in the Indenture.

“**Borrower**” has the meaning provided in the preamble hereto.

“**Borrower Fiscal Year**” means (a) as of the Effective Date, a fiscal year of the Borrower commencing on July 1 of any calendar year and ending on June 30 of the immediately succeeding calendar year or (b) such other fiscal year as the Borrower may hereafter adopt.

“**Borrower’s Authorized Representative**” means any Person who shall be designated as such pursuant to Section 21 (*Borrower’s Authorized Representative*).

“**Business Day**” means any day other than a Saturday, a Sunday or any other day on which offices of the Government are authorized to be closed or on which any Fiduciary (as defined in the Indenture) is authorized or required by law to be closed for business.

“**Capitalized Interest Period**” means the period from (and including) the Effective Date to (but excluding) the first day of the initial Payment Period, subject to earlier termination as set forth in Section 8(b) (*Payment of Principal and Interest – Capitalized Interest Period*).

“**Code**” means the Internal Revenue Code of 1986, as amended from time to time, or any successor tax code.

“**Congress**” means the Congress of the United States of America.

“**Construction Period**” means the period from the Effective Date through the Substantial Completion Date.

“**Construction Period Servicing Fee**” has the meaning provided in Section 10(a)(ii) (*Fees and Expenses – Fees*).

“**Construction Schedule**” means (a) the initial schedule or schedules on which the construction timetables for the Project are set forth, attached as **Schedule III** (*Construction Schedule*), and (b) any updates thereto included in the periodic reports submitted to the WIFIA Lender pursuant to Section 16(d) (*Reporting Requirements – Construction Reporting*) most recently approved by the WIFIA Lender.

“**Control**” means, when used with respect to any particular Person, the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of such Person, whether through the ownership of voting securities or partnership or other ownership interests, by contract or otherwise, and the terms “**Controlling**” and “**Controlled by**” have meanings correlative to the foregoing.

“**CPI**” means the Consumer Price Index for All Urban Consumers (CPI-U) for the U.S. City Average for All Items, 1982-84=100 (not seasonally adjusted) or its successor, published by the Bureau of Labor Statistics and located at <https://www.bls.gov/news.release/cpi.t01.htm>.

“**Debt Service Payment Commencement Date**” means the earliest to occur of either (a) September 1, 2031; or (b) if the Capitalized Interest Period ends pursuant to Section 8(b) (*Payment of Principal and Interest – Capitalized Interest Period*) due to the occurrence of an Event of Default, the first Payment Date immediately following the end of the Capitalized Interest Period; or (c) the Payment Date falling closest to, but not later than, the fifth anniversary of the Substantial Completion Date.

“**Debt Service Requirement**” has the meaning set forth in the Indenture.

“**Default**” means any event or condition that, with the giving of any notice, the passage of time, or both, would be an Event of Default.

“**Default Rate**” means an interest rate equal to the sum of (a) the WIFIA Interest Rate plus (b) 200 basis points.

“**Development Default**” means (a) the Borrower abandons work or fails, in the reasonable judgment of the WIFIA Lender, to diligently prosecute the work related to the Project or (b) the Borrower fails to achieve Substantial Completion of the Project within twenty-four (24) months following the Projected Substantial Completion Date, unless delayed due to Uncontrollable Force that is not due to the fault of the Borrower (and which the Borrower could not reasonably have avoided or mitigated).

“**Dollars**” and “**\$**” means the lawful currency of the United States of America.

“**DPUC Order**” means order no. 23643 as supplemented by order no. 23645 issued by the Rhode Island Division of Public Utilities and Carriers on August 9, 2019 pursuant to Rhode Island General Laws Section 39-3-15 for the approval of the issuance of the WIFIA Bond.

“**Effective Date**” means the date of this Agreement.

“**Eligible Project Costs**” means amounts in the Project Budget approved by the WIFIA Lender, which are paid by or for the account of the Borrower in connection with the Project (including, as applicable, Project expenditures incurred prior to the receipt of WIFIA credit assistance), which shall arise from the following:

- (a) development-phase activities, including planning, feasibility analysis (including any related analysis necessary to carry out an eligible project), revenue

forecasting, environmental review, permitting, preliminary engineering and design work and other preconstruction activities;

(b) construction, reconstruction, rehabilitation, and replacement activities;

(c) the acquisition of real property or an interest in real property (including water rights, land relating to the Project and improvements to land), environmental mitigation (including acquisitions pursuant to Section 3905(8) of Title 33 of the United States Code), construction contingencies, and acquisition of equipment; or

(d) capitalized interest (with respect to Obligations other than the WIFIA Loan) necessary to meet market requirements, reasonably required reserve funds, capital issuance expenses, and other carrying costs during construction;

provided, that Eligible Project Costs must be consistent with all other applicable federal law, including the Act.

“EMMA” means the Electronic Municipal Market Access system as described in 1934 Act Release No. 59062 and maintained by the Municipal Securities Rulemaking Board established pursuant to Section 15B(b) of the Securities Exchange Act of 1934, as amended, and its successors.

“**Environmental Laws**” has the meaning provided in Section 12(r) (*Representations and Warranties of Borrower – Environmental Matters*).

“EPA” means the United States Environmental Protection Agency.

“**Event of Default**” has the meaning provided in Section 17 (*Events of Default and Remedies*).

“**Event of Loss**” means any event or series of events that causes any portion of the System to be damaged, destroyed or rendered unfit for normal use for any reason whatsoever, including through a casualty, a failure of title, or any loss of such property through eminent domain.

“**Existing Indebtedness**” means the indebtedness of the Borrower that has been issued or incurred prior to the Effective Date and remains Outstanding and is listed and described in **Schedule IV** (*Existing Indebtedness*).

“**Existing Principal Project Contract**” means each contract of the Borrower set forth in Part A of **Schedule 12(n)** (*Principal Project Contracts*).

“**Federal Fiscal Year**” means the fiscal year of the Government, which is the twelve (12) month period that ends on September 30 of the specified calendar year and begins on October 1 of the preceding calendar year.

“**Final Disbursement Date**” means the earliest of (a) the date on which the WIFIA Loan has been disbursed in full; (b) the last anticipated date of disbursement set forth in the then-

current Anticipated WIFIA Loan Disbursement Schedule; (c) the date on which the Borrower has certified to the WIFIA Lender that it will not request any further disbursements under the WIFIA Loan; (d) the date on which the WIFIA Lender terminates its obligations relating to disbursements of any undisbursed amounts of the WIFIA Loan in accordance with Section 17 (*Events of Default and Remedies*); and (e) the date that is one (1) year after the Substantial Completion Date.

“Final Maturity Date” means the earlier of (a) September 1, 2046 (or such earlier date as is set forth in an updated **Exhibit F** (*WIFIA Debt Service*) pursuant to Section 8(g) (*Payment of Principal and Interest – Adjustments to Loan Amortization Schedule*)); and (b) the Payment Date immediately preceding the date that is thirty-five (35) years following the Substantial Completion Date.

“Financial Statements” has the meaning provided in Section 12(v) (*Representations and Warranties of Borrower – Financial Statements*).

“GAAP” means generally accepted accounting principles for governmental entities, as established by GASB, in effect from time to time in the United States of America.

“GASB” means the Government Accounting Standards Board, or any successor entity with responsibility for establishing accounting rules for governmental entities.

“Government” means the United States of America and its departments and agencies.

“Governmental Approvals” means all authorizations, consents, approvals, waivers, exceptions, variances, filings, permits, orders, licenses, exemptions and declarations of or with any Governmental Authority.

“Governmental Authority” means any federal, state, provincial, county, city, town, village, municipal or other government or governmental department, commission, council, court, board, bureau, agency, authority or instrumentality (whether executive, legislative, judicial, administrative or regulatory), of or within the United States of America or its territories or possessions, including the State and its counties and municipalities, and their respective courts, agencies, instrumentalities and regulatory bodies, or any entity that acts “on behalf of” any of the foregoing, whether as an agency or authority of such body.

“Indemnitee” has the meaning provided in Section 32 (*Indemnification*).

“Indenture” means that certain Trust Indenture, dated as of April 15, 2004, between the Borrower and the Trustee, as amended or supplemented.

“Indenture Documents” means the Indenture, each Supplemental Indenture (including the WIFIA Supplemental Indenture), documentation related to any Additional Security, Qualified Swap Agreements and each other agreement, instrument and document executed and delivered pursuant to or in connection with any of the foregoing.

“**Insolvency Laws**” means the United States Bankruptcy Code, 11 U.S.C. § 101 *et seq.*, as from time to time amended and in effect, and any state bankruptcy, insolvency, receivership, conservatorship or similar law now or hereafter in effect.

“**Interest Payment Date**” means each March 1 and September 1, commencing on the Debt Service Payment Commencement Date.

“**Investment Grade Rating**” means a public rating no lower than ‘BBB-’, ‘Baa3’, ‘BBB (low)’, or higher, from a Nationally Recognized Rating Agency.

“**Lien**” means any mortgage, pledge, hypothecation, assignment, mandatory deposit arrangement, encumbrance, attachment, lien (statutory or other), charge or other security interest, or preference, priority or other security agreement or preferential arrangement of any kind or nature whatsoever, including any sale-leaseback arrangement, any conditional sale or other title retention agreement, any financing lease having substantially the same effect as any of the foregoing, and the filing of any financing statement or similar instrument under the UCC or any other applicable law.

“**Loan Amortization Schedule**” means the Loan Amortization Schedule reflected in the applicable column of **Exhibit F** (*WIFIA Debt Service*), as amended from time to time in accordance with Section 8(g) (*Payment of Principal and Interest – Adjustments to Loan Amortization Schedule*).

“**Material Adverse Effect**” means (a) a change in, or effect on (i) the System, the Project or the Revenues or (ii) the business, operations, properties, condition (financial or otherwise) or prospects of the Borrower, which would, in either case, adversely affect the Borrower’s ability to pay its Obligations when due; or (b) a material adverse effect on (i) the legality, validity or enforceability of any material provision of any Indenture Document or WIFIA Loan Document, (ii) the ability of the Borrower to enter into, perform or comply with any of its material obligations under any Related Document, (iii) the validity, enforceability or priority of the Liens provided under the Indenture Documents on the Pledged Collateral in favor of the Secured Parties or (iv) the WIFIA Lender’s rights or remedies available under any WIFIA Loan Document.

“**Nationally Recognized Rating Agency**” means any nationally recognized statistical rating organization identified as such by the Securities and Exchange Commission.

“**NEPA**” means the National Environmental Policy Act of 1969, as amended, and any successor statute of similar import, and regulations thereunder, in each case as in effect from time to time.

“**NEPA Determination**” means the Finding of No Significant Impact for the Project issued by EPA on July 1, 2019 in accordance with NEPA.

“**Net Revenues**” has the meaning set forth in the Indenture.

“**Non-Lobbying Certificate**” means a certificate, signed by the Borrower’s Authorized Representative, with respect to the prohibition on the use of appropriated funds for lobbying

pursuant to 49 C.F.R. § 20.100(b), substantially in the form attached hereto as **Exhibit M** (*Form of Non-Lobbying Certificate*).

“**Obligations**” means debt of the Borrower that is secured by a pledge and lien on all or a portion of the Revenues, including the Senior Obligations and Subordinated Obligations.

“**OFAC**” means the Office of Foreign Assets Control of the United States Department of the Treasury.

“**Operating Period Servicing Fee**” has the meaning provided in Section 10(a)(iii) (*Fees and Expenses – Fees*).

“**Operating Expenses**” has the meaning set forth in the Indenture.

“**Organizational Documents**” means: (a) the constitutional and statutory provisions that are the basis for the existence and authority of the Borrower, including any enabling statutes, ordinances or public charters and any other organic laws establishing the Borrower and (b) the resolutions, bylaws, code of regulations, operating procedures or other organizational documents of or adopted by the Borrower by which the Borrower, its powers, operations or procedures or its securities, bonds, notes or other obligations are governed or from which such powers are derived.

“**Outstanding**” has the meaning set forth in the Indenture.

“**Outstanding WIFIA Loan Balance**” means the sum of (i) the aggregate principal amount of the WIFIA Loan drawn by the Borrower plus (ii) compounded and capitalized interest added to the principal balance of the WIFIA Loan minus (iii) the aggregate principal amount of the WIFIA Loan repaid by the Borrower, as determined in accordance with Section 8(g) (*Payment of Principal and Interest – Adjustments to Loan Amortization Schedule*).

“**Patriot Act**” means the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act of 2001, as amended, and all regulations promulgated thereunder.

“**Payment Date**” means each Interest Payment Date and each Principal Payment Date.

“**Payment Default**” has the meaning provided in Section 17(a)(i) (*Events of Default and Remedies – Payment Default*).

“**Payment Period**” means the six (6) month period beginning on March 1, 2031 and ending on August 31, 2031, and each succeeding six (6) month period thereafter; provided, however, that if the Debt Service Payment Commencement Date occurs earlier than September 1, 2031, the first Payment Period shall be the six (6) month period ending on the date immediately prior to the Debt Service Payment Commencement Date.

“**Permitted Debt**” means:

- (a) Existing Indebtedness;

- (b) the WIFIA Loan;
- (c) Additional Senior Obligations;
- (d) Additional Subordinated Obligations; and
- (e) any other Obligations permitted by the Indenture.

“**Permitted Investments**” has the meaning set forth in the Indenture.

“**Permitted Liens**” means:

- (a) Liens imposed pursuant to the WIFIA Loan Documents;
- (b) Liens imposed by law, including Liens for taxes that are not yet due or are being contested in compliance with Section 14(i) (*Affirmative Covenants – Material Obligations*);
- (c) carriers’, warehousemen’s, mechanics’, materialmen’s, repairmen’s and other like Liens imposed by law, arising in the ordinary course of business and securing obligations that are not overdue by more than thirty (30) days or are being contested in compliance with Section 14(i) (*Affirmative Covenants – Material Obligations*);
- (d) pledges and deposits made in the ordinary course of business in compliance with workers’ compensation, unemployment insurance, and other social security laws or regulations;
- (e) deposits to secure the performance of bids, trade contracts, leases, statutory obligations, surety and appeal bonds, performance bonds and other obligations of a like nature, in each case in the ordinary course of business;
- (f) judgment Liens in respect of judgments that do not constitute an Event of Default under Section 17(a)(vi) (*Events of Default and Remedies – Material Adverse Judgment*); and
- (g) easements, zoning restrictions, rights-of-way and similar encumbrances on real property imposed by law or arising in the ordinary course of business that, in any case, do not secure any monetary obligations and do not materially detract from the value of the affected property or interfere with the ordinary conduct of business of the Borrower.

“**Person**” means and includes an individual, a general or limited partnership, a joint venture, a corporation, a limited liability company, a trust, an unincorporated organization and any Governmental Authority.

“**Pledged Collateral**” has the meaning assigned to the term “Trust Estate,” as set forth in the Indenture.

“Principal Payment Date” means each September 1, commencing on September 1, 2038.

“Principal Project Contracts” means the Existing Principal Project Contracts and the Additional Principal Project Contracts.

“Principal Project Party” means any Person (other than the Borrower) party to a Principal Project Contract.

“Project” means the design and construction of certain combined sewer overflow control facilities and the design of regulator modifications and interceptors that will convey flow from various outfalls to the new tunnel and sewer separation, all in connection with the System and located at various sites in the greater Providence metropolitan area, as further described in **Schedule I** (*Project Definition*).

“Project Budget” means the budget for the Project attached to this Agreement as **Schedule II** (*Project Budget*) showing a summary of Total Project Costs with a breakdown of all Eligible Project Costs and the estimated sources and uses of funds for the Project.

“Projected Substantial Completion Date” means September 30, 2026, as such date may be adjusted in accordance with Section 16(d) (*Reporting Requirements – Construction Reporting*).

“Public Benefits Report” has the meaning provided in Section 16(e) (*Reporting Requirements – Public Benefits Report*).

“Qualified Swap Agreement” has the meaning set forth in the Indenture.

“Qualified Swap Payments” has the meaning set forth in the Indenture.

“Rate Covenant” has the meaning provided in Section 14(a) (*Affirmative Covenants – Rate Covenant*).

“Reimbursement Obligations” has the meaning set forth in the Indenture.

“Related Documents” means the Indenture Documents, this Agreement, the WIFIA Bond, and the Principal Project Contracts.

“Requisition” has the meaning provided in Section 4(a) (*Disbursement Conditions*).

“Reserved Revenues” has the meaning set forth in the Indenture.

“Revenue Fund” has the meaning set forth in the Indenture.

“Revenues” has the meaning set forth in the Indenture.

“Secured Obligations” means the Senior Obligations, Subordinated Obligations, Reimbursement Obligations, Qualified Swap Payments and any payments due from the Borrower or the Trustee on behalf of the Borrower, as a cost, expense or fee under the Qualified

Swap Agreement, including, but not limited to, any swap termination payment or indemnification of the counterparty to a Qualified Swap Agreement; provided that (a) in the case of Qualified Swap Payments or other obligations of the Borrower or Trustee under a Qualified Swap Agreement, only to the extent the Borrower's obligations under the Qualified Swap Agreement are secured by the Pledged Collateral pursuant to the Indenture Documents, and (b) in the case of Reimbursement Obligations, only to the extent the Borrower's Reimbursement Obligations are secured by the Pledged Collateral pursuant to the Indenture Documents.

"Secured Parties" means the Trustee, the WIFIA Lender, other Bondholders, each Counterparty (as defined in the Indenture), and each provider of any Additional Security; provided that (a) in the case of a Counterparty, only to the extent the Borrower's obligations in respect of Qualified Swap Payments to the Counterparty are secured by the Pledged Collateral pursuant to the Indenture Documents, and (b) in the case of a provider of Additional Security, only to the extent the Borrower's Reimbursement Obligations to such provider are secured by the Pledged Collateral pursuant to the Indenture Documents.

"Senior Obligations" means (a) Bonds (as defined in the Indenture) other than Subordinated Obligations and (b) any other obligations secured and permitted to be secured under the Indenture by a senior Lien on the Pledged Collateral.

"Servicer" means such entity or entities as the WIFIA Lender shall designate from time to time to perform, or assist the WIFIA Lender in performing, certain duties hereunder.

"Servicing Fee" means the Servicing Set-Up Fee and any Construction Period Servicing Fee or Operating Period Servicing Fee.

"Servicing Set-Up Fee" has the meaning provided in Section 10(a)(i) (*Fees and Expenses – Fees*).

"State" has the meaning provided in the preamble hereto.

"Subordinated Obligations" means Subordinated Bonds, as defined in the Indenture.

"Substantial Completion" means, with respect to the Project, the stage at which the Project is able to perform the functions for which the Project is designed.

"Substantial Completion Date" means the date on which the Borrower certifies to the WIFIA Lender, with evidence satisfactory to the WIFIA Lender, that Substantial Completion has occurred.

"Supplemental Indenture" has the meaning set forth in the Indenture and includes the WIFIA Supplemental Indenture.

"System" has the meaning set forth in the Indenture.

"System Accounts" means those funds and accounts established pursuant to Section 502 (*Establishment of Funds and Accounts*) of the Indenture.

“**Total Project Costs**” means (a) the costs paid or incurred or to be paid or incurred by the Borrower in connection with or incidental to the acquisition, design, construction and equipping of the Project, including legal, administrative, engineering, planning, design, insurance and financing (including costs of issuance); (b) amounts, if any, required by the Indenture Documents or the WIFIA Loan Documents to be paid into any fund or account upon the incurrence of the WIFIA Loan, any Senior Obligations, or any Subordinated Obligations, in each case in respect of the Project; (c) payments when due (whether at the maturity of principal, the due date of interest, or upon optional or mandatory prepayment) during the Construction Period in respect of any indebtedness of the Borrower or any Additional Security maintained by the Borrower, in each case in connection with the Project (other than the WIFIA Loan); and (d) costs of equipment and supplies and initial working capital and reserves required by the Borrower for the commencement of operation of the Project, including general administrative expenses and overhead of the Borrower.

“**Trustee**” has the meaning set forth in the Indenture.

“**Uncontrollable Force**” means any cause beyond the control of the Borrower, including: (a) a hurricane, tornado, flood or similar occurrence, landslide, earthquake, fire or other casualty, strike or labor disturbance, freight embargo, act of a public enemy, explosion, war, blockade, terrorist act, insurrection, riot, general arrest or restraint of government and people, civil disturbance or similar occurrence, sabotage, or act of God (provided, that the Borrower shall not be required to settle any strike or labor disturbance in which it may be involved) or (b) the order or judgment of any federal, state or local court, administrative agency or governmental officer or body, if it is not also the result of willful or negligent action or a lack of reasonable diligence of the Borrower and the Borrower does not control the administrative agency or governmental officer or body; provided, that the diligent contest in good faith of any such order or judgment shall not constitute or be construed as a willful or negligent action or a lack of reasonable diligence of the Borrower.

“**Uniform Commercial Code**” or “**UCC**” means the Uniform Commercial Code, as in effect from time to time in the State.

“**WIFIA**” has the meaning provided in the recitals hereto.

“**WIFIA Bond**” means the 2019 Series C Bond (as defined in the WIFIA Supplemental Indenture) delivered by the Borrower in substantially the form of **Exhibit A** (*Form of WIFIA Bond*).

“**WIFIA Debt Service**” means with respect to any Payment Date occurring on or after the Debt Service Payment Commencement Date, the principal portion of the Outstanding WIFIA Loan Balance and any interest payable thereon (including interest accruing after the date of any filing by the Borrower of any petition in bankruptcy or the commencement of any bankruptcy, insolvency or similar proceeding with respect to the Borrower), in each case, (a) as set forth on **Exhibit F** (*WIFIA Debt Service*) and (b) due and payable on such Payment Date in accordance with the provisions of Section 8(c) (*Payment of Principal and Interest – Payment of WIFIA Debt Service*).

“**WIFIA Debt Service Account**” means the debt service account established for the benefit of the WIFIA Lender in accordance with the terms of the Indenture and the WIFIA Supplemental Indenture.

“**WIFIA Interest Rate**” has the meaning provided in Section 6 (*Interest Rate*).

“**WIFIA Lender**” has the meaning provided in the preamble hereto.

“**WIFIA Lender’s Authorized Representative**” means the Administrator and any other Person who shall be designated as such pursuant to Section 22 (*WIFIA Lender’s Authorized Representative*).

“**WIFIA Loan**” means the secured loan made by the WIFIA Lender to the Borrower on the terms and conditions set forth herein, pursuant to the Act, in an original principal amount not to exceed \$268,710,610 (excluding compounded and capitalized interest), to be used in respect of Eligible Project Costs paid or incurred by the Borrower.

“**WIFIA Loan Documents**” means this Agreement, the WIFIA Bond and the Indenture Documents (excluding documentation related to Additional Security, Qualified Swap Agreements and any Supplemental Indenture other than the WIFIA Supplemental Indenture).

“**WIFIA Supplemental Indenture**” means the Twenty-Sixth Supplemental Indenture, dated August 27, 2019, between the Borrower and the Trustee.

Section 2. Interpretation.

(a) Unless the context shall otherwise require, the words “hereto,” “herein,” “hereof” and other words of similar import refer to this Agreement as a whole.

(b) Words of the masculine gender shall be deemed and construed to include correlative words of the feminine and neuter genders and vice versa.

(c) Words importing the singular number shall include the plural number and vice versa unless the context shall otherwise require.

(d) The words “include,” “includes” and “including” shall be deemed to be followed by the phrase “without limitation.”

(e) Whenever the Borrower’s knowledge is implicated in this Agreement or the phrase “to the Borrower’s knowledge” or a similar phrase is used in this Agreement, the Borrower’s knowledge or such phrase(s) shall be interpreted to mean to the best of the Borrower’s actual knowledge. Unless the context shall otherwise require, references to any Person shall be deemed to include such Person’s successors and permitted assigns.

(f) Unless the context shall otherwise require, references to preambles, recitals, Sections, subsections, clauses, schedules, exhibits, appendices and provisions are to the applicable preambles, recitals, Sections, subsections, clauses, schedules, exhibits, appendices and provisions of this Agreement.

(g) The schedules and exhibits to this Agreement, and the appendices and schedules to such exhibits, are hereby incorporated by reference and made an integral part of this Agreement.

(h) The headings or titles of this Agreement and its Sections, schedules or exhibits, as well as any table of contents, are for convenience of reference only and shall not define or limit its provisions.

(i) Unless the context shall otherwise require, all references to any resolution, contract, agreement, lease or other document shall be deemed to include any amendments or supplements to, or modifications or restatements or replacements of, such documents that are approved from time to time in accordance with the terms thereof and hereof.

(j) Every request, order, demand, application, appointment, notice, statement, certificate, consent or similar communication or action hereunder by any party shall, unless otherwise specifically provided, be delivered in writing in accordance with Section 31 (*Notices*) and signed by a duly authorized representative of such party.

(k) References to “disbursements of WIFIA Loan Proceeds” or similar phrasing shall be construed as meaning the same thing as “paying the purchase price of the WIFIA Bond”.

(l) Whenever the Agreement requires a change in principal amount, interest rate or amortization schedule of the WIFIA Loan, it is intended that such change be reflected in the WIFIA Bond. Whenever there is a mandatory or optional prepayment of the WIFIA Loan, it is intended that such prepayment be implemented through a prepayment of the WIFIA Bond.

ARTICLE II THE WIFIA LOAN

Section 3. WIFIA Loan Amount. The original principal amount of the WIFIA Loan shall not exceed \$268,710,610 (excluding any interest that is compounded and capitalized in accordance with the terms hereof). WIFIA Loan proceeds available to be drawn shall be disbursed from time to time in accordance with Section 4 (*Disbursement Conditions*) and Section 11(b) (*Conditions Precedent – Conditions Precedent to Disbursements*).

Section 4. Disbursement Conditions.

(a) WIFIA Loan proceeds shall be disbursed solely in respect of Eligible Project Costs paid or incurred and approved for payment by or on behalf of the Borrower in connection with the Project. If the Borrower intends to utilize the WIFIA Loan proceeds to make progress payments for Project construction work performed under the Principal Project Contracts, the Borrower shall demonstrate to the satisfaction of the WIFIA Lender that such progress payments are commensurate with the value of the work that has been completed. Each disbursement of the WIFIA Loan shall be made pursuant to a requisition and certification (a “**Requisition**”) in the form set forth in **Appendix One** (*Form of Requisition*) to **Exhibit D** (*Requisition Procedures*), along with all documentation and other information required thereby, submitted by the Borrower to, and approved by, the WIFIA Lender, all in accordance with the

procedures of **Exhibit D** (*Requisition Procedures*) and subject to the requirements of this Section 4 (*Disbursement Conditions*) and the conditions set forth in Section 11(b) (*Conditions Precedent – Conditions Precedent to Disbursements*); provided, that no disbursements of WIFIA Loan proceeds shall be made on or after the Final Disbursement Date.

(b) The Borrower shall deliver copies of each Requisition to the WIFIA Lender and the Servicer (if any) on or before the first (1st) Business Day of each month for which a disbursement is requested. If the WIFIA Lender shall expressly approve a Requisition or shall not expressly deny a Requisition, disbursements of funds shall be made on the fifteenth (15th) day of the month for which a disbursement has been requested, or on the next succeeding Business Day if such fifteenth (15th) day is not a Business Day. Express WIFIA Lender approval or denial shall be substantially in the form annexed hereto as **Appendix Two** (*[Approval/Disapproval] of the WIFIA Lender*) to **Exhibit D** (*Requisition Procedures*). In no event shall disbursements be made more than once each month.

(c) At the time of any disbursement, the sum of all prior disbursements of WIFIA Loan proceeds and the disbursement then to be made shall not exceed the cumulative disbursements through the end of the then-current Federal Fiscal Year set forth in the Anticipated WIFIA Loan Disbursement Schedule, as the same may be amended from time to time in accordance with the terms of this Agreement. Subject to this Section 4 (*Disbursement Conditions*), any scheduled disbursement (as reflected in the Anticipated WIFIA Loan Disbursement Schedule) that remains undrawn at the end of any Federal Fiscal Year shall automatically roll forward to be available in the succeeding Federal Fiscal Year, having the effect of automatically updating the Anticipated WIFIA Loan Disbursement Schedule without need for the WIFIA Lender's approval. The Borrower may also amend the Anticipated WIFIA Loan Disbursement Schedule by submitting a revised version thereof to the WIFIA Lender no later than thirty (30) days prior to the proposed effective date of such amendment, together with a detailed explanation of the reasons for such revisions. Such revised Anticipated WIFIA Loan Disbursement Schedule shall become effective upon the WIFIA Lender's approval thereof, which approval shall be granted or denied in the WIFIA Lender's sole discretion.

Section 5. Term. The term of the WIFIA Loan shall extend from the Effective Date to the Final Maturity Date or to such earlier date as all amounts due or to become due to the WIFIA Lender hereunder have been irrevocably paid in full in immediately available funds.

Section 6. Interest Rate. The interest rate with respect to the Outstanding WIFIA Loan Balance (the "**WIFIA Interest Rate**") shall be one and eighty-nine hundredths percent (1.89%) per annum. Interest will accrue and be computed on the Outstanding WIFIA Loan Balance (as well as on any past due interest) from time to time on the basis of a three hundred sixty (360) day year of twelve (12) thirty (30) day months; provided, that, in the event of an Event of Default, the Borrower shall pay interest on the Outstanding WIFIA Loan Balance at the Default Rate, in the case of any Payment Default, from (and including) its due date to (but excluding) the date of actual payment and, in the case of any other Event of Default, from (and including) the date of such occurrence to (but excluding) the earlier of the date on which (x) such Event of Default has been cured (if applicable) in accordance with the terms of this Agreement and (y) the Outstanding WIFIA Loan Balance has been paid in full in cash.

Section 7. Security and Priority; Flow of Funds.

(a) As security for the WIFIA Loan, the Borrower shall pledge, assign and grant to the WIFIA Lender, or shall cause to be pledged, assigned and granted, to the Trustee for the benefit of the WIFIA Lender, Liens on the Pledged Collateral in accordance with the provisions of the Indenture Documents and shall deliver to the WIFIA Lender, as the registered owner or Bondholder, the WIFIA Bond. The WIFIA Loan shall constitute a Bond for purposes of the Indenture, entitled to all of the benefits of a Bond under the Indenture, and shall be secured by the Liens on the Pledged Collateral, which Liens shall at all times be (i) *pari passu* in right of payment and right of security with the Liens on the Pledged Collateral for the benefit of the other Holders of Bonds and (ii) senior in right of payment and right of security to the Liens on the Pledged Collateral for the benefit of the Holders of Subordinated Obligations. Except for Permitted Liens, the Pledged Collateral will be free and clear of any pledge, Lien, charge or encumbrance thereon or with respect thereto, of equal rank with or senior to the pledge of the Borrower created under the Indenture Documents.

(b) The Indenture provides that all Revenues, except for certain exclusions as set forth in Section 504 (*Revenue Fund*) of the Indenture, and certain other moneys shall be deposited in the Revenue Fund and applied in accordance with the requirements specified in Section 504 (*Revenue Fund*) of the Indenture. A copy of such section, as of the Effective Date, is attached hereto as **Schedule VI** (*Flow of Funds*).

(c) The Indenture provides that, during the continuance of an Event of Default (as defined in the Indenture), moneys, Reserve Deposits (as defined in the Indenture), Additional Security, if any, and funds and such Revenues and income therefrom held by and available to the Trustee, including as a result of the exercise of remedies by the Trustee on behalf of the Holders of Obligations, shall be applied as set forth in Section 702 (*Application of Revenues and Other Moneys after Default*) of the Indenture. A copy of such section, as of the Effective Date, is attached hereto as **Schedule VII** (*Flow of Funds Following Default*).

Section 8. Payment of Principal and Interest.

(a) Payment Dates. The Borrower agrees to pay the principal of and interest on the WIFIA Loan by making payments in accordance with the provisions of this Agreement, the WIFIA Bond, and the Indenture Documents, in the case of interest, on each Interest Payment Date, and in the case of principal, on each Principal Payment Date, and in each case, on each other date on which payment thereof is required to be made hereunder (including the Final Maturity Date and any date on which payment is due by reason of the acceleration of the maturity of the WIFIA Loan or otherwise); provided, that if any such date is not a Business Day, payment shall be made on the next Business Day following such date. Any payment in respect of the WIFIA Bond shall be treated as a payment in respect of the WIFIA Loan and any prepayment of principal in respect of the WIFIA Loan shall be treated as a redemption in respect of the WIFIA Bond. With respect to the WIFIA Loan (and the corresponding WIFIA Bond), interest shall accrue and be payable only on those amounts for which a Requisition has been submitted and funds (or such portion of funds as has been approved by the WIFIA Lender) have been made available to the Borrower for use on the Project in accordance with Section 4 (*Disbursement Conditions*).

(b) Capitalized Interest Period. No payment of the principal of or interest on the WIFIA Loan is required to be made during the Capitalized Interest Period. Interest on amounts compounded and capitalized pursuant to this Section 8(b) (*Payment of Principal and Interest – Capitalized Interest Period*) shall commence on the date such interest is added to the principal balance of the WIFIA Loan (and corresponding WIFIA Bond) during the Capitalized Interest Period. On each March 1 and September 1 occurring during the Capitalized Interest Period, interest accrued on the WIFIA Loan in the six (6) month period ending immediately prior to such date shall be compounded, capitalized and added to the Outstanding WIFIA Loan Balance. Within thirty (30) days after the end of the Capitalized Interest Period, the WIFIA Lender shall give written notice to the Borrower stating the Outstanding WIFIA Loan Balance as of the close of business on the last day of the Capitalized Interest Period, which statement thereof shall be deemed conclusive absent manifest error; provided, however, that no failure to give or delay in giving such notice shall affect any of the obligations of the Borrower hereunder or under any of the other WIFIA Loan Documents. Notwithstanding the foregoing, the Capitalized Interest Period shall end immediately upon written notification to the Borrower by the WIFIA Lender that an Event of Default has occurred, in which case the provisions of this Section 8(b) (*Payment of Principal and Interest – Capitalized Interest Period*) shall no longer apply and payments of principal and interest shall be currently due and payable in accordance with the terms hereof and interest shall no longer be compounded and capitalized. For purposes of this subsection, an Event of Default under Section 17(a)(v) (*Events of Default and Remedies – Cross Default with Other Financing Documents*) shall be deemed to have occurred upon the occurrence of any nonpayment of principal of, interest on or redemption price of Senior Obligations when due, regardless of whether the holders of the applicable Obligations or the Trustee for the applicable obligations, or any legal order, has waived, permitted deferral of, or forgiven any such payment.

(c) Payment of WIFIA Debt Service. On each Payment Date occurring on or after the Debt Service Payment Commencement Date, the Borrower shall pay WIFIA Debt Service in the amounts set forth in respect of such Payment Date on **Exhibit F** (*WIFIA Debt Service*), as the same may be revised as provided in Section 8(g) (*Payment of Principal and Interest – Adjustments to Loan Amortization Schedule*), which payments shall be made in accordance with Section 8(d) (*Payment of Principal and Interest – Manner of Payment*).

(d) Manner of Payment. Payments under this Agreement (and the WIFIA Bond, which payments shall not be duplicative) shall be made by wire transfer on or before each Payment Date in Dollars and in immediately available funds (without counterclaim, offset or deduction) in accordance with the payment instructions set forth in **Schedule V** (*WIFIA Payment Instructions*), as modified in writing from time to time by the WIFIA Lender. The Borrower may make any such payment or portion thereof (or direct the Trustee to make such payment) with funds then on deposit in the WIFIA Debt Service Account.

(e) Final Maturity Date. Notwithstanding anything herein to the contrary, the Outstanding WIFIA Loan Balance and any accrued interest thereon shall be due and payable in full on the Final Maturity Date (or on any earlier date on which the WIFIA Loan and corresponding WIFIA Bond are subject to prepayment prior to maturity thereof or shall be accelerated pursuant to the terms of the Indenture).

(f) WIFIA Bond. As evidence of the Borrower's obligation to repay the WIFIA Loan, the Borrower shall issue and deliver to the WIFIA Lender, on or prior to the Effective Date, the WIFIA Bond substantially in the form of **Exhibit A** (*Form of WIFIA Bond*), having a maximum original principal amount (excluding compounded and capitalized interest) of \$268,710,610 (subject to increase or decrease as herein provided), bearing interest at the rate set forth in Section 6 (*Interest Rate*) and having principal and interest payable on the same dates set forth herein.

(g) Adjustments to Loan Amortization Schedule.

(i) The Outstanding WIFIA Loan Balance will be (A) increased on each occasion on which the WIFIA Lender disburses loan proceeds hereunder, by the amount of such disbursement of loan proceeds; (B) increased on each occasion on which interest on the WIFIA Loan is compounded and capitalized pursuant to the provisions of Section 8(b) (*Payment of Principal and Interest – Capitalized Interest Period*), by the amount of interest so compounded and capitalized; and (C) decreased upon each payment or prepayment of the Outstanding WIFIA Loan Balance, by the amount of principal so paid. The WIFIA Lender may in its discretion at any time and from time to time, or when so requested by the Borrower, advise the Borrower and the Trustee by written notice of the amount of the Outstanding WIFIA Loan Balance as of the date of such notice, and its determination of such amount in any such notice shall be deemed conclusive absent manifest error.

(ii) The WIFIA Lender is hereby authorized to modify the Loan Amortization Schedule included in **Exhibit F** (*WIFIA Debt Service*) from time to time, in accordance with the principles set forth below in this clause (ii), to reflect (A) any change to the Outstanding WIFIA Loan Balance, (B) any change to the date and amount of any principal or interest due and payable or to become due and payable by the Borrower under this Agreement, and (C) such other information as the WIFIA Lender may determine is necessary for administering the WIFIA Loan and this Agreement. Any calculations described above shall be rounded up to the nearest whole cent. Any partial prepayments of the Outstanding WIFIA Loan Balance pursuant to Section 9 (*Prepayment*) shall be applied in accordance with Section 9(d) (*Prepayment – General Prepayment Instructions*). Any adjustments or revisions to the Loan Amortization Schedule as a result of changes in the Outstanding WIFIA Loan Balance other than prepayments shall be applied to reduce future payments due on the WIFIA Bond in inverse order of maturity. Absent manifest error, the WIFIA Lender's determination of such matters as set forth on **Exhibit F** (*WIFIA Debt Service*) shall be conclusive evidence thereof; provided, however, that neither the failure to make any such recordation nor any error in such recordation shall affect in any manner the Borrower's obligations hereunder or under any other WIFIA Loan Document. The WIFIA Lender shall provide the Borrower and the Trustee with a copy of **Exhibit F** (*WIFIA Debt Service*) as revised, but no failure to provide or delay in providing the Borrower with such copy shall affect any of the obligations of the Borrower under this Agreement or the other WIFIA Loan Documents.

Section 9. Prepayment.

(a) [RESERVED].

(b) Optional Prepayments. The Borrower may prepay the WIFIA Loan in whole or in part (and, if in part, the amounts thereof to be prepaid shall be determined by the Borrower; provided, however, that such prepayments shall be in principal amounts of \$1,000,000 or any integral multiple of \$1.00 in excess thereof), at any time or from time to time, but not more than annually, without penalty or premium, by paying to the WIFIA Lender such principal amount of the WIFIA Loan to be prepaid, together with the unpaid interest accrued on the amount of principal so prepaid to the date of such prepayment. Each prepayment of the WIFIA Loan shall be made on such date and in such principal amount as shall be specified by the Borrower in a written notice delivered to the WIFIA Lender not less than ten (10) days or more than thirty (30) days prior to the date set for prepayment, unless otherwise agreed by the WIFIA Lender. At any time between delivery of such written notice and the applicable optional prepayment, the Borrower may, without penalty or premium, rescind its announced optional prepayment by further written notice to the WIFIA Lender. Anything in this Section 9(b) (*Prepayment – Optional Prepayments*) to the contrary notwithstanding, the failure by the Borrower to make any optional prepayment shall not constitute a breach or default under this Agreement.

(c) Borrower's Certificate. Each prepayment pursuant to this Section 9 (*Prepayment*) shall be effected pursuant to the WIFIA Supplemental Indenture and accompanied by a certificate signed by the Borrower's Authorized Representative identifying the provision of this Agreement pursuant to which such prepayment is being made and containing a calculation in reasonable detail of the amount of such prepayment.

(d) General Prepayment Instructions. Upon the WIFIA Lender's receipt of confirmation that payment in full of the entire Outstanding WIFIA Loan Balance and any unpaid interest, fees and expenses with respect thereto has occurred as a result of a prepayment, the WIFIA Lender shall surrender the WIFIA Bond to the Borrower or its representative at the principal office of the WIFIA Lender. If the Borrower prepays only part of the unpaid balance of principal of the WIFIA Loan, the WIFIA Lender may make a notation on **Exhibit F** (*WIFIA Debt Service*) indicating the amount of principal of and interest on the WIFIA Loan then being prepaid. Absent manifest error, the WIFIA Lender's determination of such matters as set forth on **Exhibit F** (*WIFIA Debt Service*) shall be conclusive evidence thereof; provided, however, that neither the failure to make any such recordation nor any error in such recordation shall affect in any manner the Borrower's obligations hereunder or under any other WIFIA Loan Document. All such partial prepayments of principal shall be applied to reduce future payments due on the WIFIA Loan in inverse order of maturity. If such funds have not been so paid on the prepayment date, such principal amount of the WIFIA Loan shall continue to bear interest until payment thereof at the rate provided for in Section 6 (*Interest Rate*).

Section 10. Fees and Expenses.

(a) Fees. The Borrower shall pay to the WIFIA Lender:

(i) a servicing set-up fee equal to \$20,430 (the “**Servicing Set-Up Fee**”), which shall be due and payable within thirty (30) days after receipt of an invoice from the WIFIA Lender with respect thereto (or, if earlier, the first disbursement date);

(ii) an annual construction period servicing fee equal to \$20,430 (the “**Construction Period Servicing Fee**”), which shall accrue on the first Business Day of the then-current Federal Fiscal Year and shall be due and payable on or prior to each November 15 during the Construction Period (including the Federal Fiscal Year during which the Substantial Completion Date occurs); provided, that the initial Construction Period Servicing Fee shall be due and payable within thirty (30) days after receipt of an invoice from the WIFIA Lender with respect thereto (or, if earlier, the first disbursement date), in a pro-rated amount equal to \$1,702; and

(iii) an annual operating period servicing fee equal to \$7,660 (the “**Operating Period Servicing Fee**”), which shall accrue on the first Business Day of the then-current Federal Fiscal Year and shall be due and payable on or prior to each November 15, beginning with the first November 15 following the end of the Federal Fiscal Year during which the Substantial Completion Date occurs, until (and including) the Final Maturity Date; provided, that the Operating Period Servicing Fee due and payable with respect to the Federal Fiscal Year during which the Final Maturity Date occurs shall be equal to the pro-rata monthly portion of the then applicable Operating Period Servicing Fee multiplied by the number of partial or whole months remaining between October 1 and the Final Maturity Date.

(b) The amount of each Construction Period Servicing Fee (other than the initial Construction Period Servicing Fee) and each Operating Period Servicing Fee shall be adjusted in proportion to the percentage change in CPI for the calendar year immediately preceding the calendar year during which such fee is due. The WIFIA Lender shall notify the Borrower of the amount of each such fee at least thirty (30) days before payment is due, which determination shall be conclusive absent manifest error.

(c) Expenses. The Borrower agrees, whether or not the transactions hereby contemplated shall be consummated, to reimburse the WIFIA Lender on demand from time to time, within thirty (30) days after receipt of any invoice from the WIFIA Lender, for any and all fees, costs, charges, and expenses incurred by it (including the fees, costs, and expenses of its legal counsel, financial advisors, auditors and other consultants and advisors) in connection with the negotiation, preparation, execution, delivery, and performance of this Agreement and the other WIFIA Loan Documents and the transactions hereby and thereby contemplated, including attorneys’, and engineers’ fees and professional costs, including all such fees, costs, and expenses incurred as a result of or in connection with (i) the enforcement of or attempt to enforce, or the protection or preservation of any right or claim under, the Pledged Collateral or any provision of this Agreement or any of the other WIFIA Loan Documents or the rights of the WIFIA Lender thereunder; (ii) any amendment, modification, waiver, or consent with respect to this Agreement or any other Related Document; and (iii) any work-out, restructuring, or similar arrangement of the obligations of the Borrower under this Agreement or the other WIFIA Loan Documents, including during the pendency of any Event of Default.

(d) The obligations of the Borrower under this Section 10 (*Fees and Expenses*) shall survive the payment or prepayment in full or transfer of the WIFIA Bond, the enforcement of any provision of this Agreement or the other WIFIA Loan Documents, any such amendments, waivers or consents, any Event of Default, and any such workout, restructuring, or similar arrangement.

ARTICLE III CONDITIONS PRECEDENT

Section 11. Conditions Precedent.

(a) Conditions Precedent to Effectiveness. Notwithstanding anything in this Agreement to the contrary, this Agreement shall not become effective until each of the following conditions precedent has been satisfied or waived in writing by the WIFIA Lender in its sole discretion:

(i) The Borrower shall have duly executed and delivered to the WIFIA Lender this Agreement and the WIFIA Bond, each in form and substance satisfactory to the WIFIA Lender, and the Authenticating Agent (as defined in the Indenture) shall have authenticated the WIFIA Bond.

(ii) The Borrower shall have delivered to the WIFIA Lender certified, complete, and fully executed copies of each Indenture Document (excluding documentation related to Additional Security and Qualified Swap Agreements), together with any amendments, waivers or modifications thereto, that has been entered into on or prior to the Effective Date, and each such agreement shall be in full force and effect and in form and substance satisfactory to the WIFIA Lender, and all conditions contained in such documents to the closing of the transactions contemplated thereby shall have been fulfilled or effectively waived (provided, that for purposes of this Section 11(a)(ii) (*Conditions Precedent – Conditions Precedent to Effectiveness*), any such waiver shall be subject to the WIFIA Lender's consent in its sole discretion).

(iii) Counsel to the Borrower shall have rendered to the WIFIA Lender legal opinions satisfactory to the WIFIA Lender in its sole discretion (including those opinions set forth on **Exhibit G-1** (*Opinions Required from Counsel to Borrower*) and bond counsel to the Borrower shall have rendered to the WIFIA Lender legal opinions satisfactory to the WIFIA Lender in its sole discretion (including those opinions set forth on **Exhibit G-2** (*Opinions Required from Bond Counsel*)).

(iv) The Borrower shall have provided a certificate from the Borrower's Authorized Representative as to the absence of debarment, suspension or voluntary exclusion from participation in Government contracts, procurement and non-procurement matters substantially in the form attached hereto as **Exhibit C** (*Certification Regarding Debarment, Suspension and other Responsibility Matters*) with respect to the Borrower and its principals (as defined in 2 C.F.R. § 180.995 and supplemented by 2 C.F.R. § 1532.995). The Borrower shall have delivered to the WIFIA Lender the Non-Lobbying Certificate.

(v) The Borrower shall have provided evidence to the WIFIA Lender's satisfaction, no more than thirty (30) days prior to the Effective Date, of the assignment by at least two (2) Nationally Recognized Rating Agencies of a public Investment Grade Rating to the Senior Obligations then Outstanding and any Senior Obligations proposed to be issued for the Project and a public rating on the WIFIA Loan and no such rating has been reduced, withdrawn or suspended as of the Effective Date.

(vi) The Borrower shall have delivered to the WIFIA Lender a certificate from the Borrower's Authorized Representative in the form attached hereto as **Exhibit I** (*Form of Borrower's Officer's Certificate*) (A) as to the satisfaction of certain conditions precedent set forth in this Section 11(a) (*Conditions Precedent – Conditions Precedent to Effectiveness*) as required by the WIFIA Lender, (B) designating the Borrower's Authorized Representative, and (C) confirming such person's position and incumbency.

(vii) The Borrower shall have demonstrated to the WIFIA Lender's satisfaction that as of the Effective Date the aggregate of all funds committed to the development and construction of the Project as set forth in the Base Case Financial Model and in the Project Budget are sufficient to carry out the Project, pay all Total Project Costs anticipated for the Project and achieve Substantial Completion by the Projected Substantial Completion Date.

(viii) Each Existing Principal Project Contract shall be in full force and effect and, if requested in writing by the WIFIA Lender, the Borrower shall have provided to the WIFIA Lender certified, complete, and fully executed copies of each, together with any amendments, waivers or modifications thereto.

(ix) The Borrower shall have demonstrated to the WIFIA Lender's satisfaction (A) that it has obtained all Governmental Approvals required (1) as of the Effective Date in connection with the Project and (2) to execute and deliver, and perform its obligations under the WIFIA Loan Agreement and (B) that all such Governmental Approvals are final, non-appealable, and in full force and effect (and are not subject to any notice of violation, breach or revocation); provided that the WIFIA Lender and the Borrower understand and agree that, pursuant to Rhode Island General Laws Section 42-35-15, the DPUC Order is subject to a thirty (30)-day appeal period.

(x) The Borrower shall have delivered to the WIFIA Lender a certified Base Case Financial Model on or prior to the Effective Date, which Base Case Financial Model shall (A) demonstrate that projected Revenues are sufficient to meet the Loan Amortization Schedule, (B) demonstrate compliance with the Rate Covenant for each Borrower Fiscal Year through the Final Maturity Date; (C) reflect principal amortization and interest payment schedules acceptable to the WIFIA Lender, (D) demonstrate that the Borrower has developed, and identified adequate revenues to implement, a plan for operating, maintaining and repairing the Project over the useful life of the Project; and (E) otherwise be in form and substance acceptable to the WIFIA Lender.

(xi) The Borrower shall have (A) provided evidence satisfactory to the WIFIA Lender that the Borrower is authorized, pursuant to Sections 46-25-5, 46-25-58 and 46-25-59 of the Rhode Island General Laws, to pledge, assign, and grant the Liens on the Pledged Collateral purported to be pledged, assigned, and granted pursuant to the Indenture Documents, without the need for notice to any Person, physical delivery, recordation, filing or further act, (B) recorded or filed, or caused to be recorded or filed, for record in such manner and in such places as are required all documents and instruments, and taken or caused to be taken all other actions, as are necessary or desirable to establish and enforce the Trustee's Lien on the Pledged Collateral (for the benefit of the Secured Parties) to the extent contemplated by the Indenture Documents or required pursuant to applicable law, and (C) paid, or caused to be paid, all taxes and filing fees that are due and payable in connection with the execution, delivery or recordation of any Related Documents or any instruments, certificates or financing statements in connection with the foregoing.

(xii) The Borrower shall have paid in full all invoices delivered by the WIFIA Lender to the Borrower as of the Effective Date for the fees and expenses of the WIFIA Lender's counsel and financial advisors and any auditors or other consultants retained by the WIFIA Lender for the purposes hereof.

(xiii) The Borrower shall have (A) provided evidence satisfactory to the WIFIA Lender of compliance with NEPA and any applicable federal, state or local environmental review and approval requirements with respect to the Project and (B) complied with all applicable requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601 *et seq.*) and Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*) and shall have provided evidence satisfactory to the WIFIA Lender of such compliance upon request by the WIFIA Lender.

(xiv) No later than thirty (30) days prior to the Effective Date, the Borrower shall have delivered to the WIFIA Lender the Public Benefits Report.

(xv) The Borrower shall have (A) obtained a Federal Employer Identification Number, (B) obtained a Data Universal Numbering System number, and (C) registered with, and obtained confirmation of active registration status from, the federal System for Award Management (www.SAM.gov).

(xvi) Each of the insurance policies obtained by the Borrower in satisfaction of the conditions in Section 14(f) (*Affirmative Covenants – Insurance and Condemnation*) is in full force and effect, and no notice of termination thereof has been issued by the applicable insurance provider.

(xvii) The Borrower shall have provided to the WIFIA Lender evidence that the Borrower is duly organized and validly existing under the laws of its jurisdiction of formation, with full power, authority and legal right to own its properties and carry on its business and governmental functions as now conducted, including a copy of the Borrower's Organizational Documents, as in effect on the Effective Date (and certified by the Secretary of State of the State, to the extent applicable), which Organizational

Documents shall be certified by the Borrower's Authorized Representative to be in full force and effect and shall not have been amended since the date of the last amendment thereto shown on the certificate.

(xviii) The Borrower shall have provided to the WIFIA Lender (A) an executed copy of the WIFIA Supplemental Indenture, (B) all other resolutions, ordinances, or supplements (as the case may be), if any, authorizing the Borrower to execute and deliver, and to perform its respective obligations under, the WIFIA Loan Documents to which it is a party, and (C) all further instruments and documents as are necessary, appropriate or advisable to effectuate the foregoing resolutions and to consummate and implement the transactions contemplated by such resolutions and the WIFIA Loan Documents, and in each case such documents have not been subsequently modified, rescinded or amended, are in full force and effect in the form adopted, and are the only documents required and adopted by the Borrower relating to the matters described therein.

(xix) [RESERVED].

(xx) The Borrower shall have received certified, complete and fully executed copies of each performance security instrument (if any) required to be delivered to the Borrower pursuant to any Principal Project Contract as of the Effective Date, each of which performance security instruments (if any) shall be (A) in compliance with the requirements for such performance security pursuant to the applicable Principal Project Contract and (B) in full force and effect.

(xxi) The representations and warranties of the Borrower set forth in this Agreement (including Section 12 (*Representations and Warranties of Borrower*)) and in each other Related Document shall be true and correct, as of the Effective Date, except to the extent such representations and warranties expressly relate to an earlier date (in which case, such representations and warranties shall be true and correct as of such earlier date).

(xxii) The Borrower shall have provided the WIFIA Lender with evidence satisfactory to the WIFIA Lender that, as of the Effective Date (A) the maximum principal amount of the WIFIA Loan (excluding any interest that is compounded and capitalized in accordance with the terms hereof), together with the amount of any other credit assistance provided under the Act to the Borrower, does not exceed forty-nine percent (49%) of reasonably anticipated Eligible Project Costs and (B) the total federal assistance provided to the Project, including the maximum principal amount of the WIFIA Loan (excluding any interest that is compounded and capitalized in accordance with the terms hereof), does not exceed eighty percent (80%) of Total Project Costs.

(xxiii) The Borrower shall have delivered to the WIFIA Lender a duly executed certificate from the Trustee in the form attached hereto as **Exhibit H** (*Form of Certificate of Trustee*).

(xxiv) [RESERVED].

(xxv) [RESERVED].

(xxvi) The Borrower shall have delivered such other agreements, documents, instruments, opinions and other items required by the WIFIA Lender, all in form and substance satisfactory to the WIFIA Lender.

(b) Conditions Precedent to Disbursements. Notwithstanding anything in this Agreement to the contrary, the WIFIA Lender shall have no obligation to make any disbursement of loan proceeds to the Borrower (including the initial disbursement hereunder) until each of the following conditions precedent has been satisfied or waived in writing by the WIFIA Lender in its sole discretion:

(i) (A) The 30-day appeal period for the DPUC Order shall have expired without the filing of any appeal, (B) the WIFIA Bond shall have been fully approved pursuant to all applicable laws of the State, and (C) the Borrower shall have provided the WIFIA Lender with the certificate of the Borrower's Authorized Representative required pursuant to Section 16(h)(i) (*Reporting Requirements – Notices*);

(ii) The Borrower shall have provided to the WIFIA Lender evidence satisfactory to the WIFIA Lender that (A) the aggregate amount of all disbursements of the WIFIA Loan (including the requested disbursement but excluding any interest that is compounded and capitalized in accordance with the terms hereof) shall not exceed the amount of Eligible Project Costs paid or incurred by the Borrower and (B) the Borrower has sufficient available funds committed to the Project, which together with funds that remain available and not yet drawn under the WIFIA Loan, will be sufficient to pay the reasonably anticipated remaining Total Project Costs.

(iii) The Borrower shall have provided all information required as of the relevant disbursement date pursuant to Section 16(a) (*Reporting Requirements – Financial Reporting*) and Section 16(b) (*Reporting Requirements – Annual Financial Statements*).

(iv) To the extent not previously delivered to the WIFIA Lender, the Borrower shall have delivered to the WIFIA Lender certified, complete and fully executed copies of any Indenture Documents entered into after the Effective Date.

(v) To the extent (A) not previously delivered to the WIFIA Lender and (B) requested in writing by the WIFIA Lender, the Borrower shall have provided certified copies of all Principal Project Contracts (including, in each case, any amendment, modification or supplement thereto) entered into after the Effective Date.

(vi) The Borrower shall have demonstrated to the WIFIA Lender's satisfaction that all Governmental Approvals necessary as of the time of the applicable disbursement for the development, construction, operation and maintenance of the Project have been issued and are in full force and effect (including approval from the Rhode Island Coastal Resources Management Council for those construction activities subject to its regulatory authority).

(vii) Each of the insurance policies obtained by the Borrower and by any applicable Principal Project Party in satisfaction of the conditions in Section 14(f) (*Affirmative Covenants – Insurance and Condemnation*) is in full force and effect, and no notice of termination thereof has been issued by the applicable insurance provider.

(viii) At the time of, and immediately after giving effect to, any disbursement of WIFIA Loan proceeds then currently requested, (A) no Default or Event of Default hereunder shall have occurred and be continuing and (B) no event of default or default that, with the giving of notice or the passage of time or both, would constitute an event of default, in each case, under any other Related Document, shall have occurred and be continuing.

(ix) The representations and warranties of the Borrower set forth in this Agreement (including Section 12 (*Representations and Warranties of Borrower*)) and in each other Related Document shall be true, correct and complete as of each date on which any disbursement of the WIFIA Loan is made, except to the extent such representations and warranties expressly relate to an earlier date (in which case, such representations and warranties shall be true and correct as of such earlier date).

(x) No Material Adverse Effect, or any event or condition that could reasonably be expected to result in a Material Adverse Effect, shall have occurred since February 28, 2019.

(xi) The Borrower shall have delivered to the WIFIA Lender a Requisition that complies with the provisions of Section 4 (*Disbursement Conditions*), and the WIFIA Lender shall have approved (or be deemed to have approved in accordance with Section 4(b) (*Disbursement Conditions*)) such Requisition.

(xii) The Borrower shall have paid in full (A) any outstanding Servicing Fees due and payable under Section 10 (*Fees and Expenses*) and (B) all invoices received from the WIFIA Lender as of the date of disbursement of the WIFIA Loan and delivered by the WIFIA Lender to the Borrower, for the fees and expenses of the WIFIA Lender's counsel and financial advisors and any auditors or other consultants retained by the WIFIA Lender for the purposes hereof.

(xiii) To the extent not previously received by the Borrower, the Borrower shall have received complete and fully executed copies of each performance security instrument (if any) required to be delivered to the Borrower pursuant to any Principal Project Contract as of the date of disbursement of the WIFIA Loan, each of which performance security instruments shall be (A) in compliance with the requirements for such performance security pursuant to the applicable Principal Project Contract and (B) in full force and effect.

(xiv) The Borrower shall have provided the WIFIA Lender with evidence satisfactory to the WIFIA Lender that, as of the relevant disbursement date, the total federal assistance provided to the Project, including the maximum principal amount of the WIFIA Loan (excluding any interest that is compounded and capitalized in

accordance with the terms hereof), does not exceed eighty percent (80%) of Total Project Costs.

ARTICLE IV REPRESENTATIONS AND WARRANTIES

Section 12. Representations and Warranties of Borrower. The Borrower hereby represents and warrants that, as of the Effective Date and, as to each of the representations and warranties below other than those contained in Section 12(b) (*Representations and Warranties of Borrower – Officers’ Authorization*), Section 12(k) (*Representations and Warranties of Borrower – Credit Ratings*), and the first sentence of Section 12(n) (*Representations and Warranties of Borrower – Principal Project Contracts*), as of each date on which any disbursement of the WIFIA Loan is requested or made:

(a) Organization; Power and Authority. The Borrower is a public corporation duly organized and validly existing under its Organizational Documents and the laws of the State, has full legal right, power and authority to do business in the State and to enter into the Related Documents then in existence, to execute and deliver this Agreement and the WIFIA Bond, and to carry out and consummate all transactions contemplated hereby and thereby and has duly authorized the execution, delivery and performance of this Agreement, the WIFIA Bond, and the other Related Documents.

(b) Officers’ Authorization. As of the Effective Date, the officers of the Borrower executing (or that previously executed) the Related Documents, and any certifications or instruments related thereto, to which the Borrower is a party are (or were at the time of such execution) duly and properly in office and fully authorized to execute the same.

(c) Due Execution; Enforceability. Each of the Related Documents in effect as of any date on which this representation and warranty is made, and to which the Borrower is a party has been duly authorized, executed and delivered by the Borrower and constitutes the legal, valid and binding agreement of the Borrower enforceable against the Borrower in accordance with its terms, except as such enforceability (i) may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws affecting the rights of creditors generally and (ii) is subject to general principles of equity (regardless of whether enforceability is considered in equity or at law).

(d) Non-Contravention. The execution and delivery of the Related Documents to which the Borrower is a party, the consummation of the transactions contemplated by the Related Documents, and the fulfillment of or compliance with the terms and conditions of all of the Related Documents, will not (i) conflict with the Borrower’s Organizational Documents, (ii) conflict in any material respect with, or constitute a violation, breach or default (whether immediately or after notice or the passage of time or both) by the Borrower of or under, any applicable law, administrative rule or regulation, any applicable court or administrative decree or order, or any indenture, mortgage, deed of trust, loan agreement, lease, contract or other agreement or instrument to which the Borrower is a party or by which it or its properties or assets are otherwise subject or bound, or (iii) result in the creation or imposition of any prohibited Lien,

charge or encumbrance of any nature whatsoever upon any of the property or assets of the Borrower.

(e) Consents and Approvals. No consent or approval of any trustee, holder of any indebtedness of the Borrower or any other Person, and no consent, permission, authorization, order or license of, or filing or registration with, any Governmental Authority is necessary in connection with (i) the execution and delivery by the Borrower of the Related Documents, except as have been obtained or made and as are in full force and effect, or (ii) (A) the consummation of any transaction contemplated by any of the foregoing documents or (B) the fulfillment of or compliance by the Borrower with the terms and conditions of any of the Related Documents, except as have been obtained or made and as are in full force and effect or as are ministerial in nature and can reasonably be expected to be obtained or made in the ordinary course on commercially reasonable terms and conditions when needed; provided, however, that, in respect of clause (ii) of this Section 12(e) (*Representations and Warranties of Borrower – Consents and Approvals*), the Borrower may require approval of rate increases from the Rhode Island Division of Public Utilities and Carriers and, in respect of the entirety of this Section 12(e) (*Representations and Warranties of Borrower – Consents and Approvals*) as of the Effective Date and only prior to September 15, 2019, the WIFIA Lender and the Borrower understand and agree that, pursuant to Rhode Island General Laws Section 42-35-15, the DPUC Order is subject to a thirty (30)-day appeal period.

(f) Litigation. There is no action suit, proceeding or, to the knowledge of the Borrower, any inquiry or investigation, in any case before or by any court or other Governmental Authority pending or, to the knowledge of the Borrower, threatened against or affecting the System (including the Project) or the ability of the Borrower to execute, deliver and perform its obligations under the Related Documents. As of the Effective Date and as of each other date on which the representations and warranties herein are made or confirmed, there is no action, suit, proceeding or, to the knowledge of the Borrower, any inquiry or investigation before or by any court or other Governmental Authority pending, or to the knowledge of the Borrower, threatened against or affecting the System (including the Project), the Borrower or the assets, properties or operations of the Borrower, that in any case could reasonably be expected to result in a Material Adverse Effect. To the Borrower's knowledge after reasonable and diligent inquiry, there are no actions of the type described above pending or, threatened against or affecting any of the Principal Project Parties, except for matters arising after the Effective Date that could not reasonably be expected to (i) result in a Material Adverse Effect or (ii) adversely affect the Borrower's ability to receive Revenues in amounts sufficient to meet the Loan Amortization Schedule. The Borrower is not in default (and no event has occurred and is continuing that, with the giving of notice or the passage of time or both, could constitute a default) with respect to any Governmental Approval, which default could reasonably be expected to result in a Material Adverse Effect.

(g) Security Interests. The Indenture Documents and Sections 46-25-5, 46-25-58 and 46-25-59 of the Rhode Island General Laws establish, in favor of the Trustee for the benefit of the WIFIA Lender, the valid and binding Liens on the Pledged Collateral that they purport to create, irrespective of whether any Person has notice of the pledge and without the need for any physical delivery, recordation, filing, or further act. Such Liens are in full force and effect and are not subordinate or junior to any other Liens in respect of the Pledged Collateral

except for the Permitted Liens arising by operation of law, and not *pari passu* with any obligations other than the Senior Obligations. The Borrower has duly and lawfully taken all actions required under this Agreement, the Indenture Documents, and applicable laws for the pledge of the Pledged Collateral pursuant to and in accordance with the Indenture Documents, and the security interests created in the Pledged Collateral have been duly perfected under applicable State law. The Borrower is not in breach of any covenants set forth in Section 14 (*Affirmative Covenants*) or in the Indenture Documents with respect to the matters described in such Section. As of the Effective Date and as of each other date this representation and warranty is made, (i) all documents (including UCC-1 financing statements) and instruments have been recorded or filed for record in such manner and in such places as are required and all other action as is necessary or desirable has been taken to establish a legal, valid, binding, and enforceable and perfected Lien on the Pledged Collateral in favor of the Trustee (for the benefit of the Secured Parties) to the extent contemplated by the Indenture Documents, and (ii) all taxes and filing fees that are due and payable in connection with the execution, delivery or recordation of any Indenture Documents or any instruments, certificates or financing statements in connection with the foregoing, have been paid.

(h) No Debarment. The Borrower has fully complied with its verification obligations under 2 C.F.R. § 180.320 and confirms, based on such verification, that, to its knowledge, neither the Borrower nor any of its principals (as defined in 2 C.F.R. § 180.995 and supplemented by 2 C.F.R. § 1532.995) is debarred, suspended or voluntarily excluded from participation in Government contracts, procurement or non-procurement matters or delinquent on a Government debt as more fully set forth in the certificate delivered pursuant to Section 11(a)(iv) (*Conditions Precedent – Conditions Precedent to Effectiveness*).

(i) Accuracy of Representations and Warranties. The representations, warranties and certifications of the Borrower set forth in this Agreement and the other Related Documents are true, correct, and complete, except to the extent such representations and warranties expressly relate to an earlier date (in which case, such representations and warranties shall be true, correct, and complete as of such earlier date).

(j) Compliance with Federal Requirements. The Borrower, and each of its contractors and subcontractors at all tiers with respect to the Project, has complied with all applicable federal laws, rules, regulations and requirements, including (i) 40 U.S.C. §§ 3141-3144, 3146, and 3147 and regulations relating thereto (Davis-Bacon Act Requirements), (ii) 33 U.S.C. § 3914 (relating to American iron and steel products), and (iii) those set forth in **Exhibit E** (*Compliance With Laws*). To ensure such compliance, the Borrower has included in all contracts with respect to the Project requirements that its contractor(s) shall comply with applicable federal laws, rules, regulations, and requirements set forth in this Section 12(j) (*Representations and Warranties of Borrower – Compliance with Federal Requirements*) and follow applicable federal guidance, and has required that the contractor(s) incorporate in all subcontracts (and cause all subcontractors to include in lower tier subcontracts) such terms and conditions as are required to be incorporated therein by applicable federal laws, rules, regulations and requirements set forth in this Section 12(j) (*Representations and Warranties of Borrower – Compliance with Federal Requirements*). With respect to the Davis-Bacon Act Requirements, the Borrower has inserted in full in all contracts relating to the Project the contract clauses set forth in the Code of Federal Regulations, Title 29 Part 5.5, and required and ensured that its

contractor(s) have inserted such clauses in all subcontracts and also a clause requiring all subcontractors to include these clauses in any lower tier subcontracts.

(k) Credit Ratings. The WIFIA Loan and the Senior Obligations then Outstanding have received a public Investment Grade Rating from at least two (2) Nationally Recognized Rating Agencies, the WIFIA Loan has received a public rating from at least two (2) Nationally Recognized Rating Agencies, written evidence of such ratings has been provided to the WIFIA Lender prior to the Effective Date, and no such rating has been reduced, withdrawn or suspended as of the Effective Date.

(l) No Defaults. No Default or Event of Default, and no default or event of default by the Borrower under any other Related Document, has occurred and is continuing.

(m) Governmental Approvals. All Governmental Approvals required as of the Effective Date and any subsequent date on which this representation is made (or deemed made) for the undertaking and completion by the Borrower of the Project, and for the operation and management thereof, have been obtained or effected and are in full force and effect and there is no basis for, nor proceeding that is pending or threatened that could reasonably be expected to result in, the revocation of any such Governmental Approval.

(n) Principal Project Contracts. Attached as **Schedule 12(n)** (*Principal Project Contracts*) is a list of the Existing Principal Project Contracts and all Additional Principal Project Contracts that are expected to be entered into, in each case including (i) the name of the contract, (ii) the parties thereto, (iii) the effective date or expected effective date, as applicable, and (iv) a brief description of each contract. With respect to each Principal Project Contract executed as of any date on which this representation and warranty is made, (x) it is in full force and effect, (y) all conditions precedent to the obligations of the respective parties under each such Principal Project Contract have been satisfied and (z) the Borrower has delivered to the WIFIA Lender a fully executed, complete and correct copy of each such Principal Project Contract (including in each case all exhibits, schedules and other attachments), including any amendments or modifications thereto and any related credit support instruments or side letters. No event has occurred that gives the Borrower or, to the Borrower's knowledge, any Principal Project Party, the right to terminate any such Principal Project Contract. The Borrower is not in breach of any material term in or in default under any of such Principal Project Contracts, and, to the knowledge of the Borrower, no party to any of such agreements or contracts is in breach of any material term therein or in default thereunder.

(o) Information. The information furnished by or on behalf of the Borrower to the WIFIA Lender, when taken as a whole, does not contain any untrue statement of a material fact or omit to state any material fact necessary to make the statements contained therein not misleading as of the date made or furnished; provided, that no representation or warranty is made with regard to projections or other forward-looking statements provided by or on behalf of the Borrower (including the Base Case Financial Model and the assumptions therein) except that the Base Case Financial Model (i) is based on assumptions that were reasonable in all material respects when made, (ii) was prepared in good faith and (iii) represents, in the opinion of the Borrower, reasonable projections at the time made of the future performance of the System and the Project (it being understood that projections are not to be considered or regarded as facts and

contain significant uncertainties and contingencies, many of which are beyond the control of the Borrower, that actual results may differ significantly from projections and that no representation is made with respect to the accuracy of such projections).

(p) OFAC; Anti-Corruption Laws. The Borrower (i) is not in violation of nor, since the date that is five (5) years prior to the Effective Date, has violated: (A) any applicable anti-money laundering laws, including those contained in the Bank Secrecy Act and the Patriot Act; (B) any applicable economic sanction laws administered by OFAC or by the United States Department of State; or (C) any applicable anti-drug trafficking, anti-terrorism, or anti-corruption laws, civil or criminal; and (ii) is not a Person (A) that is charged with, or has received notice from a Governmental Authority that it is under investigation for, any violation of any such laws; or (B) that has been, since the date that is five (5) years prior to the Effective Date, convicted of any violation of, has been subject to criminal or civil penalties pursuant to, had any of its property seized or forfeited under, or has entered into any agreement with the Government or a state or local government related to violations of any such laws. Neither the Borrower nor, to the knowledge of the Borrower after reasonable and diligent inquiry, any Principal Project Party, is a Person (i) that is named on the list of "Specially Designated Nationals and Blocked Persons" maintained by OFAC (or any successor Government office or list), or any similar list maintained by the United States Department of State (or any successor Government office or list); or (ii) with whom any U.S. Person (as defined by the applicable OFAC regulations) is prohibited from transacting business of the type contemplated by this Agreement and the other Related Documents under any other applicable law.

(q) Compliance with Law. The Borrower has complied in all material respects with, and has conducted (or caused to be conducted) its management and operation of the System (including the Project) in compliance in all material respects with, all applicable laws (other than Environmental Laws, which are addressed in Section 12(r) (*Representations and Warranties of Borrower – Environmental Matters*)), including those set forth on **Exhibit E** (*Compliance With Laws*), to the extent applicable. To the Borrower's knowledge, each of the Borrower's contractors and subcontractors at all tiers, has complied in all material respects with all applicable laws (other than such Environmental Laws) with respect to the Project, including those set forth on **Exhibit E** (*Compliance With Laws*), to the extent applicable. To the Borrower's knowledge after reasonable and diligent inquiry, each Principal Project Party is, and has caused its respective contractors and subcontractors to be, in compliance in all material respects with all applicable laws as they relate to the Project, including those set forth on **Exhibit E** (*Compliance With Laws*), to the extent applicable. No notices of violation of any applicable law have been issued, entered or received by the Borrower or, to the Borrower's knowledge after reasonable and diligent inquiry and solely in respect of the Project or any Principal Project Contract, any Principal Project Party, other than, in each case, notices of violations that are immaterial.

(r) Environmental Matters. Except as set forth in **Schedule 12(r)** (*Environmental Matters*), each of the Borrower and, to the Borrower's knowledge, each Principal Project Party, is in compliance with all laws applicable to the System (including the Project) relating to (i) air emissions, (ii) discharges to surface water or ground water, (iii) noise emissions, (iv) solid or liquid waste disposal, (v) the use, generation, storage, transportation or disposal of toxic or hazardous substances or wastes, (vi) biological resources (such as threatened

and endangered species), and (vii) other environmental, health or safety matters, including all laws applicable to the System (including the Project) (collectively, the “**Environmental Laws**”). All Governmental Approvals for the Project relating to Environmental Laws have been, or, when required, will be, obtained and are (or, as applicable, will be) in full force and effect. The Borrower has not received any written communication or notice, whether from a Governmental Authority, employee, citizens group, or any other Person, that alleges that the Borrower is not in full compliance with all Environmental Laws and Governmental Approvals relating thereto in connection with the Project and, to the Borrower’s knowledge, there are no circumstances that may prevent or interfere with full compliance in the future by the Borrower with any such Environmental Law or Governmental Approval. The Borrower has provided to the WIFIA Lender all material assessments, reports, results of investigations or audits, and other material information in the possession of or reasonably available to the Borrower regarding the Borrower’s or the Project’s compliance with (A) Environmental Laws and (B) Governmental Approvals that are required for the Project and relate to Environmental Laws.

(s) Sufficient Rights. The Borrower possesses either valid legal and beneficial title to, leasehold title in, or other valid legal rights with respect to the real property relating to the System (including the Project), in each case as is necessary and sufficient as of the date this representation is made for the construction, operation, maintenance and repair of the System (including the Project). As of any date on which this representation and warranty is made, the Principal Project Contracts then in effect and the Governmental Approvals that have been obtained and are then in full force and effect create rights in the Borrower sufficient to enable the Borrower to own, construct, operate, maintain and repair the Project and to perform its obligations under the Principal Project Contracts to which it is a party.

(t) Insurance. The Borrower is in compliance with all insurance obligations required under each Principal Project Contract and the other Related Documents as of the date on which this representation and warranty is made. To the extent the Borrower self-insures, the Borrower’s self-insurance program is actuarially sound and the Borrower has received an opinion from an accredited actuary within the last twelve (12) months, which opinion confirms that the Borrower’s self-insurance program is actuarially sound.

(u) No Liens. Except for Permitted Liens, the Borrower has not created, and is not under any obligation to create, and has not entered into any transaction or agreement that would result in the imposition of, any Lien on the Pledged Collateral, the System, the Project, or the Revenues, properties or assets in relation to the Project.

(v) Financial Statements. Each income statement, balance sheet and statement of operations and cash flows (collectively, “**Financial Statements**”) delivered to the WIFIA Lender pursuant to Section 16(b) (*Reporting Requirements – Annual Financial Statements*) has been prepared in accordance with GAAP and presents fairly, in all material respects, the financial condition of the Borrower as of the respective dates of the balance sheets included therein and the results of operations of the Borrower for the respective periods covered by the statements of income included therein. Except as reflected in such Financial Statements, there are no liabilities or obligations of the Borrower of any nature whatsoever for the period to which such Financial Statements relate that are required to be disclosed in accordance with GAAP.

(w) Securities Laws. Under existing law, the WIFIA Bond may be issued and sold without registration under the Securities Act of 1933, as amended, and any state blue sky laws, and the Indenture is exempt from qualification pursuant to the Trust Indenture Act of 1939, as amended.

(x) Taxes. The Borrower is not required to file tax returns in respect of income tax with any Governmental Authority.

(y) Sufficient Funds. The amount of the WIFIA Loan, when combined with all other funds committed for the development and construction of the Project as set forth under the various sources of funds in the Base Case Financial Model and the Project Budget will be sufficient to carry out the Project, pay all Total Project Costs anticipated for the development and construction of the Project and achieve Substantial Completion by the Projected Substantial Completion Date.

(z) Sovereign Immunity. The Borrower has no immunity from the jurisdiction of any court of competent jurisdiction or from any legal process therein which could be asserted in any action to enforce the obligations of the Borrower under any of the Related Documents to which it is a party or the transactions contemplated hereby or thereby, including the obligations of the Borrower hereunder and thereunder.

(aa) Patriot Act. The Borrower is not required to establish an anti-money laundering compliance program pursuant to the Patriot Act.

(bb) Federal Debt. The Borrower has no delinquent federal debt (including tax liabilities but excluding any delinquencies that have been resolved with the appropriate federal agency in accordance with the standards of the Debt Collection Improvement Act of 1996).

Section 13. Representations and Warranties of WIFIA Lender. The WIFIA Lender represents and warrants that:

(a) Power and Authority. The WIFIA Lender has all requisite power and authority to make the WIFIA Loan and to perform all transactions contemplated by the Related Documents to which it is a party.

(b) Due Execution; Enforceability. The Related Documents to which it is a party have been duly authorized, executed and delivered by the WIFIA Lender, and are legally valid and binding agreements of the WIFIA Lender, enforceable in accordance with their terms.

(c) Officers' Authorization. The officers of the WIFIA Lender executing each of the Related Documents to which the WIFIA Lender is a party are duly and properly in office and fully authorized to execute the same on behalf of the WIFIA Lender.

ARTICLE V COVENANTS

Section 14. Affirmative Covenants. The Borrower covenants and agrees as follows until the date the WIFIA Bond and the Obligations of the Borrower under this Agreement (other than contingent indemnity obligations) are irrevocably paid in full in cash, unless the WIFIA Lender waives compliance in writing:

(a) Rate Covenant. The Borrower shall fix, charge and collect rates, fees and charges for the System during each Borrower Fiscal Year which:

(i) comply with the requirements specified in Section 603 (*Covenant as to Rates and Charges*) of the Indenture, which requirements are hereby incorporated herein and a copy of such section, as of the Effective Date, is attached hereto as **Schedule VIII** (*Rate Covenant*); and

(ii) will be at least sufficient to yield, in each Borrower Fiscal Year, Net Revenues equal to at least one hundred twenty-five percent (125%) of the Debt Service Requirement during such Borrower Fiscal Year with respect to all Outstanding Obligations (including Agency Bonds based on debt service net of any interest rate subsidy), as of the first day of such fiscal year (together with clause (i), the “**Rate Covenant**”).

(b) Securing Liens. The Borrower shall at any and all times, to the extent permitted by law, pass, make, do, execute, acknowledge and deliver, all and every such further resolutions, acts, deeds, conveyances, assignments, transfers and assurances as may be necessary or desirable in connection with assuring, conveying, granting, assigning, securing and confirming the Liens on the Pledged Collateral (whether now existing or hereafter arising) granted to the WIFIA Lender for its benefit pursuant to the Indenture Documents, or intended so to be granted pursuant to the Indenture Documents, or which the Borrower may become bound to grant, and the Borrower shall at all times maintain the Pledged Collateral free and clear of any pledge, Lien, charge or encumbrance thereon or with respect thereto that has priority over, or equal rank with, the Liens created by the Indenture Documents, other than as permitted by this Agreement, and all organizational, regulatory or other necessary action on the part of the Borrower to that end shall be duly and validly taken at all times. The Borrower shall at all times, to the extent permitted by law, defend, preserve and protect the Liens on the Pledged Collateral granted pursuant to the Indenture Documents and for the benefit of the WIFIA Lender under the Indenture Documents against all claims and demands of all Persons whomsoever, subject to Permitted Liens.

(c) Use of Proceeds. The Borrower shall use the proceeds of the WIFIA Loan for purposes permitted by applicable law and as otherwise permitted under this Agreement and the other Related Documents.

(d) Prosecution of Work; Verification Requirements.

(i) The Borrower shall diligently prosecute the work relating to the Project and complete the Project in accordance with the Construction Schedule, and in accordance with the highest standards of the Borrower's industry.

(ii) The Borrower shall ensure that each Principal Project Party complies with all applicable laws and legal or contractual requirements with respect to any performance security instrument delivered by such Principal Project Party to the Borrower and shall ensure that any letter of credit provided pursuant to any Principal Project Contract meets the requirements therefor set forth in such Principal Project Contract.

(iii) The Borrower shall comply with Subpart C of 2 C.F.R. Part 180, as supplemented by Subpart C of 2 C.F.R. Part 1532 (relating to debarment), including the verification requirements set forth in 2 C.F.R. §§ 180.300 and 180.320, and shall include in its contracts with respect to the Project similar terms or requirements for compliance.

(e) Operations and Maintenance. The Borrower shall (i) operate and maintain the System (including, but not limited to, the Project) (A) in a reasonable and prudent manner and (B) substantially in accordance with the information submitted by the Borrower pursuant to Section 16(a) (*Reporting Requirements – Financial Reporting*) (except as necessary to prevent or mitigate immediate threats to human health and safety or to prevent or mitigate physical damage to material portions of the System (including the Project)) and (ii) maintain the System (including the Project) in good repair, working order and condition and in accordance with the requirements of all applicable laws and each applicable Related Document. The Borrower shall at all times do or cause to be done all things necessary to obtain, preserve, renew, extend and keep in full force and effect the Governmental Approvals and any other rights, licenses, franchises, and authorizations material to the conduct of its business.

(f) Insurance and Condemnation. The Borrower shall comply with the requirements specified in Section 606 (*Insurance and Condemnation*) of the Indenture, which requirements are hereby incorporated herein. The Borrower shall cause all liability insurance policies (if any) that it maintains (and, during the Construction Period, that are maintained by any Principal Project Party), other than workers' compensation insurance, to reflect the WIFIA Lender as an additional insured. All such policies shall be available at all reasonable times for inspection by the WIFIA Lender, its agents and representatives.

(g) Permitted Investments. The Borrower shall comply with the requirements specified in Section 514 (*Investments*) of the Indenture, which requirements are hereby incorporated herein.

(h) Compliance With Laws. The Borrower shall, and shall require its contractors and subcontractors at all tiers with respect to the Project to, comply in all material respects with all applicable federal, State and local laws, rules, regulations and requirements, including without limitation (i) 40 U.S.C. §§ 3141-3144, 3146, and 3147 (Davis-Bacon Act requirements), (ii) 33 U.S.C. § 3914 (relating to American iron and steel products), and (iii) all items set forth in **Exhibit E** (*Compliance With Laws*). To ensure such compliance, the Borrower shall include in all contracts with respect to the Project requirements that its contractor(s) shall

comply with applicable federal laws, rules, regulations, and requirements set forth in this Section 14(h) (*Affirmative Covenants – Compliance With Laws*) and follow applicable federal guidance, and shall require that the contractor(s) incorporate in all subcontracts (and cause all subcontractors to include in all lower tier subcontracts) such terms and conditions as are required to be incorporated therein by applicable federal laws, rules, regulations and requirements set forth in this Section 14(h) (*Affirmative Covenants – Compliance With Laws*). With respect to the Davis-Bacon Act Requirements, the Borrower shall insert in full in all contracts relating to the Project the contract clauses set forth in the Code of Federal Regulations, Title 29 Part 5.5, and require and ensure that its contractor(s) insert such clauses in all subcontracts with respect to the Project and also a clause requiring all subcontractors to include these clauses in any lower tier subcontracts.

(i) Material Obligations. The Borrower shall pay its material obligations promptly and in accordance with their terms and pay and discharge promptly all taxes, assessments and governmental charges or levies imposed upon it or upon the Revenues or other assets of the System, before the same shall become delinquent or in default, as well as all lawful and material claims for labor, materials and supplies or other claims which, if unpaid, might give rise to a Lien upon such properties or any part thereof or on the Revenues or the Pledged Collateral; provided, however, that such payment and discharge shall not be required with respect to any such tax, assessment, charge, levy, claim or Lien so long as the validity or amount thereof shall be contested by the Borrower in good faith by appropriate proceedings and so long as the Borrower shall have set aside adequate reserves with respect thereto in accordance with and to the extent required by GAAP, applied on a consistent basis.

(j) [RESERVED].

(k) SAM Registration. The Borrower shall obtain and maintain through the Final Disbursement Date an active registration status with the federal System for Award Management (www.SAM.gov) (or any successor system or registry).

(l) DUNS Number. The Borrower shall obtain and maintain from Dun & Bradstreet (or a successor entity) a Data Universal Numbering System Number (a “**DUNS Number**”).

(m) Events of Loss; Loss Proceeds. If an Event of Loss shall occur with respect to the System (including the Project) or any part thereof, the Borrower shall comply with the requirements specified in Section 605 (*Operation, Maintenance and Reconstruction*) of the Indenture and Section 606 (*Insurance and Condemnation*) of the Indenture.

(n) Immunity. To the fullest extent permitted by applicable law, the Borrower agrees that it will not assert any immunity (and hereby waives any such immunity) it may have as a governmental entity from lawsuits, other actions and claims, and any judgments with respect to the enforcement of any of the obligations of the Borrower under this Agreement or any other WIFIA Loan Document.

(o) Accounting and Audit Procedures.

(i) The Borrower shall establish fiscal controls and accounting procedures sufficient to assure proper accounting for all (i) Revenues, operating expenses, capital expenses, depreciation, reserves, debt issued and outstanding and debt payments and (ii) Project-related costs, WIFIA Loan requisitions submitted, WIFIA Loan proceeds received, payments made by the Borrower with regard to the Project, other sources of funding for the Project (including amounts paid from such sources for Project costs so that audits may be performed to ensure compliance with and enforcement of this Agreement). The Borrower shall use accounting, audit and fiscal procedures conforming to GAAP, including, with respect to the WIFIA Loan, accounting of principal and interest payments, disbursements, prepayments and calculation of interest and principal amounts Outstanding.

(ii) The Borrower shall have a single or program-specific audit conducted in accordance with 2 C.F.R. Part 200 Subpart F and 31 U.S.C. § 7502 in year 2019 and annually thereafter, except to the extent biennial audits are permitted for the Borrower pursuant to 2 C.F.R. § 200.504 and 31 U.S.C. § 7502(b). Upon reasonable notice, the Borrower shall cooperate fully in the conduct of any periodic or compliance audits conducted by the WIFIA Lender, or designees thereof, pursuant to 40 C.F.R. Part 35, 31 U.S.C. § 7503(b), or 31 U.S.C. § 6503(h) and shall provide full access to any books, documents, papers or other records that are pertinent to the Project or the WIFIA Loan, to the Administrator, or the designee thereof, for any such project or programmatic audit.

(p) Access; Records.

(i) So long as the WIFIA Loan or any portion thereof shall remain outstanding and until five (5) years after the WIFIA Loan shall have been paid in full, the WIFIA Lender shall have the right, upon reasonable prior notice, to visit and inspect any portion of the Project, to examine books of account and records of the Borrower relating to the Project, to make copies and extracts therefrom at the Borrower's expense, and to discuss the Borrower's affairs, finances and accounts relating to the Project with, and to be advised as to the same by, its officers and employees and its independent public accountants (and by this provision the Borrower irrevocably authorizes its independent public accountants to discuss with the WIFIA Lender the affairs, finances and accounts of the Borrower, whether or not any representative of the Borrower is present, it being understood that nothing contained in this Section 14(p) (*Affirmative Covenants – Access; Records*) is intended to confer any right to exclude any such representative from such discussions), all at such reasonable times and intervals as the WIFIA Lender may request. The Borrower agrees to pay all out-of-pocket expenses incurred by the WIFIA Lender in connection with the WIFIA Lender's exercise of its rights under this Section 14(p) (*Affirmative Covenants – Access; Records*) at any time when an Event of Default shall have occurred and be continuing.

(ii) The Borrower shall maintain and retain all files relating to the Project and the WIFIA Loan until five (5) years after the later of the date on which (i) all rights and duties under this Agreement and under the WIFIA Bond (including payments) have been fulfilled and any required audits have been performed and (ii) any litigation

relating to the Project, the WIFIA Loan or this Agreement is finally resolved or, if the WIFIA Lender has reasonable cause to extend such date, a date to be mutually agreed upon by the WIFIA Lender and the Borrower. The Borrower shall provide to the WIFIA Lender in a timely manner all records and documentation relating to the Project that the WIFIA Lender may reasonably request from time to time.

Section 15. Negative Covenants. The Borrower covenants and agrees as follows until the date the WIFIA Bond and the obligations of the Borrower under this Agreement (other than contingent indemnity obligations) are irrevocably paid in full in cash, unless the WIFIA Lender waives compliance in writing:

(a) Indebtedness. The Borrower shall not issue any Obligations, unless the conditions described in this Section 15(a) (*Negative Covenants – Indebtedness*) are satisfied:

(i) The Borrower shall comply with the requirements specified in Section 205 (*General Provisions for Issuance of Bonds*) of the Indenture and Section 607 (*Creation of Liens, Other Indebtedness*) of the Indenture, which requirements are hereby incorporated herein and a copy of each such section, as of the Effective Date, is attached hereto as **Schedule IX** (*Additional Bonds Test*); and

(ii) The Borrower has demonstrated that, for the three (3) full Borrower Fiscal Years following issuance of the Obligations (including the Borrower Fiscal Year in which such Obligations are issued), the estimated annual Net Revenues for each such Borrower Fiscal Year together with the amounts of Reserved Revenues, if any, available in such fiscal year (as calculated by an Authorized Officer (as defined in the Indenture) at the time of the issuance of such Obligations but without double-counting the amount of Reserved Revenues included in the estimated Net Revenues) will be at least equal to one hundred twenty-five percent (125%) of (A) the Debt Service Requirement for all Outstanding Obligations (including Agency Bonds based on debt service net of any interest rate subsidy) for such fiscal year less (B) the amount, if any, of proceeds available or projected to be available to pay Principal Installments (as defined in the Indenture) and interest becoming due in such fiscal year on Outstanding Obligations or projected to be Outstanding as of the first day of such fiscal year.

(iii) Upon the incurrence of Additional Senior Obligations, the Borrower shall provide to the WIFIA Lender a certificate signed by the Borrower's Authorized Representative, (A) specifying the closing date with respect to such Additional Senior Obligations and (B) confirming that the incurrence of such Additional Senior Obligations satisfies the requirements set forth in this Section 15(a) (*Negative Covenants – Indebtedness*).

(b) No Lien Extinguishment or Adverse Amendments. The Borrower shall not, and shall not permit any Person to, without the prior written consent of the WIFIA Lender: (i) release all or substantially all the Pledged Collateral from the Lien of the Indenture or otherwise extinguish or materially impair (as to the WIFIA Loan or any other Secured Obligations the proceeds of which are applied to fund Total Project Costs) the pledged source of repayment granted pursuant to the Indenture; (ii) extinguish the Rate Covenant; (iii) amend,

modify or supplement any Indenture Document in a manner that could reasonably be expected to disproportionately affect the WIFIA Lender in connection with the WIFIA Loan compared to other holders of Obligations; (iv) amend, modify or supplement any Indenture Document in a manner that would affect the order of priority in which funds are to be applied to the Operation and Maintenance Account and the Debt Service Fund (as defined in the Indenture) for the Bonds as set forth in Section 504 (*Revenue Fund*) of the Indenture as of the Effective Date; (v) assign any Related Document; or (vi) terminate, replace, amend, modify or supplement any Principal Project Contract in a manner that could reasonably be expected to have a Material Adverse Effect.

(c) No Prohibited Liens. Except for Permitted Liens, the Borrower shall not create, incur, assume or permit to exist any Lien on the Project, the Pledged Collateral, the Revenues, or the Borrower's respective rights therein. The Borrower shall not collaterally assign any of its rights under or pursuant to any Principal Project Contract and shall not permit a Lien to encumber the Borrower's rights or privileges under any Principal Project Contract, unless pursuant to the Indenture Documents in favor of the Trustee on behalf of the Secured Parties.

(d) Restricted Payments and Transfers. The Borrower shall not permit Revenues or other assets of the System, or any funds in any accounts held under the Indenture or in any other fund or account held by or on behalf of the Borrower in respect of the System, to be paid or transferred or otherwise applied for purposes other than ownership, operation or maintenance of the System, except with the consent of the WIFIA Lender, which consent shall be in the WIFIA Lender's sole discretion.

(e) No Prohibited Sale, Lease or Assignment. The Borrower shall comply with requirements specified in Section 604 (*Sale, Lease or Encumbrance of System*) of the Indenture, which requirements are hereby incorporated herein. The Borrower reasonably expects that no portion of the Project will be sold prior to the Final Maturity Date of the WIFIA Loan.

(f) Fiscal Year. The Borrower shall not at any time adopt any fiscal year other than the Borrower Fiscal Year, except with thirty (30) days' prior written notice to the WIFIA Lender.

(g) Mergers and Acquisitions. The Borrower shall not, and shall not agree to, reorganize, consolidate with or merge into another Person except in accordance with Section 604 (*Sale, Lease or Encumbrance of System*) of the Indenture.

(h) No Defeasance. Notwithstanding anything to the contrary in any Indenture Document or document related thereto, the WIFIA Loan shall not be subject to defeasance and no amounts in respect of the WIFIA Loan shall be considered or deemed to have been paid until the WIFIA Lender shall have received irrevocable payment in immediately available funds in accordance with the requirements for payment set forth in this Agreement.

(i) OFAC Compliance. The Borrower shall not: (i) violate (A) any applicable anti-money laundering laws, including those contained in the Bank Secrecy Act and the Patriot Act, (B) any applicable economic sanction laws administered by OFAC or by the United States Department of State, or (C) any applicable anti-drug trafficking, anti-terrorism, or anti-corruption

laws, civil or criminal; or (ii) be a Person (A) that is charged with, or that has received notice from a Governmental Authority that it is under investigation for, any violation of any such laws, (B) that is convicted of any violation of, is subject to civil or criminal penalties pursuant to, has any of its property seized or forfeited under, or enters into any agreement with the Government or a state or local government related to violations of, any such laws, (C) that is named on the list of “Specially Designated Nationals and Blocked Persons” maintained by OFAC (or any successor Government office or list), or any similar list maintained by the United States Department of State (or any successor Government office or list), (D) with whom any U.S. Person (as defined in the applicable OFAC regulations) is prohibited from transacting business of the type contemplated by this Agreement and the other Related Documents under any other applicable law, (E) that is owned, Controlled by, or affiliated with any Person identified in clause (A), (B), (C) or (D) of this clause (ii), or (F) that is in violation of any obligation to maintain appropriate internal controls as required by the governing laws of the jurisdiction of such Person as are necessary to ensure compliance with the economic sanctions, anti-money laundering and anti-corruption laws of the United States of America and the jurisdiction where the Person resides, is domiciled or has its principal place of business. The Borrower shall not knowingly make a payment to any Principal Project Party that is a Person (A) that is named on the list of “Specially Designated Nationals and Blocked Persons” maintained by OFAC (or any successor Government office or list), or any similar list maintained by the United States Department of State (or any successor Government office or list) or (B) with whom any U.S. Person (as defined in the applicable OFAC regulations) is prohibited from transacting business of the type contemplated by this Agreement and the other Related Documents under any other applicable law.

(j) Hedging. Other than Qualified Swap Agreements expressly permitted under the Indenture, the Borrower shall not enter into any swap or hedging transaction, including inflation indexed swap transactions, “cap” or “collar” transactions, futures, or any other hedging transaction, in each case, payable from the Pledged Collateral.

Section 16. Reporting Requirements.

(a) Financial Reporting. The Borrower shall provide the WIFIA Lender with the following:

(i) unless included as part of the annual budget pursuant to clause (ii) of this Section 16(a) (*Reporting Requirements – Financial Reporting*) or the annual financial statements pursuant to Section 16(b) (*Reporting Requirements – Annual Financial Statements*), an analysis of operating revenues and expenses, including a description of the status of all revenues securing the WIFIA Bond and of any operating expenses in excess of budget, not later than one hundred eighty (180) days after the end of each Borrower Fiscal Year;

(ii) a copy of the annual budget of the Borrower, not later than fifteen (15) days after its adoption;

(iii) unless included as part of the annual budget pursuant to clause (ii) of this Section 16(a) (*Reporting Requirements – Financial Reporting*) or the annual

financial statements pursuant to Section 16(b) (*Reporting Requirements – Annual Financial Statements*), a schedule of current and projected short-term and long-term debt service, concurrently with each annual budget provided pursuant to clause (ii) of this Section 16(a) (*Reporting Requirements – Financial Reporting*); and

(iv) unless included as part of the annual budget pursuant to clause (ii) of this Section 16(a) (*Reporting Requirements – Financial Reporting*) or the annual financial statements pursuant to Section 16(b) (*Reporting Requirements – Annual Financial Statements*), a schedule of capital replacement reserves, concurrently with each annual budget provided pursuant to clause (ii) of this Section 16(a) (*Reporting Requirements – Financial Reporting*).

(b) Annual Financial Statements. The Borrower shall post to EMMA, no later than one hundred eighty (180) days after the end of each Borrower Fiscal Year:

(i) a copy of the audited income statement and balance sheet of the Borrower as of the end of such Borrower Fiscal Year and the related audited statements of operations and of cash flow of the Borrower for such Borrower Fiscal Year, (A) setting forth in each case in comparative form the figures for the previous fiscal year, (B) certified without qualification or exception, or qualification as to the scope of the audit, by an independent public accounting firm selected by the Borrower and (C) which shall be complete and correct in all material respects and shall be prepared in reasonable detail and in accordance with GAAP applied consistently throughout the periods reflected therein (except, with respect to the annual financial statements, for changes approved or required by the independent public accountants certifying such statements and disclosed therein); and

(ii) together with each delivery of such annual audited financial statements, a certificate signed by the chief executive officer or chief financial officer of the Borrower or the Borrower's Authorized Representative, stating whether or not, to the Borrower's knowledge, during the annual period covered by such financial statements, there occurred any Default or Event of Default and, if any such Default or Event of Default shall have occurred during such period, the nature of such Default or Event of Default and the actions that the Borrower has taken or intends to take in respect thereof.

(c) Final Design Specifications; RIDEM Approvals. The Borrower shall deliver, upon the request of the WIFIA Lender (i) the final designs, plans and specifications relating to the development and construction of the Project and (ii) evidence of receipt of the Orders of Approval and Certificates of Approval from the Rhode Island Department of Environmental Management.

(d) Construction Reporting. The WIFIA Lender shall have the right in its sole discretion to monitor (or direct its agents to monitor) the development of the Project, including environmental compliance, design, and construction of the Project. The Borrower shall be responsible for administering construction oversight of the Project in accordance with applicable federal, state and local governmental requirements. The Borrower agrees to cooperate in good faith with the WIFIA Lender in the conduct of such monitoring by promptly providing the

WIFIA Lender with such reports, documentation or other information as shall be requested by the WIFIA Lender or its agents, including any independent engineer reports, documentation or information and, if requested by the WIFIA Lender, copies of any Principal Project Contracts and related documentation. During the period through Substantial Completion of the Project, the Borrower shall furnish to the WIFIA Lender, on a quarterly basis, a report on the status of the Project, substantially in the form of **Exhibit K** (*Form of Quarterly Report*). The report shall be executed by the Borrower's Authorized Representative and, for any quarter, shall be delivered to the WIFIA Lender not later than the fifteenth (15th) day of the following quarter (or if such day is not a Business Day, on the next following Business Day). If the then-current projection for the Substantial Completion Date is a date later than the Projected Substantial Completion Date, the Borrower shall provide in such report a description in reasonable detail to the reasonable satisfaction of the WIFIA Lender of the reasons for such projected delay, an estimate of the impact of such delay on the capital and operating costs of the System (if any), and that the new date could not reasonably be expected to result in a Material Adverse Effect or a material and adverse effect on the Project or the System. The Projected Substantial Completion Date shall automatically be adjusted to the date specified by the Borrower in its report unless the WIFIA Lender objects to the adjustment in writing to the Borrower within sixty (60) days following receipt of the Borrower's report on the basis that the Borrower's report does not demonstrate the matters specified in this Section 16(d) (*Reporting Requirements – Construction Reporting*).

(e) Public Benefits Report. The Borrower shall deliver to the WIFIA Lender a report, in the form of **Exhibit L** (*Form of Public Benefits Report*) (the "**Public Benefits Report**"), (i) no later than thirty (30) days prior to the Effective Date, (ii) within ninety (90) days following the Substantial Completion Date and (iii) within ninety (90) days following the fifth (5th) anniversary of the Substantial Completion Date. The Borrower agrees that information described under this Section 16(e) (*Reporting Requirements – Public Benefits Report*) may be made publicly available by the WIFIA Lender at its discretion.

(f) Modifications to Total Project Costs. For the period through the Substantial Completion Date, the Borrower shall provide the WIFIA Lender with written notification at least thirty (30) days prior to instituting any increase or decrease to the aggregate Total Project Costs in an amount equal to or greater than ten percent (10%), which notification shall set forth the nature of the proposed increase or decrease and an estimate of the impact of such increase or decrease on the capital costs and operating costs of the System. The Borrower's notice shall demonstrate that the proposed increase or decrease is consistent with the provisions of this Agreement, is necessary or beneficial to the Project, does not materially impair the WIFIA Lender's security or the Borrower's ability to comply with its obligations under the Related Documents (including any financial ratios or covenants included therein), and could not reasonably be expected to result in a Material Adverse Effect.

(g) Operations and Maintenance. The WIFIA Lender shall have the right, in its sole discretion, to monitor (or direct its agents to monitor) the Project's operations and, as the WIFIA Lender may request from time to time, to receive reporting on the operation and management of the Project, and copies of any contracts relating to the operation and maintenance of the Project. The Borrower agrees to cooperate in good faith with the WIFIA Lender in the conduct of such monitoring by promptly providing the WIFIA Lender with such reports, documentation, or other information requested by the WIFIA Lender. The WIFIA Lender has the

right, in its sole discretion, to retain such consultants or advisors, to carry out the provisions of this Section 16(g) (*Reporting Requirements – Operations and Maintenance*). On or prior to the Substantial Completion Date, the Borrower shall deliver to the WIFIA Lender an operations and maintenance manual with respect to the Project, in form and substance reasonably acceptable to the WIFIA Lender.

(h) Notices.

(i) On or before September 15, 2019, the Borrower shall provide the WIFIA Lender with a certificate of the Borrower's Authorized Representative, certifying that the 30-day appeal period for the DPUC Order has expired without the filing of any appeal and that the WIFIA Bond has been fully approved pursuant to all applicable laws of the State.

(ii) The Borrower shall, within ten (10) Business Days after the Borrower learns of the occurrence, give the WIFIA Lender notice of any of the following events or receipt of any of the following notices, as applicable, setting forth details of such event:

(A) Substantial Completion: the occurrence of Substantial Completion, such notice to be provided in the form set forth in **Exhibit J** (*Form of Certificate of Substantial Completion*);

(B) Defaults; Events of Default; any Default or Event of Default;

(C) Litigation; (1) the filing of any litigation, suit or action, or the commencement of any proceeding, against the Borrower before any arbitrator, Governmental Authority, alternative dispute resolution body, or other neutral third-party, or the receipt by the Borrower in writing of any threat of litigation, suit, action, or proceeding, or of any written claim against the Borrower that, in each case, could reasonably be expected to have a Material Adverse Effect, and any material changes in the status of such litigation, suit, action or claim, and (2) any judgments against the Borrower with award amounts in excess of \$50,000,000, either individually or in the aggregate;

(D) Environmental Notices: any material notice of violation or material change in finding under any Environmental Law related to the Project or any material changes to the NEPA Determination;

(E) 2 C.F.R. § 180.350 Notices: any notification required pursuant to 2 C.F.R. § 180.350, whether attributable to a failure by the Borrower to disclose information previously required to have been disclosed or due to the Borrower or any of its principals meeting any of the criteria set forth in 2 C.F.R. § 180.335;

(F) Amendments; any material amendment of any Related Document; provided that (1) if applicable, such notice can be accomplished through an email to the WIFIA Lender that includes a link to the posting of the relevant document on

EMMA and (2) a Supplemental Indenture executed solely for the purpose of issuing Additional Senior Obligations, without any modification to the Indenture, shall not be considered a material amendment for purposes of this clause (F);

(G) Ratings Changes: any change in the rating assigned to the Senior Obligations or any Subordinated Obligations, in each case by any Nationally Recognized Rating Agency that has provided a public rating on such indebtedness, and any notices, reports or other written materials (other than those that are ministerial in nature) received from any such rating agencies; provided that such notice can be accomplished through an email to the WIFIA Lender that includes a link to the posting of the relevant documents on EMMA;

(H) Postings on EMMA; the posting of any document on EMMA in accordance with the requirements of any continuing disclosure agreement with respect to any Outstanding Obligations relating to annual financial information and operating data and the reporting of significant events; provided that such notice can be accomplished through an email to the WIFIA Lender that includes a link to the posting of the relevant document on EMMA;

(I) Mergers and Acquisitions; the consummation of a merger, consolidation, or acquisition of the Borrower or the sale of all or substantially all of the assets of the Borrower, other than in the ordinary course of business, the entry into a definitive agreement to undertake such an action or the termination of a definitive agreement relating to any such actions, other than pursuant to its terms; provided that such notice can be accomplished through an email to the WIFIA Lender that includes a link to the posting of the relevant documents on EMMA;

(J) Change in Trustee; the appointment of a successor or additional trustee, or the change of name of a trustee, if material;

(K) Other Significant Financial Matters: any (1) unscheduled draws on debt service reserves reflecting financial difficulties, (2) unscheduled draws on credit enhancements reflecting financial difficulties, (3) substitution of credit or liquidity providers, or their failure to perform, (4) Bond calls, if material, and tender offers, (5) defeasances, (6) release, substitution or sale of property securing repayment of the WIFIA Bond, if material, or (7) incurrence of a financial obligation of the Borrower, if material, or agreement to covenants, events of default, remedies, priority rights, or other similar terms of a financial obligation of the Borrower, any of which affect the WIFIA Lender, if material; provided that any such notice can be accomplished through an email to the WIFIA Lender that includes a link to the posting of the relevant documents on EMMA; and

(L) Other Adverse Events; the occurrence of any other event or condition, including any notice of breach from a contract counterparty or any Holder of any Obligations, that could reasonably be expected to result in a Material Adverse Effect or have a material and adverse effect on the Project.

(iii) The Borrower and the WIFIA Lender agree and confirm that no provision of this Section 16(h) (*Reporting Requirements – Notices*) constitutes a continuing disclosure undertaking pursuant to SEC Rule 15c2-12 adopted by the Securities Exchange Commission under the Securities Exchange Act of 1934.

(i) Requested Information. The Borrower shall, at any time while the WIFIA Loan remains outstanding, promptly deliver to the WIFIA Lender such additional information regarding the business, financial, legal or organizational affairs of the Borrower or regarding the Project, the System or the Revenues as the WIFIA Lender may from time to time reasonably request. Such additional information may include, if requested by the WIFIA Lender, a written statement from the Borrower's Authorized Representative setting forth the actions the Borrower proposes to take with respect to the occurrence of any event specified in Section 16(h)(ii) (*Reporting Requirements – Notices*), excluding the events specified in sub-clauses (A) (*Substantial Completion*), (F) (*Amendments*) or, in the case of a ratings upgrade, (G) (*Ratings Changes*) thereto.

(j) Annual Officer's Certificate. The Borrower shall furnish to the WIFIA Lender, concurrently with the delivery of the same to the Trustee, a copy of the certificate required to be delivered to the Trustee pursuant to Section 603(4) (*Covenant as to Rates and Charges*) of the Indenture; provided that the failure of the Borrower to deliver such certificate to the WIFIA Lender concurrently with the delivery to the Trustee shall not constitute a Default or Event of Default unless (i) the WIFIA Lender shall have provided the Borrower with written notice of such failure, and (ii) the Borrower shall have failed to deliver such certificate to the WIFIA Lender within thirty (30) days after the date of delivery of such notice.

ARTICLE VI EVENTS OF DEFAULT

Section 17. Events of Default and Remedies.

(a) An "**Event of Default**" shall exist under this Agreement if any of the following occurs:

(i) Payment Default. The Borrower shall fail to pay any of the principal amount of or interest on the WIFIA Loan (including WIFIA Debt Service required to have been paid pursuant to the provisions of Section 8 (*Payment of Principal and Interest*) when and as the payment thereof shall be required under this Agreement or the WIFIA Bond or on the Final Maturity Date (each such failure, a "**Payment Default**").

(ii) Covenant Default. The Borrower shall fail to observe or perform any covenant, agreement or obligation of the Borrower under this Agreement, the WIFIA Bond or any other WIFIA Loan Document (other than in the case of any Payment Default or any Development Default), and such failure shall not be cured within thirty (30) days after the earlier to occur of (A) receipt by the Borrower from the WIFIA Lender of written notice thereof or (B) the Borrower's knowledge of such failure; provided, however, that if such failure is capable of cure but cannot reasonably be cured within such thirty (30) day cure period, then no Event of Default shall be deemed to have

occurred or be continuing under this clause (ii), and such thirty (30) day cure period shall be extended by up to one hundred fifty (150) additional days, if and so long as (x) within such thirty (30) day cure period the Borrower shall commence actions reasonably designed to cure such failure and shall diligently pursue such actions until such failure is cured and (y) such failure is cured within one hundred eighty (180) days of the date specified in either (A) or (B) above, as applicable.

(iii) Misrepresentation Default. Any of the representations, warranties or certifications of the Borrower made in or delivered pursuant to the WIFIA Loan Documents (or in any certificates delivered by the Borrower in connection with the WIFIA Loan Documents) shall prove to have been false or misleading in any material respect when made or deemed made (or any representation and warranty that is subject to a materiality qualifier shall prove to have been false or misleading in any respect); provided, that no Event of Default shall be deemed to have occurred under this clause (iii) if and so long as (A) such misrepresentation is not intentional, (B) such misrepresentation is not a misrepresentation in respect of Section 12(h) (*Representations and Warranties of Borrower – No Debarment*), Section 12(j) (*Representations and Warranties of Borrower – Compliance with Federal Requirements*), Section 12(p) (*Representations and Warranties of Borrower – OFAC; Anti-Corruption Laws*), or Section 12(aa) (*Representations and Warranties of Borrower – Patriot Act*), (C) in the reasonable determination of the WIFIA Lender, such misrepresentation has not had, and would not reasonably be expected to result in, a Material Adverse Effect, (D) in the reasonable determination of the WIFIA Lender, the underlying issue giving rise to the misrepresentation is capable of being cured, (E) the underlying issue giving rise to the misrepresentation is cured by the Borrower within thirty (30) days from the date on which the Borrower first became aware (or reasonably should have become aware) of such misrepresentation, and (F) the Borrower diligently pursues such cure during such thirty (30) day period.

(iv) Acceleration of Senior Obligations. Any acceleration shall occur of the maturity of any Senior Obligation, or any such Senior Obligation shall not be paid in full upon the final maturity thereof.

(v) Cross Default with Other Financing Documents. Any default shall occur in respect of the performance of any covenant, agreement or obligation of the Borrower under the Related Documents (except for the Principal Project Contracts), and such default shall be continuing after the giving of any applicable notice and the expiration of any applicable grace period specified in the Related Documents (except for the Principal Project Contracts) with respect to such default, and the Borrower shall have failed to cure such default or to obtain an effective written waiver thereof in accordance with the terms of the applicable Senior Obligations.

(vi) Material Adverse Judgment. Any final, non-appealable judgment related to the Revenues, the System or the Project shall be entered against the Borrower which has a Material Adverse Effect.

(vii) Occurrence of a Bankruptcy Related Event. A Bankruptcy Related Event shall occur with respect to the Borrower.

(viii) Invalidity of WIFIA Loan Documents and Indenture Documents. (A) Any WIFIA Loan Document ceases to be in full force and effect (other than as a result of the termination thereof in accordance with its terms) or becomes void, voidable, illegal or unenforceable, or the Borrower contests in any manner the validity or enforceability of any WIFIA Loan Document to which it is a party or denies it has any further liability under any WIFIA Loan Document to which it is a party, or purports to revoke, terminate or rescind any WIFIA Loan Document to which it is a party; (B) any Indenture Document ceases (other than as expressly permitted thereunder) to be effective or to grant a valid and binding security interest on any material portion of the Pledged Collateral other than as a result of actions or a failure to act by, and within the control of, the Trustee or any Secured Party, and with the priority purported to be created thereby; or (C) any event occurs that results in the material impairment in the perfection or priority of the WIFIA Lender's security interest in the Pledged Collateral or in the value of such Pledged Collateral.

(ix) [RESERVED].

(x) Development Default. A Development Default shall occur.

(xi) Default Under Principal Project Contracts. The Borrower shall default in the timely performance of any covenant, agreement or obligation under any Principal Project Contract or any Principal Project Contract shall be terminated prior to its scheduled expiration (unless in any case such default or termination could not reasonably be expected to have a Material Adverse Effect), and the Borrower shall have failed to cure such default or to obtain an effective written waiver or revocation thereof prior to the expiration of the applicable grace period specified in any such Principal Project Contract, or to obtain an effective revocation of such termination (as the case may be); provided, however, that no Event of Default shall be deemed to have occurred or be continuing under this clause if, in the case of any termination of a Principal Project Contract, the Borrower replaces such Principal Project Contract with a replacement agreement (1) entered into with another counterparty that (I) is of similar or greater creditworthiness and experience as the counterparty being replaced was at the time the applicable Principal Project Contract was originally executed (or otherwise reasonably acceptable to the WIFIA Lender) and (II) is not, at the time of such replacement, suspended or debarred or subject to a proceeding to suspend or debar from bidding, proposing or contracting with any federal or state department or agency, (2) on substantially the same terms and conditions as the Principal Project Contract being replaced (or otherwise reasonably acceptable to the WIFIA Lender) and (3) effective as of the date of termination of the Principal Project Contract being replaced.

(xii) Cessation of System Operations. Following the Substantial Completion Date, operation of the System shall cease for a continuous period of not less than one hundred eighty (180) days unless such cessation of operations shall occur by

reason of an Uncontrollable Force that is not due to the fault of the Borrower (and which the Borrower could not reasonably have avoided or mitigated).

(xiii) Failure to Maintain Legal Structure. The Borrower shall fail to maintain its existence as a public corporation organized and existing under its Organizational Documents and the laws of the State.

(b) Upon the occurrence of any Bankruptcy Related Event, all obligations of the WIFIA Lender hereunder with respect to the disbursement of any undisbursed amounts of the WIFIA Loan shall automatically be deemed terminated.

(c) Upon the occurrence of any Event of Default, the WIFIA Lender, by written notice to the Borrower, may exercise any or all of the following remedies:

(i) the WIFIA Lender may suspend or terminate all of its obligations hereunder with respect to the disbursement of any undisbursed amounts of the WIFIA Loan;

(ii) the WIFIA Lender may cease permitting interest on the WIFIA Loan to be compounded and capitalized;

(iii) the WIFIA Lender may apply the Default Rate provisions of Section 6 (*Interest Rate*);

(iv) the WIFIA Lender may suspend or debar the Borrower from further participation in any Government program administered by the WIFIA Lender and to notify other departments and agencies of such default; and/or

(v) subject to the provisions of the Indenture, the WIFIA Lender shall be entitled and empowered to institute any actions or proceedings at law or in equity for the collection of any sums due and unpaid hereunder or under the WIFIA Bond or the other WIFIA Loan Documents, and may prosecute any such judgment or final decree against the Borrower and collect in the manner provided by law out of the property of the Borrower the moneys adjudged or decreed to be payable, and the WIFIA Lender shall have all of the rights and remedies of a creditor, including all rights and remedies of a secured creditor under the Uniform Commercial Code, and may take such other actions at law or in equity as may appear necessary or desirable to collect all amounts payable by Borrower under this Agreement, the WIFIA Bond or the other WIFIA Loan Documents then due and thereafter to become due, or to enforce performance and observance of any obligation, agreement or covenant of the Borrower under this Agreement, the WIFIA Bond or the other WIFIA Loan Documents. The WIFIA Lender acknowledges that it has no right to accelerate the Outstanding amount of the WIFIA Loan except as permitted under the Indenture.

(d) No action taken pursuant to this Section 17 (*Events of Default and Remedies*) shall relieve Borrower from its obligations pursuant to this Agreement, the WIFIA Bond or the other WIFIA Loan Documents, all of which shall survive any such action.

ARTICLE VII MISCELLANEOUS

Section 18. Disclaimer of Warranty. The WIFIA Lender makes no warranty or representation, either express or implied, as to the value, design, condition, merchantability or fitness for a particular purpose or fitness for use of the Project or any portion thereof or any other warranty with respect thereto. In no event shall the WIFIA Lender be liable for any incidental, indirect, special or consequential damages incidental to or arising out of this Agreement or the Project or the existence, furnishing, functioning or use of the Project or any item or products or services provided for in this Agreement.

Section 19. No Personal Recourse. No official, employee or agent of the WIFIA Lender or the Borrower or any Person executing this Agreement or any of the other WIFIA Loan Documents shall be personally liable on this Agreement or such other WIFIA Loan Documents by reason of the issuance, delivery or execution hereof or thereof.

Section 20. No Third Party Rights. The parties hereby agree that this Agreement creates no third party rights against the Borrower, the Government, or the WIFIA Lender, solely by virtue of the WIFIA Loan, and the Borrower agrees to indemnify and hold the WIFIA Lender, the Servicer (if any), the Administrator, and the Government harmless, to the extent permitted by law and in accordance with Section 32 (*Indemnification*), from any lawsuit or claim arising in law or equity solely by reason of the WIFIA Loan, and that no third party creditor or creditors of the Borrower shall have any right against the WIFIA Lender with respect to the WIFIA Loan made pursuant to this Agreement.

Section 21. Borrower's Authorized Representative. The Borrower shall at all times have appointed a Borrower's Authorized Representative by designating such Person or Persons from time to time to act on the Borrower's behalf pursuant to a written certificate furnished to the WIFIA Lender and the Servicer, if any, containing the specimen signature or signatures of such Person or Persons and signed by the Borrower.

Section 22. WIFIA Lender's Authorized Representative. The WIFIA Lender hereby appoints the Director of the WIFIA Program, whose notice details are set forth below in Section 31 (*Notices*), to serve as the WIFIA Lender's Authorized Representative under this Agreement until such time as a successor or successors shall have been appointed. Thereafter, the successor in office shall serve as the WIFIA Lender's Authorized Representative. The WIFIA Lender shall provide notice to the Borrower within a reasonable time period following the succession.

Section 23. Servicer. The WIFIA Lender may from time to time designate another entity or entities to perform, or assist the WIFIA Lender in performing, the duties of the Servicer or specified duties of the WIFIA Lender under this Agreement and the WIFIA Bond. The WIFIA Lender shall give the Borrower written notice of the appointment of any successor or additional Servicer and shall enumerate the duties or any change in duties to be performed by any Servicer. Any references in this Agreement to the WIFIA Lender shall be deemed to be a reference to the Servicer with respect to any duties which the WIFIA Lender shall have delegated to such Servicer. The WIFIA Lender may at any time assume the duties of any Servicer under this Agreement and the WIFIA Bond. The Borrower shall cooperate and respond to any reasonable

request of the Servicer for information, documentation or other items reasonably necessary for the performance by the Servicer of its duties hereunder.

Section 24. Amendments and Waivers. No amendment, modification, termination, or waiver of any provision of this Agreement shall in any event be effective without the written consent of each of the parties hereto.

Section 25. Governing Law. This Agreement shall be governed by the federal laws of the United States of America if and to the extent such federal laws are applicable and the internal laws of the State, if and to the extent such federal laws are not applicable.

Section 26. Severability. In case any provision in or obligation under this Agreement shall be invalid, illegal, or unenforceable in any jurisdiction, the validity, legality and enforceability of the remaining provisions or obligations, or of such provision or obligation in any other jurisdiction, shall not in any way be affected or impaired thereby.

Section 27. Successors and Assigns. This Agreement shall be binding upon the parties hereto and their respective permitted successors and assigns and shall inure to the benefit of the parties hereto and their permitted successors and assigns. Neither the Borrower's rights or obligations hereunder nor any interest therein may be assigned or delegated by the Borrower without the prior written consent of the WIFIA Lender.

Section 28. Remedies Not Exclusive. No remedy conferred herein or reserved to the WIFIA Lender is intended to be exclusive of any other available remedy or remedies, but each and every such remedy shall be cumulative and shall be in addition to every other remedy given hereunder or now or hereafter existing at law or in equity or by statute.

Section 29. Delay or Omission Not Waiver. No delay or omission of the WIFIA Lender to exercise any right or remedy provided hereunder upon a default of the Borrower (except a delay or omission pursuant to a written waiver) shall impair any such right or remedy or constitute a waiver of any such default or acquiescence therein. Every right and remedy given by this Agreement or by law to the WIFIA Lender may be exercised from time to time, and as often as may be deemed expedient by the WIFIA Lender.

Section 30. Counterparts. This Agreement and any amendments, waivers, consents or supplements hereto or in connection herewith may be executed in any number of counterparts and by the different parties hereto in separate counterparts, each of which when so executed and delivered shall be deemed an original, but all such counterparts together shall constitute one and the same instrument; signature pages may be detached from multiple separate counterparts and attached to a single counterpart so that all signature pages are physically attached to the same document. Electronic delivery of an executed counterpart of a signature page of this Agreement or of any document or instrument delivered in connection herewith in accordance with Section 31 (*Notices*) shall be effective as delivery of an original executed counterpart of this Agreement or such other document or instrument, as applicable.

Section 31. Notices. Notices hereunder shall be (a) in writing, (b) effective as provided below and (c) given by (i) nationally recognized courier service, (ii) hand delivery, or (iii) email, in each case to:

If to WIFIA Lender: Environmental Protection Agency
WJC-W 6201A
1200 Pennsylvania Avenue NW
Washington, D.C. 20460
Attention: WIFIA Director
Email: WIFIA_Portfolio@epa.gov

If to Borrower: Narragansett Bay Commission
One Service Road
Providence, RI 02905
Attention: Chief Financial Officer
Email: Karen.Giebink@narrabay.com

If to Trustee: U.S. Bank National Association
One Federal Street
Boston, MA 02110
Attention: Karen Beard
Email: Karen.Beard@usbank.com

Unless otherwise instructed by the WIFIA Lender's Authorized Representative, all notices to the WIFIA Lender should be made by email to the email address noted above for the WIFIA Lender. Notices required to be provided herein shall be provided to such different addresses or to such further parties as may be designated from time to time by a Borrower's Authorized Representative, with respect to notices to the Borrower, or by the WIFIA Lender's Authorized Representative, with respect to notices to the WIFIA Lender or the Servicer. Each such notice, request or communication shall be effective (x) if delivered by hand or by nationally recognized courier service, when delivered at the address specified in this Section 31 (*Notices*) (or in accordance with the latest unrevoked written direction from the receiving party) and (y) if given by email, when such email is delivered to the address specified in this Section 31 (*Notices*) (or in accordance with the latest unrevoked written direction from the receiving party); provided, that notices received on a day that is not a Business Day or after 5:00 p.m. Eastern Time on a Business Day will be deemed to be effective on the next Business Day.

Section 32. Indemnification. The Borrower shall, to the extent permitted by law, indemnify the WIFIA Lender and any official, employee, agent or representative of the WIFIA Lender (each such Person being herein referred to as an "**Indemnitee**") against, and hold each Indemnitee harmless from, any and all losses, claims, damages, liabilities, fines, penalties, costs and expenses (including the fees, charges and disbursements of any counsel for any Indemnitee and the costs of environmental remediation), whether known, unknown, contingent or otherwise, incurred by or asserted against any Indemnitee arising out of, in connection with, or as a result of (a) the execution, delivery and performance of this Agreement or any of the other Related Documents, (b) the WIFIA Loan or the use of the proceeds thereof, or (c) the violation of any law, rule, regulation, order, decree, judgment or administrative decision relating to the environment, the preservation or reclamation of natural resources, the management, release or threatened release of any hazardous material or to health and safety matters; in each case arising out of or in direct relation to the Project; provided, that such indemnity shall not, as to any

Indemnitee, be available to the extent that such losses, claims, damages, liabilities, fines, penalties, costs or related expenses are determined by a court of competent jurisdiction by final and nonappealable judgment to have resulted from the gross negligence or willful misconduct of such Indemnitee. In case any action or proceeding is brought against an Indemnitee by reason of any claim with respect to which such Indemnitee is entitled to indemnification hereunder, the Borrower shall be entitled, at its expense, to participate in the defense thereof; provided, that such Indemnitee has the right to retain its own counsel, at the Borrower's expense, and such participation by the Borrower in the defense thereof shall not release the Borrower of any liability that it may have to such Indemnitee. Any Indemnitee against whom any indemnity claim contemplated in this Section 32 (*Indemnification*) is made shall be entitled, after consultation with the Borrower and upon consultation with legal counsel wherein such Indemnitee is advised that such indemnity claim is meritorious, to compromise or settle any such indemnity claim. Any such compromise or settlement shall be binding upon the Borrower for purposes of this Section 32 (*Indemnification*). Nothing herein shall be construed as a waiver of any legal immunity that may be available to any Indemnitee. To the extent permitted by applicable law, neither the Borrower nor the WIFIA Lender shall assert, and each of the Borrower and the WIFIA Lender hereby waives, any claim against any Indemnitee or the Borrower, respectively, on any theory of liability, for special, indirect, consequential or punitive damages (as opposed to direct or actual damages) arising out of, in connection with, or as a result of, this Agreement, any of the other Related Documents, the other transactions contemplated hereby and thereby, the WIFIA Loan or the use of the proceeds thereof, provided, that nothing in this sentence shall limit the Borrower's indemnity obligations to the extent such damages are included in any third party claim in connection with which an Indemnitee is entitled to indemnification hereunder. All amounts due to any Indemnitee under this Section 32 (*Indemnification*) shall be payable promptly upon demand therefor. The obligations of the Borrower under this Section 32 (*Indemnification*) shall survive the payment or prepayment in full or transfer of the WIFIA Bond, the enforcement of any provision of this Agreement or the other Related Documents, any amendments, waivers (other than amendments or waivers in writing with respect to this Section 32 (*Indemnification*)) or consents in respect hereof or thereof, any Event of Default, and any workout, restructuring or similar arrangement of the obligations of the Borrower hereunder or thereunder.

Section 33. Sale of WIFIA Loan. The WIFIA Lender shall not sell the WIFIA Loan at any time prior to the Substantial Completion Date. After such date, the WIFIA Lender may sell the WIFIA Loan to another entity or reoffer the WIFIA Loan into the capital markets only in accordance with the provisions of this Section 33 (*Sale of WIFIA Loan*). Such sale or reoffering shall be on such terms as the WIFIA Lender shall deem advisable. However, in making such sale or reoffering the WIFIA Lender shall not change the terms and conditions of the WIFIA Loan without the prior written consent of the Borrower in accordance with Section 24 (*Amendments and Waivers*). The WIFIA Lender shall provide, at least sixty (60) days prior to any sale or reoffering of the WIFIA Loan, written notice to the Borrower of the WIFIA Lender's intention to consummate such a sale or reoffering; provided, however, that no such notice shall be required during the continuation of any Event of Default. The provision of any notice pursuant to this Section 33 (*Sale of WIFIA Loan*) shall not (x) obligate the WIFIA Lender to sell nor (y) provide the Borrower with any rights or remedies in the event the WIFIA Lender, for any reason, does not sell the WIFIA Loan.

Section 34. Effectiveness. This Agreement shall be effective on the Effective Date.


Section 35. Termination. This Agreement shall terminate upon the irrevocable payment in full in cash by the Borrower of the Outstanding WIFIA Loan Balance, together with all accrued interest, fees and expenses with respect thereto; provided, however, that the indemnification requirements of Section 32 (*Indemnification*), the reporting and record keeping requirements of Section 14(p) (*Affirmative Covenants – Access; Records*) and the payment requirements of Section 10 (*Fees and Expenses*) shall survive the termination of this Agreement as provided in such Sections.

Section 36. Integration. This Agreement constitutes the entire contract between the parties relating to the subject matter hereof and supersedes any and all previous agreements and understandings, oral or written, relating to the subject matter hereof.

[Signature pages follow]


IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed and delivered by their respective officers thereunto duly authorized as of the date first written above.

NARRAGANSETT BAY COMMISSION

By: 
Name: Vincent J. Mesolella
Title: Chairman

By: 
Name: Laurie Horridge
Title: Executive Director

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, acting by and
through the Administrator of the
Environmental Protection Agency

By: 
Name: Andrew R. Wheeler
Title: Administrator

[Signature page to Narragansett Bay Commission CSO Phase III Project -- WIFIA Loan Agreement]

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APPENDIX: WIFIA SPECIFICATION PACKAGE AND BID CONTRACT LANGUAGE

Last Updated: December 2020

This is a reference document that provides all necessary contract language for WIFIA funded projects. Please note that some of the contract language in this package is required and must be included verbatim and some is suggested. For *Suggested Contract Language*, you may use your own language so long as it still ensures that provisions are included to guarantee compliance with the federal requirements.

EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THE FEDERAL LANGUAGE PROVISIONS WITH RESPECT TO STATE OR LOCAL LAW.

ECONOMIC AND MISCELLANEOUS AUTHORITIES

DEBARMENT AND SUSPENSION AND PROHIBITIONS RELATING TO VIOLATIONS OF CWA AND CAA WITH RESPECT TO FEDERAL CONTRACTS, GRANTS, OR LOANS

Suggested Contract Language:

Debarment and Suspension. Contractor certifies that it will not knowingly enter into a contract with anyone who is ineligible under the 2 CFR part 180 and part 1532 (per Executive Order 12549, 51 FR 6370, February 21, 1986) or who is prohibited under Section 306 of the Clean Air Act or Section 508 of the Clean Water Act to participate in the [Project]. Suspension and debarment information can be accessed at <http://www.sam.gov>. Contractor represents and warrants that it has or will include a term or conditions requiring compliance with this provision in all of its subcontracts under this Agreement.

NEW RESTRICTIONS ON LOBBYING

Suggested Contract Language:

Federal Lobbying Restrictions (31 U.S.C 1352). Recipients of federal financial assistance may not pay any person for influencing or attempting to influence any officer or employee of a federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress with respect to the award, continuation, renewal, amendment, or modification of a federal grant, loan, or contract. These requirements are implemented for USEPA in 40 CFR Part 34, which also describes types of activities, such as legislative liaison activities and professional and technical services, which are not subject to this prohibition. Upon award of this contract, Contractor shall complete and submit to the City the certification and disclosure forms in Appendix A and Appendix B to 40 CFR Part 34. Contractor shall also require all subcontractors and suppliers of any tier awarded a subcontract over \$100,000 to similarly complete and submit the certification and disclosure forms pursuant to the process set forth in 40 CFR 34.110.

CIVIL RIGHTS, NONDISCRIMINATION, AND EQUAL EMPLOYMENT OPPORTUNITY AUTHORITIES

AGE DISCRIMINATION ACT, SECTION 504 OF THE REHABILITATION ACT, TITLE VI OF THE CIVIL RIGHTS ACT OF 1964, AND SECTION 13 OF THE CLEAN WATER ACT

Suggested Contract Language:

CIVIL RIGHTS OBLIGATIONS. Contractor shall comply with the following federal non-discrimination requirements:

- a. Title VI of the Civil Rights Act of 1964, which prohibits discrimination based on race, color, and national origin, including limited English proficiency (LEP). (42 U.S.C 2000D, *et. seq*)
- b. Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination against persons with disabilities. (29 U.S.C. 794, supplemented by EO 11914, 41 FR 17871, April 29, 1976 and EO 11250, 30 FR 13003, October 13, 1965)
- c. The Age Discrimination Act of 1975, which prohibits age discrimination. (42 U.S.C 6101 *et. seq*)
- d. Section 13 of the Federal Water Pollution Control Act Amendments of 1972, which prohibits discrimination on the basis of sex.
- e. 40 CFR Part 7, as it relates to the foregoing.

EQUAL EMPLOYMENT OPPORTUNITY

Required *Contract Language. This language must be included verbatim:*

Equal Employment Opportunity (EEO). The Contractor shall comply with Executive Order 11246, entitled 'Equal Employment Opportunity,' as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60). (EO 11246, 30 FR 12319, September 28, 1965)

Contractor's compliance with Executive order 11246 shall be based on implementation of the Equal Opportunity Clause, and specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4.

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

- 1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, 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, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices

- to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- 2) The contractor will, in all solicitations or advancements 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, religion, sex, sexual orientation, gender identity, or national origin.
 - 3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
 - 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 by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, 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 No. 11246 of Sept. 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 No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting 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 noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 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 provisions of paragraphs (1) through (8) 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 No. 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 may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States. [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966-1970 Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp.,

Standard Federal Equal Employment Opportunity Construction Contract Specifications. (41 CFR 60-4.3)

- 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 Contract Compliance Programs, United States Department of Labor, or any person to whom 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 of 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 is 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 an 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 7 a 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 or 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 its goals in each craft during the period specified.

- 5) Neither the provisions of any collective bargaining agreement, nor 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 nonworking 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. 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 therefor, along with whatever 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 meet 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 compiled under 7b above.

- f) Disseminate the Contractor's EEO 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 news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom 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 obligations under these specifications are being carried out.
- n) Ensure that all facilities and company activities are non-segregated 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 a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of 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 workforce 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 of 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, sexual orientation, gender identity, 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 Contractor fails to comply with the requirements of 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 in 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 1977 and the Community Development Block Grant Program).

Segregated Facilities. (41 CFR 60-1.8) The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensuring that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. This obligation extends to all contracts containing the equal opportunity clause regardless of the amount of the contract. The term "facilities," as used in this section, means waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, wash rooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees; Provided, That separate or single-user restrooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

Required language in bid solicitations (or equivalent):

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) located at 41 CFR § 60-4.2:

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 workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation in each trade
	Insert goals for each year ¹	6.9% ²

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

¹ Goals can be found at: <https://www.dol.gov/agencies/ofccp/construction>

² Nationwide goal for all covered areas

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 non-federally 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 specifications 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 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 subcontract 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 of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract 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).

PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES IN PROCUREMENT UNDER EPA FINANCIAL ASSISTANCE AGREEMENTS

Note: The WIFIA program only requires use of the EPA DBE program's six good faith efforts during contract procurement. States may require additional DBE reporting.

Suggested Contract Language:

Disadvantaged Business Enterprises (DBE). The contractor must ensure that the DBE's six good faith efforts are used during the procurement of subcontractors for the [Project]. The six good faith efforts are found at: <https://www.epa.gov/grants/disadvantaged-business-enterprise-program-requirements#sixgoodfaiththefforts>.

AMERICAN IRON AND STEEL (AIS) REQUIREMENT

Suggested Contract Language:

The Contractor acknowledges to and for the benefit of _____ (“Purchaser”) and the United States Environmental Protection Agency (“EPA”) that it understands the goods and services under this Agreement are being funded with monies made available by the Water Infrastructure Finance and Innovation Act program of the EPA that has 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 (“American Iron and Steel Requirement”) including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents, warrants and covenants to and for the benefit of the Purchaser and the EPA 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 Purchaser or the EPA. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or the EPA to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or the EPA resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the EPA or any damages owed to the EPA by the Purchaser). While the Contractor has no direct contractual privity with the EPA, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the EPA 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 EPA.

LABOR LAWS AND STANDARDS

Note that the language below addresses Davis Bacon and Related Acts and incorporates the WIFIA borrower as an authorized representative, in accordance with the WIFIA loan agreement, to ensure compliance with this federal requirement.

Required Contract Language.

Compliance with Davis-Bacon and Related Acts.

(a) 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 public building or public work, or building or work 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 29 C.F.R. § 5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, provided that such modifications are first approved by the Department of Labor):

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), 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.

(ii)

(A) The WIFIA assistance recipient, [name of WIFIA borrower], on behalf of the U.S. Environmental Protection Agency (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 WIFIA assistance recipient shall approve 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 WIFIA assistance recipient agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent to the Administrator of the Wage and Hour Division (WHD Administrator), U.S. Department of Labor, Washington, DC 20210. The WHD Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the WIFIA assistance recipient or will notify the WIFIA assistance recipient 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 WIFIA assistance recipient do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the WIFIA assistance recipient shall refer the questions, including the views of all interested parties and the recommendation of the WIFIA assistance recipient, to the WHD Administrator for determination. The WHD Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the WIFIA assistance recipient or will notify the WIFIA assistance recipient 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. [name of WIFIA borrower], shall upon written request of the WIFIA Director 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 (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the WIFIA Director 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 (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). 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) {no text here}

- (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to [name of WIFIA borrower] . The payrolls submitted 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 weekly transmittals. 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/esa/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 [name of WIFIA borrower], for transmission to the EPA, 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 [name of WIFIA borrower]).
- (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 [name of the borrower, 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 EPA may, after written notice to the [name of WIFIA borrower], 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 WHD 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 WHD Administrator 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.

- (iii) 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 may by appropriate instructions require, 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 [name of WIFIA borrower], 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.

(b) Contract Work Hours and Safety Standards Act. The following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section shall be inserted 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 § 5.5(a) or § 4.6 of part 4 of this title. 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 therefor 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 \$25 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 [name of WIFIA borrower] shall upon its own action or upon written request of an authorized representative of the Department of Labor, or the EPA, 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 (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.

- (c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in § 5.1, 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 EPA shall cause or require the [name of WIFIA borrower] to 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 [name of WIFIA borrower], EPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

LATEST UPDATES ON FEDERAL REQUIREMENTS

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

Suggested Contract Language:

Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment (Effective August 13, 2020). The John S. McCain National Defense Authorization Act for Fiscal Year 2019 (P.L. 115-232), at Section 889, prohibits EPA financial assistance recipients, including WIFIA borrowers, from expending loan funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in the Act, “covered telecommunications equipment or services” means:

- a) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- b) 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).
- c) Telecommunications or video surveillance services provided by such entities or using such equipment.
- d) 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.

The Act does not prohibit:

- a) Procuring with an entity to provide a service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements.
- b) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

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SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.01 RELATED SECTIONS:

- A. Contract Agreement, Section CA.

1.02 QUALITY CONTROL:

- A. Conform to reference standard by date of issue current on date of Bid Opening.

1.03 SCHEDULE OF REFERENCES:

- A. AA: Aluminum Association, 818 Connecticut Avenue, N.W., Washington, DC 20006.
- B. AABC: Associated Air Balance Council, 1000 Vermont Avenue, N.W., Washington, DC 20005.
- C. AASHTO: American Association of State Highway and Transportation Officials, 444 North Capitol Street, N.W., Washington, DC 20001.
- D. ACI: American Concrete Institute, Box 19150, Redford Station, Detroit, MI 48219.
- E. ADC: Air Diffusion Council, 230 North Michigan Avenue, Chicago, IL 60601.
- F. AFBMA: Antifriction Bearing Manufacturers Association, 1101 Connecticut Avenue, N.W., Suite 700, Washington, DC 20036.
- G. AGA: American Gas Association.
- H. AGC: Associated General Contractors of America, 1957 "E" Street, N.W., Washington, DC 20006.
- I. AGMA: American Gear Manufacturers Association, 1500 King Street, Suite 201, Alexandria, VA 22314.
- J. AI: Asphalt Institute, Asphalt Institute Building, College Park, MD 20740.
- K. AIA: American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006.
- L. AISC: American Institute of Steel Construction, 400 North Michigan Avenue, Eighth Floor Chicago, IL 60611.
- M. AISI: American Iron and Steel Institute, 1000 16th Street, N.W., Washington, DC 20036.
- N. AITC: American Institute of Timber Construction, 333 W. Hampden Avenue, Englewood, CO 80110.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

- O. AMCA: Air Movement and Control Association, 30 West University Drive, Arlington Heights, IL 60004.
- P. ANSI: American National Standards Institute, 1430 Broadway, New York, NY 10018.
- Q. AOAC: Association of Official Agriculture Chemists.
- R. APA: American Plywood Association, Box 11700, Tacoma, WA 98411.
- S. API: American Petroleum Institute, 1220 "L" Street, N.W., Washington, DC 20005.
- T. ARI: Air-Conditioning and Refrigeration Institute, 1501 Wilson Boulevard, Arlington, VA 22209.
- U. ASCE: American Society of Civil Engineers, 345 E. 47th Street, New York, NY 10017.
- V. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E., Atlanta, GA 30329.
- W. ASME: American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.
- X. ASNS: American Standard for Nursery Stock.
- Y. ASPA: American Sod Producers Association, 4415 West Harrison Street, Hillside, IL 60162.
- Z. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.
- AA. AWI: Architectural Woodwork Institute, 2310 South Walter Reed Drive, Arlington, VA 22206.
- BB. AWWA: American Wood-Preservers' Association, 7735 Old Georgetown Road, Bethesda, MD 20014.
- CC. AWS: American Welding Society, 550 LeJeune Road, N.W. Miami, FL 33135.
- DD. AWWA: American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.
- EE. BIA: Brick Institute of America, 11490 Commerce Park Drive, Reston, VA 22091.
- FF. CDA: Copper Development Association, 57th Floor, Chrysler Building, 405 Lexington Avenue, New York, NY 10174.
- GG. CEMA: Conveyor Equipment Manufacturer's Association
- HH. CFR: Code of Federal Regulations.
- II. CLFMI: Chain Link Fence Manufacturers Institute, 1101 Connecticut Avenue, N.W., Washington, DC 20036.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

- JJ. CRSI: Concrete Reinforcing Steel Institute, 933 Plum Grove Road, Schaumburg, IL 60195.
- KK. CS: Commercial Standard
- LL. DHI: Door and Hardware Institute, 7711 Old Springhouse Road, McLean, VA 22101.
- MM. EJCDC: Engineers' Joint Contract Documents Committee, American Consulting Engineers Council, 1015 15th Street, N.W., Washington, DC 20005.
- NN. EJMA: Expansion Joint Manufacturers Association, 25 North Broadway, Tarrytown, NY 10591.
- OO. FGMA: Flat Glass Marketing Association, 3310 Harrison, White Lakes Professional Building, Topeka, KS 66611.
- PP. FM: Factory Mutual System, 1151 Boston-Providence Turnpike, P.O. Box 688 Norwood, MA 02062.
- QQ. FS: Federal Specification, General Services Administration, Specifications and Consumer Information Distribution Section (WRSIS), Washington Navy Yard, Building 197, Washington, DC 20407.
- RR. GA: Gypsum Association, 1603 Orrington Avenue, Evanston, IL 60201.
- SS. JIC: Joint Industrial Council, c/o National Machine Tool Builders Association, 7901 Westpark Drive, McLean, VA 22102.
- TT. HIS: Hydraulic Institute Standards.
- UU. IBR: Institute of Boiler and Radiator Manufacturers, aka Hydronics Institute, P. O. Box 218, 35 Russo Place, Berkeley Heights, NJ 07922.
- VV. ICBO: International Conference of Building Officials, 5360 S. Workman Mill Road, Whittier, CA 90601.
- WW. IEEE: Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, NY 10017.
- XX. IMIAC: International Masonry Industry All-Weather Council, International Masonry Institute, 815 15th Street, N.W., Washington, DC 20005.
- YY. MBMA: Metal Building Manufacturer's Association, 1230 Keith Building, Cleveland, OH 44115.
- ZZ. MFMA: Maple Flooring Manufacturers Association, 60 Rivere Drive Northbrook, IL 60062.
- AAA. MIL: Military Specifications, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.
- BBB. ML/SFA: Metal Lath/Steel Framing Association, 221 North LaSalle Street, Chicago, IL 60601.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

- CCC. NAAMM: National Association of Architectural Metal Manufacturers, 221 North LaSalle, Street Chicago, IL 60601.
- DDD. NBS: National Bureau of Standards
- EEE. NCMA: National Concrete Masonry Association, P.O. Box 781, Herndon, VA 22070.
- FFF. NEBB: National Environmental Balancing Bureau, 8224 Old Courthouse Road, Vienna, VA 22180.
- GGG. NEC: National Electric Code.
- HHH. NEMA: National Electrical Manufacturers' Association, 2101 "L" Street, N.W. Washington, DC 20037.
- III. NFPA: National Fire Protection Association, P.O. Box 9101, Quincy, MA 02269.
- JJJ. NFPA: National Forest Products Association, 1619 Massachusetts Avenue, N.W., Washington, DC 20036.
- KKK. NSWMA: National Solid Wastes Management Association, 1730 Rhode Island Avenue, N.W. Washington, DC 20036.
- LLL. NTMA: National Woodwork Manufacturers Association, 205 W. Touhy Avenue, Park Ridge, IL 60068.
- MMM. PCA: Portland Cement Association, 5420 Old Orchard Road, Skokie, IL 60077.
- NNN. PCI: Prestressed Concrete Institute, 201 North Wells Street, Chicago, IL 60606.
- OOO. PS: Product Standard, U.S. Department of Commerce, Washington, DC 20203.
- PPP. PTI: Post Tensioning Institute.
- QQQ. RIS: Redwood Inspection Service, One Lombard Street, San Francisco, CA 94111.
- RRR. RCSHSB: Red Cedar Shingle and Handsplit Shake Bureau, 515 116th Avenue Bellevue, WA 98004.
- SSS. SAE: Standard Automotive Engineering.
- TTT. SDI: Steel Deck Institute, P.O. Box 9506, Canton, OH 44711.
- UUU. SDI: Steel Door Institute, 712 Lakewood Center North, 14600 Detroit Avenue, Cleveland, OH 44107.
- VVV. SIGMA: Sealed Insulating Glass Manufacturers Association, 111 East Wacker Drive, Chicago, IL 60601.
- WWW. SJI: Steel Joist Institute, 1205 48th Avenue North Suite A, Myrtle Beach, SC 29577.

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

XXX. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association, 8224 Old Court House Road, Vienna, VA 22180.

YYY. SSPC: Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.

ZZZ. TCA: Tile Council of America, Inc., Box 326 Princeton, NJ 08540.

AAAA. UL: Underwriters' Laboratories, Inc., 333 Pfingston Road, Northbrook, IL 60062.

BBBB. USS Gage: United States Standard Gage

CCCC. WCLIB: West Coast Lumber Inspection Bureau, 6980 S.W. Varns Road, Box 23145, Portland, OR 97223.

DDDD. WWPA: Western Wood Products Association, 1500 Yeon Building, Portland OR 97204.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF REFERENCE STANDARDS

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SECTION 01100

MISCELLANEOUS AND SPECIAL PROJECT REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section includes restrictions on Contractor hours of operation, site noise, and other special project requirements.
- B. Related Work Described Elsewhere:
 - 1. General Specifications, Section 01000
 - 2. Summary of Work, Section 01010
 - 3. Coordination, Section 01040
 - 4. Project Safety and Health Requirements, Section 01065
 - 5. Environmental Protection Procedures, Section 01110
 - 6. Construction Facilities and Temporary Services, Section 01500.

1.02 CONSTRUCTION WORK HOUR RESTRICTIONS BY PROGRAM MANAGER AND OWNER

- A. Except as otherwise specifically allowed elsewhere in the Contract Documents, normal construction activity shall take place only between the hours of 7:00 am to 5:00 pm excluding, Saturdays, Sundays and legal holidays. The Contractor shall plan the Work to avoid working beyond these hours. However, if despite the Contractor's diligent efforts, the Contractor believes that overtime work is necessary in order for the Contractor to complete the Work, the Contractor may apply to the Program Manager and to the Owner for approval to perform overtime work, which approval may be withheld in their sole discretion. No additional compensation or time extension shall be due to the Contractor whether approval is granted or denied.
- B. If the Contractor believes that overtime work is necessary, it shall obtain prior approval from the Program Manager and the Owner. The Contractor shall file a request for such approval in writing and shall include the specific reasons therefore and the time that the overtime work is expected to be concluded. Overtime work will normally be limited to evening hours (5:00 p.m. to 8:00 p.m.) Monday through Friday and daytime hours (7:00 a.m. to 5:00 p.m.) on Saturdays except in special circumstances approved by the Program Manager and the Owner.

1.03 CONSTRUCTION WORK HOUR RESTRICTIONS BY CITY OF PAWTUCKET

- A. The Contractor's construction operations shall comply with all Laws, Permits and applicable local ordinances. Should the Contractor sustain any delay or damages in the prosecution of the Work due to the Contractor's failure to conform with the requirements of the Permit, Laws or Ordinances as determined by City of Pawtucket, or other regulatory agency, the Contractor shall not be entitled to an extension of Contract Time or Contract Price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF MISC. AND SPECIAL PROJECT REQUIREMENTS

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SECTION 01110

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 Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; 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. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- D. This Section is 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. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Rhode Island Department of Environmental Management. Contractor shall provide erosion and sedimentation controls in accordance with the Drawings and project specifications.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Program Manager will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Program Manager, of any non-compliance with State or local requirements. After receipt of such notice from the Program Manager or from the regulatory agency through the Program Manager, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. 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 was in compliance.

1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Program Manager to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Program Manager and incorporate permanent control features into the project at the earliest practicable time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition or new final condition as shown on the Drawings.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

- A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.
- B. Do 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 basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Rhode Island Department of Environmental Management. Submit two copies of approved contingency plans to the Program Manager.
- D. Water being flushed from structures or pipelines after disinfection, with a residual chlorine concentration of 2 mg/l or greater, shall be either discharged to the chlorine contact tank or treated with a dechlorination solution, in a method approved by the Program Manager, prior to discharge.

3.03 PROTECTION OF LAND RESOURCES

- A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Program Manager. 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 in any event be responsible for any damage resulting from such use.
- C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.
- D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored to their original condition. The Program Manager will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.
 - 1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated as soon as possible with an approved tree wound dressing. 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, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Program Manager, shall be immediately removed and replaced.
- E. The locations of the Contractor's storage and other construction buildings, required temporarily in the performance of the work, shall be in cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Program Manager and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Program Manager.
- F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.
 - 1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.
 - 2. Details of temporary road construction.
 - 3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
 - 4. A drawing showing the proposed restoration of the area in accordance with the Drawings and Specifications. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect 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 Program Manager. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

- G. 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 Program Manager. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon.
- H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 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 within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause 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 is prohibited. The use of chlorides may be permitted with approval from the Program Manager.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Program Manager.

3.05 NOISE CONTROL

- A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. Maintain all facilities constructed for pollution control as long as 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.

END OF ENVIRONMENTAL PROTECTION PROCEDURES

SECTION 01115

EMERGENCY RESPONSE PLAN REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Emergency Response Plan applies to personal injuries sustained on the site and to the discovery of and/or including personal injuries sustained as a result of contact with hazardous material that could be detrimental to human health or the environment including asbestos. The Emergency Response Plan required by this Section does not relieve the Contractor from the requirements of OSHA regulations as referenced elsewhere in these specifications and the requirements of the Sections of these specifications.
- B. The procedure requirements contained herein are intended to address unanticipated contact with chemicals or hazardous materials during the project. The Emergency Response Plan will also address the Contractor's/Subcontractor's responsibilities should workers sustain personal injuries on-site or the threat of personal injuries exist on the site related to unanticipated contact with chemicals or hazardous materials.
- C. Should an unanticipated incident occur that is considered serious and/or an imminent hazard by the Contractor's Site Safety and Health Officer (SSHO), work within the area influenced by the incident will be suspended until the emergency situation has been brought under control, the incident has been evaluated, and site conditions which contributed to the emergency have been mitigated.
- D. An emergency situation or imminent hazard includes, but is not limited to, the following:
 - 1. buried drum(s) with unknown or known toxic contents
 - 2. groundwater or soils of an unnatural color
 - 3. levels of volatile organic compounds (as measured by a photoionization detector) in excess of critical action levels established by the Contractor's Certified Industrial Hygienist (CIH) in the Hazardous Materials Health and Safety Plan
 - 4. spills or leaks of chemicals or petroleum products on-site
 - 5. other perceived threats
 - 6. loss of negative pressure during asbestos abatement
- E. Site personnel shall report all incidents to the Contractor's SSHO and the Owner's on-site representative as soon as possible. The Contractor's SSHO will determine the appropriate steps to be taken subject to the Owner's concurrence. All site incidents will be investigated and documented by Owner or their designated representative. Specific mitigation actions to deal with the emergency are not included within these procedures.
- F. The Emergency Response Plan shall be submitted by the Contractor in conjunction with the Contractor's site-specific Health and Safety Manual required in Section 01065 – Project Safety and Health Specifications..

1.02 DESCRIPTION OF REQUIREMENTS

- A. The site-specific Emergency Response Plan shall be submitted to the Program Manager for review before any work covered in the specific procedures is initiated. It is the Contractor's responsibility to implement appropriate emergency response actions to protect his/her workers safety. Therefore,

the Program Manager will not approve the Emergency Response Plan but only review to verify that items specified in this section are addressed. The Contractor shall implement, maintain and enforce these procedures at the appropriate time prior to and during all phases of the Work.

- B. The Contractor shall utilize the services of an industrial hygienist certified by the American Board of Industrial Hygienists (ABIH) to develop and implement the Emergency Response Plan.

1.03 REGULATORY REQUIREMENTS AND APPLICABLE PUBLICATIONS

- A. The site specific Emergency Response Plan shall be consistent with the requirements of:
 - 1. National Contingency Plan, Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
 - 2. FEMA (Federal Emergency Management Agency) Emergency Operations Plan Requirements.
 - 3. OSHA (Occupational Safety and Health Administration) Standards and Regulations contained in Title 29 Code of Federal Regulations, Part 1910.120 "Hazardous Waste Operations and Emergency Response".
 - 4. OSHA (Occupational Safety and Health Administration) Standards and Regulations contained in Federal Regulations, Part 1910.146 "Permit - Required Confined Spaces".
 - 5. Environmental Protection Agency (EPA) Regulations contained in Title 40, Code of Federal Regulations, Part 112, "Spill Prevention Control and Countermeasure Plan."
 - 6. Rhode Island Department of Environmental Management and Rhode Island Department of Health.
- B. The Emergency Response Plan shall include, but not necessarily be limited to, the following components as required by OSHA 29 CFR 1910.120(i)(J):
 - 1. Site Description and Evaluation.
 - 2. Names of key personnel and alternates responsible for safety and health (responsibilities and chain of command).
 - 3. Emergency Equipment and First Aid Requirements.
 - 4. Emergency Response Plan and Contingency Procedures.
 - 5. Spill Prevention Control Countermeasure Plan in accordance with EPA 40 CFR 112.
- C. The site specific Emergency Response Plan shall be submitted to the Program Manager within 30 days after the Notice-To-Proceed. No work shall be performed until the Emergency Response Plan has been accepted by the Program Manager.
- D. Any disregard for the provision of these specifications shall be deemed just and sufficient cause for termination of the Contract without compromise or prejudice to the rights of the Contractor.

1.04 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

- A. The Contractor shall develop an emergency response and contingency plan for on-site and off-site emergencies, as specified in OSHA 29 CFR 1910.120 (1), which shall address at a minimum:
 - 1. Pre-emergency planning
 - 2. Personnel roles, lines of authority, training and communication
 - 3. Emergency recognition and prevention
 - 4. Safe distances and places of refuge
 - 5. Site security and control
 - 6. Evacuation routes and procedures
 - 7. Decontamination
 - 8. Emergency Medical treatment and first aid
 - 9. Emergency alerting and response procedures
 - 10. Critique of response and follow-up

11. Personal Protection Equipment and emergency equipment
- B. In the event of any emergency the Contractor shall, without delay: take diligent action to remove or otherwise minimize the cause of the emergency; alert the Program Manager; and institute whatever measures might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.
 - C. Should the emergency be related to the contact of unanticipated contaminated material, the Contractor shall enact emergency response activities or shall evacuate the area until the emergency is otherwise mitigated in compliance with the Emergency Response Plan.
 - D. Emergency medical care services shall be prearranged at a nearby medical facility with established emergency routes.
 - E. The Contractor shall establish emergency communications with health and emergency services. The names of the services and their facilities, name of contact, emergency routes and emergency communications arrangements shall be posted at the site. The posted list shall include the following minimum points:
 - 1. Ambulance service and fire department telephone numbers.
 - 2. Procedure to prompt notification of Program Manager and Owner.
 - 3. Location of emergency showers/eye wash facilities.
 - 4. Location of self-contained breathing devices.
 - 5. Specific procedures for handling personnel with excessive exposure to chemicals or contaminated soil.
 - F. All emergency contact names and telephone numbers shall be posted at all project phones.
 - G. All designated site emergency vehicles shall be equipped with route maps providing directions to the off-site medical facility. All drivers of support vehicles shall become familiar with the emergency route and the travel time required.
 - H. In the event that an accident or some other incident such as an explosion, or an exposure to toxic chemical levels occurs during the course of the project, the Program Manager and Owner shall be telephoned immediately and receive a written notification within 2 hours. The report shall include the following items:
 - 1. Name, organization, telephone number, and location of the Contractor.
 - 2. Name and title of the person(s) reporting.
 - 3. Date and time of accident/incident.
 - 4. Location of accident/incident, i.e. site location, facility name.
 - 5. Brief summary of accident/incident giving pertinent details including type of operation ongoing at time of accident.
 - 6. Cause of accident/incident, if known.
 - 7. Casualties (fatalities, disabling injuries).
 - 8. Details of any existing chemical hazard or contamination.
 - 9. Estimated property damage, if applicable.
 - 10. Nature of damage, effect on contract schedule.
 - 11. Action taken by Contractor to insure safety and security.
 - 12. Other damage or injuries sustained (public or private).
 - I. Contingency Planning: Procedures and Contractor personnel responsibilities for potential emergencies shall be identified in the Emergency Response Plan. Emphasis in the contingency planning section shall be placed on procedures.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF EMERGENCY RESPONSE PLAN REQUIREMENTS

SECTION 01200

MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION CONFERENCE

- A. After the bids have been opened but prior to the start of the construction there will be a preconstruction conference to discuss the phasing and scheduling of the construction project. The specific time and place of the conference will be arranged by Owner after the Contract has been awarded.

1.02 PROGRESS MEETINGS

- A. During the course of the construction project, the Contractor shall attend routine progress meetings as scheduled by the Program Manager. The frequency and location for these meetings is to be determined by Owner. The attendance of subcontractors and suppliers may be required during the progress of the work. The Contractor's delegate to the meeting shall be prepared and authorized to discuss the following items:
 - 1. Progress of Work in relation to Contract Schedule.
 - 2. Proposed Work activities for forthcoming period.
 - 3. Resources committed to Contract.
 - 4. Coordination of Work with others.
 - 5. Status of procurement of equipment and materials.
 - 6. Status of Submittals.
 - 7. Outstanding actions, decisions, or approvals that affect Work activities.
 - 8. Security issues.
 - 9. Quality Issues
 - 10. Potential Claims
 - 11. Contract Changes
 - 12. Costs & Budget
 - 13. Mitigation Measures

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF MEETINGS

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SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings, Product Data, and other information as specified herein. Detailed submittal requirements will be specified in the technical specification sections.
- B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing No. or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.

1.02 SCOPE OF WORK

- A. The Contractor shall submit shop drawings on all equipment and materials, structural details, piping layouts and all miscellaneous items to be incorporated into the Work. All shop drawings shall be submitted using the transmittal form furnished by the Program Manager.
- B. Such drawings shall be project-specific and shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for the Contract.
- C. When so specified or if considered, in advance, by the Program Manager to be acceptable, manufacturer's specifications, catalog data, descriptive matter, illustrations, etc., may be submitted in place of shop and working drawings.
- D. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the Work due to the absence of such drawings. Prior to the submittal of any shop drawings, the Contractor shall submit a schedule of proposed shop drawing transmittals. The schedule shall identify the subject matter of each transmittal, the corresponding specification section number and the proposed date of submission. During the progress of the Work the schedule shall be revised and resubmitted as necessary.
- E. The Contractor shall review shop drawings and product data, including those by subcontractors, prior to submission to determine and verify the following:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - 4. Conformance with the Specifications
- F. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as hereinabove provided and approved for conformance to the Contract requirements. All such materials and equipment and the work involved

in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.

- G. Until the necessary approvals have been made, the Contractor shall not proceed with any portion of the Work (such as the construction of foundations), the design or details of which are dependent upon the design or details of work, materials, equipment or other features for which review is required.
- H. All shop and working drawings shall be submitted to the Program Manager by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them.
- I. If a shop drawing shows any deviation from the Contract requirements, the Contractor shall make specific mention of the deviations in the Transmittal Form furnished by the Program Manager and provide a description of the deviations in a letter attached to the submittal.
- J. The review of shop and working drawings hereunder will be general only, and shall not relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified thereunder.
- K. Should the Contractor submit equipment that requires modifications to the structures, piping, electrical conduit, wires and appurtenances, layout, etc., detailed on the Drawings, he shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications.

1.03 SHOP DRAWINGS AND PRODUCT DATA

- A. Shop drawings as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
- B. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns (submitted as physical units or color chips, painted coupons, etc. – photocopies of colors shall not be accepted), manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, production or quality control inspection and test reports and certifications, and mill reports as applicable to the Work.

1.04 SUBMITTAL PROCEDURES

- A. Contractor shall upload all submittals to the Procore project website. Submittals will be downloaded by Program Manager for review and uploaded back to the Procore project website once review is complete. Hardcopies or electronic submissions by means other than as noted herein (e.g., email, compact disc, USB drive) will not be accepted.

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- B. Submittals of a physical nature, such as material samples, shall be delivered to Program Manager at their place of business or Contractor shall arrange for sample pickup by Program Manager at the project site. In these instances, Contractor shall upload transmittal cover page to the Procore project website for tracking purposes.
- C. Contractor shall retain one hardcopy of each approved submittal at the project site for reference during the work.
- D. Transmit all submittals with cover page provided by the Program Manager. 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 contractor.
- E. Sequentially number the transmittal cover page. Resubmittals shall have original number with an alphabetic suffix.
- F. Identify Contract, Contractor, Subcontractor and/or Supplier; pertinent drawing sheet and detail number(s), and specification section number, as appropriate. Clearly indicate model and options being proposed and strike out all non-relevant data. Identify the building, equipment or structure to which the drawing applies.
- G. All submittals must be cross-referenced to the section of the specifications to which they relate to.
- H. Only drawings that have been checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Program Manager, the Contractor shall stamp and sign them certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- I. All technical submittals or calculations shall bear the stamp and signature of a Professional Engineer registered in the State of Rhode Island.
- J. Schedule submittals in accordance with the Progress Schedule. Coordinate submission of related items.
- K. Identify variations from Contract Documents and product which may be detrimental to successful performance of the completed Work.
- L. Revise and resubmit submittals within 14 days. Identify all changes made since previous submittal.
- M. All shop drawings submitted by subcontractors for approval 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.
- N. The Contractor shall check all subcontractor's shop drawings to verify measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission to the Program Manager for approval.
- O. All details on shop drawings submitted for approval 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 submitted for approval.

- P. Project work, materials, fabrication, and installation shall conform with approved shop drawings and product data.

1.05 SUBMITTALS REQUIRED

- A. Submit a list of Shop Drawings indicating specification section number, contents, proposed numbering system, and time schedule for preparation and submission for all Shop Drawings for the Contract. This list shall be provided within 30 days after the Notice to Proceed.
- B. Submittals shall include, where applicable,:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number
 - 3. Contractor identification.
 - 4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 5. Identification of the product, with the specification section number, page and paragraph(s).
 - 6. 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 Specification numbers.
 - 9. Identification of deviations from Contract Documents.
 - 10. Identification of revisions on resubmittals.
 - 11. A blank space suitably sized for the Contractor and the Program Manager stamps.

1.06 REVIEW OF SHOP DRAWINGS, PRODUCT DATA AND WORKING DRAWINGS

- A. The review of shop drawings and data 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 Program Manager, 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 or data as submitted describe variations and show a departure from the Contract requirements which the Program Manager finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Program Manager may return the reviewed drawings without noting an exception.
- D. Submittals will be returned to the Contractor with a code indicating whether or not the submittal was approved and whether or not it has to be resubmitted.

- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals, the Contractor shall direct the Program Manager's attention, by use of revision triangles or other clear, written notation, to revisions other than the corrections requested by the Program Manager on previous submissions. Such revisions shall be so noted on the letter of transmittal and on the resubmitted shop drawings. All such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections as may be required by the Program Manager to all work done because of this type revision that is not in accordance with the Contract Documents.
- F. Partial submittals may not be reviewed. The Program Manager 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 "Not Approved" until resubmitted. The Program Manager 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 Program Manager and at the Contractor's expense, based on the Program Manager's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Program Manager. Submittals are required until approved.
 - 2. Any need for more than one resubmission, or any other delay in obtaining Program Manager'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 Program Manager at least seven working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the Program Manager, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Program Manager.

1.07 DISTRIBUTION

- A. Distribute reproductions of approved shop drawings and copies of approved product data, where required, to the job site file.

1.08 GENERAL PROCEDURES FOR SUBMITTALS

- 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 in the individual work sections of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, 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.

1.09 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

- A. If specifically required in other related Sections, submit a P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SUBMITTALS

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of Rhode Island and that he/she has been employed by

_____ to design
(Name of Contractor)

(Insert P.E. Responsibilities)

in accordance with Section _____ for the

(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____
_____, that said design is in conformance
(Name of Project)

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

(Insert Name of Owner)

or Owner's representative within seven days following written request therefor by the Owner.

P.E. Name

Contractor's Name

Signature

Signature

Address

Title

P.E. License No.

Address

Rhode Island stamp.

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SECTION 01311

CONSTRUCTION SCHEDULING

PART 1 GENERAL

1.01 PROGRAM DESCRIPTION

- A. A Bar Chart construction schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The construction schedule and updates shall be prepared by the Contractor. All work shall be done in accordance with the established schedule and the Contractor and his subcontractors shall be responsible for cooperating fully with the Program Manager and the Owner in effectively utilizing the schedule.
- B. Within 14 days following the receipt of the Notice to Proceed, the Contractor shall submit two prints of the proposed schedule to Owner for review. Following review by Owner, the Contractor shall incorporate the Program Manager's comments and submit five prints of the revised schedule.
- C. Approval of the schedule by Owner is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the contract completion date. Omissions and errors in the approved schedule shall not excuse performance less than that required by the Contract. Approval by Owner in no way makes Owner an insurer of the schedule's success or liable for time or cost overruns flowing from its shortcomings.
- D. Progress under the approved schedule shall be evaluated monthly by the Contractor, updated as appropriate and forwarded to the Owner for review and comment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CONSTRUCTION SCHEDULING

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SECTION 01370

SCHEDULE OF VALUES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit to the Owner a Schedule of Values allocated to the various portions of the work, within 30 days after date of Notice to Proceed.
- B. Upon request of the Owner, support the values with data which will substantiate their correctness.
- C. The Schedule of Values, when approved by Owner, shall be used as the only basis for the Contractor's Applications for Payment.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SCHEDULE OF VALUES

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SECTION 01381

AUDIO VIDEO RECORDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for color audio video recording of all existing site, roadway and right-of-way conditions.

1.02 REQUIREMENTS

- A. Pre-Construction recording
 - 1. Furnish to Owner an original and one copy of a continuous color audio video recording. Take recording prior to any construction activity.
 - 2. Recordings to be of sufficient detail to accurately and clearly show the existing, preconstruction conditions of the entire area of the Work. Each recording to include an audio description of the area being video recorded.
 - 3. Coverage shall include, but not be limited to, all existing roadways, sidewalks, curbing, driveways, buildings, structures, above ground utilities, landscaping, trees, signage and other physical features located within the zone of influence of the Work. The coverage may be expanded if directed by Owner.
 - 4. All recordings will be done during daylight hours. No recording shall be performed if weather is not acceptable, such as rain, fog, etc.
- B. The Owner reserves the right to reject any recordings because of poor quality.
- C. Any recordings rejected by the Owner shall be re-recorded at no additional cost.

1.03 SUBMITTALS

- A. Provide references of similar projects for review by the Owner, including project owner contacts and telephone numbers.

1.04 QUALITY CONTROL

- A. The recording shall be performed by a qualified, established audio video recording firm knowledgeable in construction practices and inspection procedures.

PART 2 PRODUCTS

2.01 AUDIO VIDEO MEDIA

- A. Recording media shall be a USB device capable of playback on Microsoft Windows computers.

PART 3 EXECUTION

3.01 AUDIO AND VIDEO RECORDING

- A. Each recording shall begin with the Owner's name, Contract name and number, Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.
- B. Information appearing on the recording must be continuous and run simultaneously by computer generated transparent digital information. No editing or overlaying of information at a later date will be acceptable.
- C. Digital information will be as follows:
 - 1. Upper left corner
 - a. Name of Contractor
 - b. Day, date and time
 - c. Name of Project
 - 2. Lower left corner
 - a. Street or route of travel
 - b. Viewing side
 - c. Direction of travel
 - d. Stationing
- D. Time must be accurate to within 1/10 of a second and continuously generated.
- E. Written documentation must coincide with the information on the recording so as to make easy retrieval of locations sought for a later date.
- F. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints or photographic negatives or digital image files in commonly accepted image file formats (e.g. .jpg, .tif, etc.).
- G. Audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Special commentary will be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, etc.
- H. All USBs shall bare labels with the following information:

1. USB Number
2. Owner's Name
3. Date of Recording
4. Project Name and Number
5. Location and Standing Limit of recording

END OF AUDIO VIDEO RECORDING

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SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 RELATED SECTIONS:

- A. Summary of Work and Contract Milestones, Section 01010.
- B. Reference Standards, Section 01090.
- C. Submittals, Section 01300.
- D. Schedule of Values, Section 01370.
- E. Material and Equipment, Section 01600.
- F. Contract Closeout, Section 01650.

1.02 QUALITY CONTROL AND CONTROL OF WORK:

- A. The Contractor is responsible for controlling the quality of Work including work of its Subcontractors and suppliers and for ensuring that the specified quality is achieved. The Contractor and its Subcontractors and suppliers shall be responsible for developing and maintaining a quality control program which is responsive to the requirements of this specification section and which includes implementing procedures necessary to ensure compliance with the requirements of the Contract. The Contractor's QC (CQC) program shall be submitted within 30 days after receipt of Notice to Proceed. The CQC program shall explain the Contractor's and its Subcontractors' approach to on-site quality control, off-site quality control, the CQC organization, documentation of quality control activities, and provide all other information necessary to demonstrate to the Program Manager that the Contractor and its Subcontractors and suppliers will provide quality control services that ensure compliance of the Work with the Contract Documents. The CQC program shall identify the Contractor's individuals responsible for the execution of the program and identify those subcontractors/suppliers working to the CQC program and those working to their own Quality Control (SQC) program. The Quality Control programs shall apply to the control of quality throughout all areas of contract performance including the procurement, identification, stocking, and issue of material; the entire process of construction; and the installation and testing of equipment. The CQC program will include the elements of a required CQC Program listed in Attachment A. The CQC program will also identify those procedures that will require inspection checklists that will be completed by the Contractor, an example of which is included in Attachment B.
- B. Overall administration of the CQC program shall be vested in a responsible, authoritative element of the contractor's organization, hereinafter referred to as the QC Organization, under a qualified on-site QC Manager acceptable to the Program Manager who has clear access to senior level offsite home office management and to Subcontractors' officers responsible for the execution of the SQC Program. The QC Manager may be the Program Manager or superintendent and may have other on-site duties, provided the requirements of this specification are met. The QC Manager's duty is to manage and administer the CQC program unless otherwise authorized in writing by the Program Manager. Such authorization can be withdrawn at any time. The QC Manager shall be assigned for the duration of the Contract on a full-time basis and any change is subject to Program Manager approval.

- C. Written quality control inspection and test procedures shall be used for all operations involving permanent work. These procedures shall contain instructions for performing the required inspection or test, contain the accept/reject criteria for each inspection or test activity (i.e. applicable drawing, specification section, industry code or standard), shall establish the frequency for performing the inspection or test, and shall provide for recording the results of inspections and tests on checklists acceptable to the Program Manager. These procedures shall be kept current and shall be available at all locations where inspections and tests are to be performed.
- D. The Contractor shall maintain control over procurement sources to ensure that materials, equipment and services conform to specified requirements. The Contractor's procurement documents shall require subcontractors and suppliers to implement their own (SQC) program, as required by paragraph 1.03 of this Specification Section, or require them to implement the CQC Program. The Contractor and its subcontractors shall comply fully with manufacturers' instructions, including completing each step in sequence. Should manufacturers' instructions conflict with Contract Documents, the contractor is to request clarification from the Program Manager before proceeding.
- E. Work to be done away from the construction site is subject to inspection by the Program Manager on behalf of NBC during its fabrication, manufacture, testing, or before shipment. The Contractor shall give notice to the Program Manager of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Program Manager at least 48 hours prior so that the necessary arrangements for inspections and witnessing of shop tests can be made. The Program Manager has the right but not the responsibility to perform inspection or to witness tests. The Program Manager's right to perform inspection or to witness tests does not relieve the Contractor of the obligation to comply with the requirements of the Contract Documents. At all locations and all times, the Contractor shall ensure that the Program Manager has clear and safe access to all Work being performed, whether it be on site or off site.
- F. The Program Manager has the right but not the responsibility to perform inspections, witness tests, or otherwise monitor or assess the Work and activities. The Program Manager and NBC's right to perform inspections, witness tests, or monitor or assess the Work and activities does not relieve the Contractor or its Subcontractors, and sellers of their obligation to comply with the requirements of the Contract Documents.
- G. Means and methods shall be established for controlling the identification, inspection status, handling, and storage of raw and fabricated material. These controls shall be maintained from the time of receipt of the material until delivery to the Program Manager, in order to protect the material from damage, deterioration, loss or substitution.
- H. The Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements. In-process and final inspection and testing of construction shall be performed in accordance with implementing written quality control inspection and test procedures to ensure that contract requirements have been met. The results of in-process and final inspections shall be recorded on inspection check lists furnished by the Contractor, which shall include a similar level of detail and elements as those contained as examples in Attachment A and approved by the Program Manager. Payment will not be processed for an item of work until checklists are completed and provided to the Program Manager.

- I. Means and methods shall be established to ensure conformance with requirements for special process specifications such as welding, heat treating and nondestructive testing of materials. Weld inspection shall include fit-up inspection and final weldment inspection on all welds and in process inspection on welds selected by the Program Manager for each welder and weld process used. Welds requiring intermediate weld layers shall be selected first for in process inspection and the inspection shall ensure compliance with the welding procedure and welder's performance qualifications. Certifications for personnel, procedures, and equipment shall be maintained as required to meet the requirements of the Contract Documents and all applicable codes.
- J. Procedures shall provide for the identification and control of unsatisfactory or nonconforming material or conditions and for the prompt notification to the Program Manager with recommendations for corrective action. An "Unsatisfactory Condition" is a deficiency which deviates from Contract Document requirements or renders the quality of an item indeterminate but can be corrected to meet such requirements without an engineering determination. A "Nonconformance" is a condition which deviates from Contract Document requirements and cannot be corrected to meet such requirements or otherwise requires an engineering determination.
- K. The CQC and SQC programs are subject to quarterly (approximately every three months) audit by NBC or the Program Manager as its representative to assure compliance with the Contract Documents. The Contractor will make their QCM available to the CM as well as all of their quality plan files, materials and documentation. This review/audit will be conducted in the Contractor's field office in space provided by the Contractor. The Audit will include a review of the quality plan and if it is being implemented in the field operations. The activities include (but are not limited to): determining if quality activities are being conducted; Auditing records to see if all activities are being documented correctly; determining if quality activities are attended by the proper parties; determining if quality activities are being approved by the proper parties; Auditing records to see if proper notice is given to all parties attending quality activities; Auditing records to determine if they are providing the required daily and monthly quality reports to the owner and Program Manager.
- L. The Contractor shall issue monthly quality control reports to the Program Manager as a prerequisite to processing requests for payments. Payments will not be processed until the contractor submits the monthly quality control report. These reports shall include: status of the contractor quality control program including procedure development, status of subcontractor/supplier quality control programs and procedures, number of inspections and tests performed during the month, unsatisfactory and nonconforming items identified as well as those that remain open or were closed during the month, a list of quality control activities planned for next month based on planned project schedule activities, and copies of all completed quality forms, checklists, and logs.

1.03 QUALITY ASSURANCE/CONTROL OF SUBCONTRACTORS/SUPPLIERS

- A. The Contractor is responsible for controlling the quality of work performed by its subcontractors and suppliers. Subcontractors and suppliers may implement their own quality control (SQC) program if the program is approved by the Contractor and the Program Manager. Otherwise the Contractor will instruct the subcontractor or supplier to implement the CQC program on all work performed and will perform the Quality Control inspections of the subcontractor's or supplier's Work and activities at their facilities. Program Manager approval of supplier QC Programs may be waived at the discretion of the Program Manager except when specifically required by the technical specifications. Such waivers can be withdrawn at any time. The CQC program shall list all Subcontractors and suppliers and identify which quality program, CQC or SQC, they are to implement. The Contractor shall have responsibility to provide and ensure access to all subcontractor or supplier facilities for the purpose of inspections.

- B. SQC programs which are responsive to the requirements of this section including the attached QC program elements (Attachment A) shall be required of Subcontractors and Suppliers pursuant to the same requirements outlined in paragraph 1.02 herein for CQC's.

1.04 REFERENCES

- A. The Contractor and its Subcontractors and sellers shall conform to reference standards current on bid opening date.
- B. The Contractor and its Subcontractors and sellers shall indicate any instance where specified reference standards conflict with Contract Documents and request clarification from Program Manager before proceeding.
- C. American Society for Nondestructive Testing:
 - 1. SNT-TC-1A: Recommended Practice for Nondestructive Testing Personnel Qualification and Certification.
- D. American Welding Society:
 - 1. AWS QC1: Standard and Guide for Qualification and Certification of Welding Inspectors.

1.05 CONTRACTOR'S ON-SITE QUALITY CONTROL TESTING AND INSPECTION

- A. The Contractor and its Subcontractors shall perform inspections, tests, and other services as required by the Contract Documents, their approved QC programs, and in accordance with laws, codes, rules, and regulations and document the results on checklists as described in paragraph 1.02 I. herein.
- B. The Contractor shall provide 24-hour notice to the Program Manager so that the Program Manager may witness Contractor and/or Subcontractors on site inspections and tests. Inspections and tests to be witnessed by the Program Manager shall be identified as hold/notification points on the Contractor's checklists. The Program Manager's witnessing of inspections and tests does not relieve the Contractor and its Subcontractors of their obligation to comply with the requirements of the Contract Documents.
- C. The Contractor and its Subcontractors shall develop an inspection and test index identifying all required inspections and tests as indicated in the Contract Documents and their approved QC program. This index shall be submitted to the Program Manager for approval and be included as part of the QC program. The Contractor shall provide one copy of inspection and test results to the Program Manager representative witnessing the inspection or test and retain and file the original inspection and test results in an orderly manner so that the Contractor can readily turn over such records to the Program Manager and demonstrate to the Program Manager at Contract Closeout that the Work has been satisfactorily performed and tested.

1.06 ENGINEER QUALITY CONTROL ACTION ITEMS

- A. Unless otherwise directed in writing by NBC or the Program Manager, the Contractor shall promptly undertake appropriate action at no additional cost to NBC to respond and correct any unsatisfactory, nonconforming, or otherwise deficient conditions reported to the Contractor by the Program Manager. These conditions may be identified as a result of Program Manager inspections, audits or surveillances.

- B. The Contractor's refusal, failure or neglect to take appropriate action or to submit a written response within the time period requested shall constitute reasonable evidence that the Contractor is not prosecuting the Work or separable part, with the diligence that will ensure its acceptable quality within the applicable Contract requirements and shall constitute sufficient basis for the Program Manager to decline to recommend payment or to recommend withholding any payment otherwise due in accordance with the General Conditions or to identify and order alternate actions or inspections at Contractor expense on the basis of the information in the Contract.

1.07 CONTRACTOR'S TESTING LABORATORY

- A. The Contractor shall employ and pay for the services of an independent testing laboratory to perform all of the testing of earth work and concrete (i.e. soil density; concrete strength, slump, temperature, and air content) and perform other inspections and tests required by the specifications or referenced codes and standards. The independent laboratory must be a CCRL (Cement and Concrete Reference Laboratory) approved facility. Personnel performing inspections and tests must be certified by the ACI (American Concrete Institute).
- B. The Contractor shall protect concrete test specimens during initial curing and storage from time of fabrication until receipt by the testing laboratory and shall provide transportation of the specimens to the laboratory.
- C. Reports will be submitted by the independent testing firm to the Contractor and the Program Manager simultaneously indicating observations and results of inspections and tests and indicating compliance or non-compliance with Contract Documents. Test results that yield strengths below the specified limits must be reported immediately by e-mail to the Program Manager.
- D. If inspection and testing by the independent laboratory indicates that Contractor's and/or Subcontractors work fails to conform to the specified requirements, Contractor and/or Subcontractors shall correct the defective work, develop suitable procedures to ensure that any new work will be in conformance with specifications, and perform additional inspections and tests to verify that the corrected work and new procedures are in compliance with the specifications, all at no additional cost to NBC.

1.08 PROGRAM MANAGER/CONSTRUCTION MANAGER QA TESTING LABORATORY:

- A. The Program Manager/Construction Manager will employ and pay for the services of an independent testing laboratory to perform random Quality Assurance (QA) testing of earth work and concrete (i.e. soil density; concrete strength, slump, temperature, and air content) and perform random inspections and tests of other areas previously completed and inspected by the Contractor at the request of the Program Manager.
- B. Reports will be submitted by the independent testing firm to the Program Manager indicating observations and results of inspections and tests and indicating compliance or non-compliance with Contract Documents.
- C. The Contractor and Subcontractors shall cooperate with the independent testing firm procured by PM/CM; furnish samples of materials and assistance as requested.
- D. The Contractor shall provide reasonable notice (at least 24 hours) to the Program Manager prior to expected time for operations requiring independent testing laboratory services.

- E. If inspection and testing by the independent laboratory procured by PM/CM indicates that Contractor's and/or Subcontractors work fails to conform to the specified requirements, Contractor and/or Subcontractors shall correct the defective work, develop suitable procedures to ensure that any new work will be in conformance with specifications, and perform additional inspections and tests to verify that the corrected work and new procedures are in compliance with the specifications, all at no additional cost to NBC.

1.09 MANUFACTURERS' FIELD INSTALLATION SERVICES AND REPORTS

- A. When specified in the Contract Documents, the Contractor and its Subcontractors shall require material or product suppliers and manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, (test, adjust, and balance of equipment) and to provide instructions when necessary.
- B. The Contractor shall report to the Program Manager in writing any observations and site decisions or instructions given by the manufacturers' representative to the Contractor that are supplemental or contrary to manufacturers' written instructions.
- C. The Contractor shall submit manufacturer's representative's reports within 10 days of each field visit, to the Program Manager for review. Reports shall be posted to the project's Submittal Exchange website. If the durations of field visits are greater than one week, the contractor shall submit weekly reports. Final report shall certify that the equipment or systems have been satisfactorily installed and are functioning correctly.

1.10 SUBMITTALS

- A. Within 30 days after receipt of the Notice to Proceed, the Contractor shall submit to the Program Manager for approval the Contractor's CQC program, including the inspection and test index described in 1.05C.
- B. Prior to their use, the Contractor shall submit any revisions or changes to the CQC program or implementing procedures previously submitted to and approved by the Program Manager.
- C. Qualifications of Contractor's Independent Testing Laboratory, certifications of personnel, and written Procedures and Quality Control Manual for all field and laboratory tests to be performed.
- D. Prior to their commencement of work, the Contractor shall submit the resume of their QC Manager.
- E. Prior to subcontractors' and suppliers' commencement of work for which their own quality control (SQC) program will be implemented, the Contractor shall review, approve and submit to the Program Manager for approval the SQC to be used.
- F. During performance of contract work, the Contractor shall submit the following to the Program Manager for information and as a condition of payment:
 - 1. Monthly quality control reports as described in paragraph 1.02.L.
 - 2. Copies of inspection and test results.
 - 3. Manufacturers representative's reports (in duplicate) within 10 days of each field visit per paragraph 1.09 including final reports which certify that equipment or systems have been satisfactorily installed and are functioning correctly. If the duration of field visits is greater than one week, the Contractor shall submit weekly reports.

- G. At contract close out and prior to release of retainage, the Contractor shall submit to the Program Manager all completed QA/QC documentation including the original inspection and test records demonstrating that the work has been satisfactorily performed and tested.

PART 2 PRODUCTS

- 2.01 The products of this section are Quality Control programs, Procedures and Records and the services of this section are Quality Program management and administration and independent quality control inspections. The CQC program and SQC programs shall define all quality records that are to be developed and turned over to the Program Manager as a result of implementing the quality program and procedures. The list of records shall be submitted to the Program Manager for approval and be included as part of the QC program.

PART 3 EXECUTION

- 3.01 NBC reserves the right to have the Program Manager either prepare or assist the Contractor or its Subcontractors and Suppliers in the preparation of quality control program and implementing procedure submittals which are overdue by more than fifteen (15) days, or to take appropriate action to correct any unsatisfactory, nonconforming, or otherwise deficient condition reported to the Contractor by the Program Manager when the Contractor refuses, fails, or neglects to take action within the time period requested and the Contractor shall reimburse NBC for all associated direct, indirect or consequential costs. In the event the Contractor fails to pay those costs within thirty (30) days after receipt of an invoice from NBC, NBC shall be entitled to a decrease in Contract Price or to withhold a set-off against any amounts recommended for payment. Program Manager's assistance with quality control program and implementing procedure preparation or in correcting unsatisfactory, nonconforming, or otherwise deficient conditions shall not relieve the Contractor of its responsibilities for determination of the methods, techniques, and sequences for the performance of the Work.
- 3.02 Pursuant to the General Conditions, the Program Manager may refuse to recommend the whole or part of any payment if, in the Program Manager's opinion, the Contractor's or its Subcontractors' failure, refusal or neglect to provide the required quality control program and implementation precludes a proper evaluation of either quality control activities or the quality of work. NBC may refuse to make payment of the full amount recommended by the Program Manager and NBC may withhold from any payment a set-off if, in NBC's opinion, the Contractor's or its Subcontractors' failure, refusal or neglect to provide the required quality control program and implementation precludes a proper evaluation of whether or not the Contractor or its Subcontractor is prosecuting the quality control program and controlling the quality of the work with diligence that will ensure its completion within the Contract requirements.
- 3.03 These remedies for the Contractor's failure, neglect or refusal to comply with the requirements of this Section are in addition to, and not in limitation of, those provided under the Agreement and the General Conditions.
- 3.04 Inspections and tests shall be made by the Contractor and its subcontractors and the appropriate documentation produced as each element of work is executed. Program Manager will require completion of all required QA/QC documentation for an item as a condition of payment for that particular item. Program Manager will also require that all documentation be complete as a condition precedent to release of retainage.

- 3.05 The Contractor shall utilize First Material Delivery and Benchmark Inspections to ensure the highest level of performance throughout the project. First Material Inspections are conducted on all new material and equipment entering the jobsite that will be incorporated into the permanent work. Benchmarking Inspections are conducted on all first in-place construction for each type of work to insure adherence and conformance to the Contract Documents.
- A. The Contractor must provide the Program Manager with a minimum 48-hour advance notice of completed work activities and arrival time of first deliveries to allow for timely inspections. The Contractor must participate in all inspections. First Material and Benchmark Inspection forms are to be completed with all appropriate information and submitted to the Program Manager a minimum of 48 hours prior to the time of inspection. No inspections will be performed without proper notice.
- B. First Delivery of Material / Equipment Inspection
1. The Contractor notifies the Program Manager of the first delivery of each type of material or equipment.
 2. The Contractor and Program Manager inspects, and the Contractor documents the first delivery of equipment or materials to site for conformance or deficiencies. The Contractor documents the first delivery on forms developed by the Contractor and approved by the Program Manager.
 3. The delivery will be verified against the requirements of the design documents and the approved shop drawings.
 4. Non-conforming materials and/or equipment will not be allowed to be set into place and will be removed from the site immediately.
 5. This inspection establishes the basis for judging all future deliveries of like materials/equipment but shall not relieve the Contractor in any way from meeting specification requirements.
- C. Bench Marks
1. Before start of construction for each type of work, the Contractor will review the contract documents, submittals, shop drawings, codes and referenced standards to verify the requirements. Bench marks will be used for operations related to the permanent, finished product.
 2. The Program Manager and Contractor will establish the extent of the first work of a specific type constructed in the normal progress of the work for use as a benchmark.
 3. The Contractor notifies the Program Manager that the work is complete, and the Program Manager calls for a benchmark review.
 4. The Contractor and Program Manager inspection team comment on and/or approve the work for conformance to the specifications and drawings. The Contractor documents the Benchmark Inspection on a form developed by the Contractor and approved by the Program Manager.
 5. This inspection establishes the basis for judging all future work of a like type.

PART 4 ATTACHMENTS

ATTACHMENT A - ELEMENTS OF A QUALITY CONTROL PROGRAM

Provided as an example of the topics which must be addressed in a Quality Control Program.

ATTACHMENT B - QUALITY CONTROL CHECK LIST CRITERIA – SAMPLE

Provided as an example of criteria that constitutes a typical quality control check list.

END OF QUALITY CONTROL

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SECTION 01400 - ATTACHMENT A

ELEMENTS OF A QUALITY CONTROL PROGRAM

INTRODUCTION

The Quality Control Program is the basic quality document for the construction of a Project, and it identifies quality program commitments. The Quality Control Program assigns responsibilities, authority levels, and interface requirements for activities which affect quality. Activities which affect quality are those activities which affect the features and characteristics important to the quality of an item, such as soil compaction, concrete curing, etc. The Quality Control Program serves as the basis for Quality Control Procedures, which contain the administrative and implementation requirements for quality control activities. The Quality Control Program will incorporate first material delivery inspections, checklists, concrete placement sign-offs, and benchmark inspections. The Contractor will maintain documentation to this effect. Include appropriate forms and samples in the Quality Control Program.

A Quality Control Program must address the following program topics/elements as they relate to the equipment, material or service being furnished:

1. Organization
2. Quality Assurance Program
3. Design Control
4. Control of Procurement Documents
5. Instruction and Procedures
6. Control of Documents
7. Control of Material, Equipment, and Services
8. Survey/Field Coordination
9. Control of Special Processes
10. Inspection and Tests
11. Unsatisfactory/Nonconformance Control
12. Quality Control Records
13. Surveillance and Audits
14. Attachments
 - A. Inspection Report
 - B. Nonconformance Report
 - C. List of Procedures
 - D. List of Subcontractors and Suppliers and applicable QC program
 - E. List of inspections, tests and checklists
 - F. List of QA Records
 - G. First Delivery of Material Inspection
 - H. Benchmark Inspection

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SECTION 01400 - ATTACHMENT B

QUALITY CONTROL CHECK LIST CRITERIA – SAMPLE (CONCRETE)

THIS SAMPLE IS **NOT** INTENDED TO BE ALL INCLUSIVE

BUT TO BE A GUIDE TO CRITICAL ISSUES, CAUSE QUESTIONS TO BE ASKED, AND SERVE AS A
GENERAL GUIDE FOR CONTRACTOR TO DEVELOP CHECKLISTS.

This document includes items concerning **Formwork, Reinforcing Steel, Concrete Delivery, Placement and
Finishing**

GENERAL

1. First Delivery of Material inspections identified?
2. Benchmarks identified?
 - a. Excavation and subgrade
 - b. Forms, ties and bracing
 - c. Approved shop drawings being used
 - d. Reinforcing and imbeds
 - e. Concrete delivery, placement and vibration
 - f. Deck installation
 - g. Testing methods
 - h. Concrete finishing
 - i. Curing
 - j. Shoring and re-shoring
3. Concrete subcontractor approved?
4. Ready-mix supplier, source of aggregate and cement approved?
5. Concrete design mix, materials and additives approved?
6. Reinforcing steel shop drawings being expedited?
7. Schedule for preparation and approval of shop drawings conform to concrete placement schedule?
8. Samples approved?
 - a. additives, admixtures
 - b. reinforcing steel accessories
 - c. water-stop
 - d. expansion joints
 - e. patching materials
 - f. form ties and accessories
 - g. grout
 - h. floor hardener
 - i. and so on

9. Reinforcing steel splicing system approved?
10. Concrete testing laboratory under contract?
 - a. Inspectors assigned?
 - b. Report format approved?

FORM-WORK

11. Forms been designed in accordance with local codes, plans and specifications?
12. Form-work drawings at the job-site?
 - a. Form-work drawings stamped and signed by a registered P.E.?
 - b. Forms erected in accordance with drawings?
13. Form materials and faces in accord with specifications?
14. Forms in adequate condition for continued use?
15. Embedded items been placed prior to concrete placement?
16. Do dimensions reflect allowance for tolerance of concrete surface and facing material?
17. Mud-sills in place?
18. Power buggies being used?
 - a. Form-work drawings indicate special requirements?
 - b. Provisions make to protect forms, steel, imbeds?
 - c. Safe buggy fill area provided?

REINFORCING STEEL

19. Rods sufficiently tied to prevent displacement?
20. Chairs and/or other accessories in accordance with requirements?
21. Adequate to carry the personnel, material and equipment for placement?
22. Dowel size, spacing and projection checked?
23. Reinforcing installed in accordance with approved shop drawings?
 - a. Correct size and number?
 - b. Proper spacing and clearances?

CONCRETE DELIVERY AND PLACEMENT

24. Delivery scheduled to meet placement requirements and prevent delays and/or overtime?
25. Cold or hot weather requirements being complied with?
26. Approved concrete additive being used?
27. Forms swept, blown and/or washed clean prior to concrete placement?
28. Bonding agent available used properly?
29. Slumps of concrete within tolerance?
30. Are concrete placement cards to be used?

31. Cylinders being made in correct number, handled and stored in compliance with specification and ACI requirements?
32. Trucks been rejected? If so, why and documented?
33. Rate of concrete placement conforms to form-work drawings and ambient temperature?
34. Excessive deflection of forms?
 - a. Remedial measures taken and documented?
35. Concrete delivery in accordance with requirements?
36. In case of breakdowns or interruptions in delivery or conveying has a cold joints procedure been approved?
 - a. Specific location and conditions are to documented
 - b. Identify any cylinders taken in the area
 - c. Method of preparation of the potential cold joint should be included
 - d. Are water stops to be installed?
37. Sufficient number of working vibrators at the site?
38. Workers using them properly?
39. Tremies or "elephant trunks" used for placing concrete in walls?
40. Sleeves, inserts, reinforcing rods, and so on installed in accord with the requirements?
41. Damage during placement? Was it repaired?

FINISHING

42. Elevation reference in area of placement and verified?
43. Wet screeds being utilized to establish grades?
44. Materials as approved?
45. Level and flat tolerances met?
46. Texture of the slab finish in accordance with the requirements?
47. Surface additives required?
48. "Bird baths" identified during finishing?
49. Corrective action taken and documented?
50. Approved curing method being used?
 - a. Compatible with succeeding finish?
 - b. Chemical compound
 - c. Water and plastic sheets
 - d. Insulation, heat or cooling
51. Stripping in accord with requirements and codes?
 - a. Test cylinders broken as required?
 - b. Low strengths documented and tracked for explanation?
52. Slabs re-shored in accord with requirements?
53. Surfaces patched in approved manner?
54. Surfaces rubbed as required?

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SECTION 01410

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Qualification, duties and responsibilities of testing laboratories.
2. Coordination and scheduling responsibilities of the Contractor.

B. Related Sections

1. Section 01600 - Materials and Equipment

1.02 PAYMENT PROCEDURES

A. Initial Testing

1. The Owner will pay for initial testing services required by the Engineer, unless noted otherwise.

B. Retesting

1. When initial tests indicate noncompliance with the Contract Documents, subsequent retesting occasioned by the noncompliance shall be performed by the same testing agency, and costs thereof will be deducted by the Owner from the Contract Sum.

C. Contractors Convenience Testing

1. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. E329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

1.04 REQUIREMENTS

A. Work included:

1. Cooperate with the Owner's selected testing agency and all others responsible or testing and inspecting the Work.
2. Provide other testing and inspecting as specified to be furnished by the Contractor in this Section and/or elsewhere in the Contract Documents.
3. Where no testing requirements are described, but the Owner directs testing, the Contractor shall provide testing under the requirements of this Specification.

B. Work not included:

1. Selection of testing laboratory: The Owner will select a qualified independent testing laboratory.

1.05 QUALITY ASSURANCE

A. Qualifications

1. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E329.

B. Regulatory requirements

1. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.
2. Regulatory Requirements Inspections and tests required by codes or ordinances, or by a plan approved authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01600 - Materials and Equipment.

- B. Promptly process and distribute, to the Engineer, required copies of test reports and instructions to assure necessary retesting and replacement of materials with the least possible delay in progress of the Work.

1.07 SCHEDULING

A. Establishing schedule

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
2. Provide all required time within the construction schedule.
3. Coordinate testing activity with the appropriate testing laboratory.

B. Revising schedule

1. When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.

C. Adherence to schedule

1. When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Site Tests

1. Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.
2. All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

END OF SECTION

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SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY SERVICES

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Contractor shall provide all temporary facilities necessary for the proper completion of the work, as necessary and as specified.
- B. The Contractor's attention is directed to the requirements of Sections 01000 – General Specifications and 01501 – Weather Protection Standard.

1.02 FIELD OFFICES

- A. The Contractor shall maintain a temporary field office near the work for his own use.
- B. Field offices shall be maintained by Contractor for the duration of construction. Readily accessible copies of all contract documents shall be maintained at Contractor's field office.
- C. Field offices shall be located where they will not interfere with the progress of the work as approved by the Program Manager and have available power, heat, air conditioning, and bathroom facilities. In charge of this office there shall be a competent superintendent of the Contractor as specified in the Agreement, under Article CA.3.3.

1.03 WATER FOR CONSTRUCTION PURPOSES

- A. The Contractor shall make arrangements with Pawtucket Water Supply Board (PWSB), as required, to use available water supplies for construction purposes.
- B. The express approval of the PWSB shall be obtained before water is used. Hydrants shall only be operated under supervision of PWSB personnel.
- C. The Contractor is required to meter all water use and the Contractor will be charged for this use.
- D. If a water ban is instituted, the Owner reserves the right to discontinue the Contractor's use of public water supply.

1.04 TEMPORARY HEAT

- A. If temporary heat is required for the protection of the Work, the Contractor shall provide and install suitable heating apparatus, shall provide adequate and proper fuel, and shall maintain heat as required.

1.05 TEMPORARY ELECTRICAL

- A. The Contractor shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the Work and during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.

- B. The Contractor shall provide sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.
- C. Temporary street lights will be required along Roosevelt Ave Ext. and Taft Street during the progress of the work when power to the street lights is interrupted. Contractor shall be responsible for coordination of the power interruption and providing and maintaining the temporary lighting.

1.06 TEMPORARY FENCING

- A. Provide commercial grade chain link fence to prevent trespass by workmen and suppliers onto private property and the public from the construction site. Fence shall be 6-feet high (min.), unless otherwise noted.
- B. Temporary fencing that faces the public right-of-way shall be furnished with a privacy windscreen. Windscreen shall be manufactured of knitted HDPE UV Polyethylene with a minimum visibility blockage of 85% and shall be black in color.

1.07 FIRE EXTINGUISHERS

- A. Provide portable UL-rated, Class A fire extinguishers for all temporary offices and similar spaces. In other locations, provide portable UL-rated Class ABC dry chemical extinguishers a combination of NEPA recommended Classes for the exposure. Comply with NEPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CONSTRUCTION FACILITIES AND TEMPORARY SERVICES

SECTION 01501

WEATHER PROTECTION STANDARD

PART 1 GENERAL

1.01 DESCRIPTION

- A. It is the intent of these standards to require the General Contractor to provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March, as required.
- B. "Weather Protection" shall mean the temporary protection of that work adversely affected by moisture, wind and cold by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Program Manager and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The General Contractor shall furnish and install all "weather protection" material and be responsible for all costs. These provisions do not supersede any specific requirements for methods of construction and/or curing of materials.
- B. Within 30 calendar days after this award of contract, the General Contractor shall submit in writing to the Program Manager for approval, three (3) copies of his proposed methods of "Weather Protection".
- C. In the event of inclement weather, the Contractor and subcontractors shall protect the Work and materials from damage or injury from the weather. If, in the opinion of the Program Manager, any portion of the Work or materials has been damaged by reason of failure on the part of the Contractor or subcontractors to so protect the Work, such Work and materials shall be removed and replaced with new materials and Work to the satisfaction of the Program Manager.
- D. The Contractor is responsible for snow removal required to maintain access to the construction site and to perform his work. The Contractor shall also be responsible for snow removal within public sidewalks adjacent to the work area.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF WEATHER PROTECTION STANDARD

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SECTION 01510

PROTECTION OF EXISTING FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work in this section includes the protection of existing utilities, trees and plantings, and archaeological and paleontological finds susceptible to effects from the construction operations.
- B. Related Work Described Elsewhere:
 - 1. General Specifications, Section 01000
 - 2. Miscellaneous and Special Project Requirements, Section 01100
 - 3. Construction Facilities and Temporary Services, Section 01500

1.02 CONTRACTOR SUBMITTALS TO OWNER

- A. Copies of correspondence with utilities impacted by construction.
- B. Copies of all correspondence with property owners affected by construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROTECTION OF WORK AND PROPERTY

- A. The Contractor shall:
 - 1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
 - 2. Not cut off any residence or business from vehicular traffic for a period exceeding 1 hour unless special arrangements have been made.
 - 3. Maintain in continuous service all existing oil and gas pipelines; underground power, telephone or communication cable; water mains; irrigation lines; sewers; poles and overhead power; and all other utilities encountered along the line of work, unless other arrangements satisfactory to owners of said utilities have been made.
 - 4. Coordinate all activities with owner of said utility and perform all work to their satisfaction where completion of Work requires temporary or permanent removal and/or relocation of an existing utility.
 - 5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
 - 6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
 - 7. In areas where Contractor's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, sewer, or irrigation system and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by Contractor.
 - 8. Notify property owners and utility offices that may be affected by construction operations at least 2 days in advance. Before exposing a utility, the Contractor shall

obtain the utility owner's permission. Should service of utility be interrupted due to the Contractor's operation, the Contractor shall notify the proper authority immediately. He shall cooperate with said authority in restoring service as promptly as possible and bear costs incurred.

9. Not impair operation of existing sewer systems, and shall prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
10. Maintain site drainage at all times.

B. For all trees and plantings, the Contractor shall:

1. Protect from damage and preserve trees, shrubs, and other plants outside the limits of the Work and within limits of the Work, which are designated on the Drawings to remain undisturbed.
2. All work affecting/impacting trees shall be coordinated with the appropriate City department head in advance.
3. The Contractor shall:
 - a. Employ hand excavation as necessary to prevent tree injury.
 - b. Not stockpile materials or permit traffic within drip lines of trees.
 - c. Provide and maintain temporary barricades around trees.
 - d. Water vegetation as necessary to maintain health.
 - e. Cover temporarily exposed roots with wet burlap and keep the burlap moist until soil is replaced around the roots.
 - f. Not remove trees, except those specifically shown on Drawings to be removed.
 - g. Dispose of removed trees in a legal manner off the site.
 - h. Not burn trees or waste materials.
4. Ball and burlap trees that are to be moved and replanted, in conformance with the recommended specifications set forth in the American Standards for Nursery Stock, published by American Association of Nurserymen. All balls shall be firm and intact. Handle ball and burlap trees by the ball and not by the top.
5. In the event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices as authorized by the City Forester.
6. Replace each plant that was to remain but dies as a result of construction activities.

C. Existing Structures: Where Contractor contemplates removal of small structures such as mailboxes, signposts, and culverts that interfere with the Contractor's operations, he shall obtain approval of the property owner and Owner. Replace those removed in a condition equal to or better than original.

D. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

E. For any archaeological and paleontological finds the following conditions are in effect:

1. The Contractor shall immediately notify NBC and Program Manager/Construction Manager and proceed in accordance with the Contract Agreement should finds of an archaeological or paleontological nature be made within the limits of the site. Continue Work in other areas without interruption.
2. Archaeological Finds are defined as evidence of human occupation or use of an area within the contract limits prior to the Year 1680. Evidence may consist of skeletons, stone, or other utensils, or evidence of habitations or structures.

3. Paleontological Finds are defined as evidence of prehistoric plant or animal life, such as skeletons, bones, fossils, or casts and other indications such as pictographs.
4. NBC may order Work stopped in other areas if, in NBC's opinion, the find is more extensive than may appear from uncovered material.
5. The Contractor shall provide protection of finds as follows:
 - a. Cover, fence, or otherwise protect finds until notice to resume Work is given.
 - b. Cover finds with plastic film held in place by earth, rocks, or other weights placed outside the find. Should additional backfilling be necessary for safety or to prevent caving, place backfill material loosely over the plastic film.
 - c. Sheet or shore as necessary to protect excavations underway. Place temporary fence to prevent unauthorized access.
 - d. Dewater finds made below the water table as necessary to protect construction Work underway. Divert groundwater or surface runoff away from find by ditching or other acceptable means.
6. The Contractor shall abide by the following requirements regarding removal of finds:
 - a. Unless otherwise determined by the NBC, all finds are the property of the NBC. Do not remove or disturb finds without the NBC's written authorization.
 - b. Should NBC elect to have a find removed, provide equipment, labor, and material to permit the safe removal of the find without damage. Provide transportation for delivery to individuals, institutions, or other places as the NBC may find desirable, expedient, or required by law.

F. For endangered species, the Contractor shall abide by the following:

1. Take precautions necessary and prudent to protect native endangered flora and fauna.
2. Notify Program Manager/Construction Manager of construction activities that might threaten endangered species or their habitats.

END OF PROTECTION OF EXISTING FACILITIES

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SECTION 01540

SECURITY

PART 1 GENERAL

1.01 SECURITY PROGRAM

- A. Protect work from theft, vandalism and unauthorized entry.
- B. Initiate security program at Contractor mobilization.
- C. Maintain security program throughout construction period until Owner acceptance precludes the need for contractor security.
- D. The Contractor and Subcontractors are wholly responsible for the security of their site office, storage compound, and laydown area for all its plant, material, equipment and tools at all times.
- E. The Contractor's overall security program must be coordinated with the Owner's security system, as specified herein. All personnel are required to abide by the Owner's security system.

1.02 ENTRY CONTROL

- A. Allow entrance to assigned work and staging areas only to authorized persons.

1.03 NARRAGANSETT BAY COMMISSION RULES AND REGULATIONS

- A. The following restrictions apply to all project personnel while on Narragansett Bay Commission property. These restrictions shall apply to all project sites, including those on property not owned by the Narragansett Bay Commission, to the extent they are applicable. Failure to comply will be cause for dismissal or denial of access to the Project.
- B. Prohibited Items or Actions
 1. Firearms and lethal weapons.
 2. Possession of alcoholic beverages, non-prescription depressant or stimulant drugs, and being under the influence thereof. Any persons under the influence or in possession of either alcohol or non-prescription or illegal drugs shall be immediately removed from the project and will be subject to permanent access denial and/or dismissal.
 3. Gaming devices and the use thereof, including but not limited to playing cards, dice, etc.
 4. Sabotage, vandalism, or negligently operating equipment or vehicles.
 5. Fighting. Participants will be subject to immediate removal and/or dismissal.
 6. Theft of unauthorized removal of tools or material.
 7. Failure to use sanitary facilities.
 8. Entering unauthorized areas.
 9. Violating safety rules.
 10. Making false statements or falsifying records or reports.
 11. Horseplay.
 12. Littering.
 13. Negligently damaging property of the Owner.
 14. Hot plates, stoves or open fires.
 15. Menacing or threatening behavior, words, or actions.

16. Displaying materials deemed offensive or inappropriate by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECURITY

SECTION 01560

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for cleaning, maintenance of the site, barriers and fences required during construction.

1.02 CLEANING DURING CONSTRUCTION

- A. Unless otherwise specified under the various trade Sections of the Specifications, the General Contractor shall perform clean-up operations during construction as herein specified.
 - 1. Control accumulation of waste materials and rubbish; periodically dispose of off-site. Bear all costs, including fees resulting from disposal.
 - 2. Clean interior areas prior to start finish work and maintain areas free of dust and other contaminants during finishing operations.
 - 3. Maintain project in accordance with all local, State and Federal Regulatory Requirements.
 - 4. Store volatile wastes in covered metal containers, and remove from premises.
 - 5. Prevent accumulation of wastes that create hazardous conditions.
 - 6. Provide adequate ventilation during use of volatile or noxious substances
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on site.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.
 - 4. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
 - 5. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.
 - 6. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and wind blown debris, resulting from construction operations.
 - 7. Provide on-site containers for collection of waste materials, debris, and rubbish.
 - 8. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal disposal areas off the construction site.
 - 9. Handle material in a controlled manner with as little handling as possible. Do not drop or throw materials from heights.
 - 10. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.
 - 11. During its progress, the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

12. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes, structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc. shall, upon completion of the work, be left in a clean and neat condition.

1.03 DUST CONTROL

- A. Provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.
- B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions or performance obligations of the General Contractor.

1.04 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts for clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Construct sediment control devices for discharge from dewatering trenches.
- G. Construct all sedimentation control devices shown on the plans.

1.05 NOISE CONTROL

- A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.
- B. Execute construction work by methods and by use of equipment which will reduce excess noise.
 1. Equip air compressors with Silencers, and power equipment with mufflers.
 2. Manage vehicular traffic and scheduling to reduce noise.

1.06 POLLUTION CONTROL

- A. Special care shall be taken to prevent contamination or muddying up or interfering in any way with the stream flows, if any along the line of work. No waste matter of any kind will be allowed to discharge into the stream flows or impounded water of any pools or other bodies of water.

1.07 SURFACE WATER CONTROL

- A. Take all precautions to prevent damage to the work or equipment by high waters or by storms. The Engineer with the approval of the Owner may prohibit the carrying out of any work at any time when in his judgment, high water or storm conditions are unfavorable or not suitable, or at any time, regardless of the weather, when proper precautions are not being taken to safeguard previously constructed work or work in progress.
- B. In case of damage caused by the failure of the Contractor to take adequate precautions, the Contractor shall repair or replace equipment damaged and shall make such repairs or rebuild such parts of the damaged work, as the Engineer may require, at no additional expense to the Owner.

1.08 BARRIERS AND ENCLOSURES

- A. Fences and Barricades
 - 1. Provide and maintain temporary fences, barriers, lights, guardrails, and barricades as indicated in the Contract Documents, or as necessary to secure the Work and adjacent property, and protect persons and property.
 - 2. Obtain necessary approvals and permits and provide temporary expedients as necessary to accommodate tasks requiring items mentioned herein.
- B. Protection of Trees
 - 1. The Contractor shall take care not to harm trees along the sides of roads or with in the existing facility in which the construction work is to be done or trees on adjacent lands except as indicated on the drawings or with the written permission of the Owner and any other owner of the trees involved. Care shall be taken not to cut tree roots so as to harm the growth of trees to remain.
 - 2. If, in the opinion of the Engineer, any trees damaged during construction can be repaired, the Contractor shall satisfactorily repair same at no further cost to the Owner.
 - 3. If, in the opinion of the Engineer, any tree damaged during construction cannot be repaired and should be removed, the Contractor shall satisfactorily remove and replace, in kind, same at no further cost to the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01570

TRAFFIC REGULATION

PART 1 GENERAL

1.01 SCOPE

- A. This Section specifies the general requirements for traffic regulation, minimum performance criteria for maintenance and protection of traffic, road closures, and coordination with other parties for the duration of the Work.
- B. The Contractor shall be responsible for the maintenance and protection of traffic on public roadways impacted by its operations for the duration of the Work. The Contractor shall bear all costs for designing, furnishing, and maintaining traffic control facilities for the duration of the Work.
- C. The Contractor shall obtain permission from the City of Pawtucket to temporarily close lanes and for other temporary traffic control measures required in performing the Work.
- D. The Contractor shall coordinate its traffic control facilities with the schedule restrictions and construction operations of other parties as specified herein and specified by Section 01010 and Section 01100.
- E. Related work described elsewhere:
 - 1. General Specifications, Section 01000
 - 2. Summary of Work, Section 01010
 - 3. Permits and Regulatory Requirements, Section 01060
 - 4. Miscellaneous and Special Project Requirements, Section 01100
 - 5. Construction Facilities and Temporary Services, 01500
 - 6. Policing, Section 01576

1.02 REFERENCE STANDARDS

- A. Federal Highway Administration, Manual on Uniform Traffic Control Devices (MUTCD), latest edition.
- B. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction.

PART 2 PRODUCTS

2.01 TRAFFIC DEVICES AND MARKINGS

- A. Traffic devices and markings shall conform to Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction Divisions I & III and the FHWA Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

2.02 TRAFFIC CONTROL FACILITIES

- A. Temporary traffic control equipment shall be furnished by the Contractor at the start of construction, adjusted as needed throughout the course of the Work and removed or restored at the completion of the Work and shall include, but shall not be limited to traffic barriers, channelizing devices, signage, re-striping, work zone warnings and flashing arrow boards.
- B. The Contractor shall restore all public roadways, highways, and traffic control devices to a condition equal to, or better than that that existed prior to the Work.

PART 3 EXECUTION

3.01 MAINTENANCE OF TRAFFIC AND TRAFFIC CONTROL DEVICES

- A. The Contractor shall not close any State or City streets or rights-of-way without prior permission from the Rhode Island Department of Transportation and/or City of Pawtucket. The Contractor shall maintain existing traffic flows to all areas adjacent to the work areas. The Contractor shall not close or obstruct any portion of a street, road, or private way that shall be rendered unsafe by the Contractor's operations. Instead, the Contractor shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.
- B. Streets, roads, private ways, and walks not closed, shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for adequacy and safety of provisions made therefore.
- C. The Contractor shall, at least seven (7) days in advance, notify the Owner and PM/CM in writing if the closure of a street or road is necessary and at least two (2) days in advance, notify the Police and Fire Department in writing, with a copy of written notice provided to PM/CM and Owner. The Contractor shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.
- D. Throughout the duration of the Work, the Contractor shall maintain all temporary and permanent traffic control facilities, signs, barricades and other protective devices in a sturdy, clean, legible condition and at the locations designated by the Maintenance and Protection of Traffic (MPOT) Plan. The Contractor shall cover or remove signs not in use. Maintenance of devices will include repairing; adjusting; washing; repainting, and the re-application of reflective sheeting.
- E. Care shall be exercised such that weeds, shrubbery, and construction materials, equipment, and spoils do not obscure the message of any sign, light, or barricade.
- F. No defective and/or damaged devices shall be installed. Devices showing defects or damage shall be either repaired or removed and replaced at no additional cost to the Owner.
- G. Any and all costs, including Owner and Program Manager's costs, of fines levied for violation of any permit requirements which are a direct result of Contractor's performance or non-compliance with issues, permits, or applicable regulations shall be paid by Contractor at no cost to the Owner.

3.02 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Maintenance and Protection of Traffic (MPOT) procedures shall be implemented so that the duration and physical extent of any temporary lane closure is minimized. The MPOT procedures and the Contractor's use of laydown shall also be designed to minimize the need for Police details to be provided in accordance with Section 01576.
- B. It is anticipated that the Work proposed be completed using a combination of typical lane shift and typical lane closure setups, as depicted on sheets T-1 through T-5 of the Drawings. However, the means of MPOT shall be established by the Contractor and approved by the City of Pawtucket.

3.03 PARKING

- A. The Contractor shall be responsible for managing employee parking throughout the duration of the Contract. The Contractor shall secure and establish parking at the work site in a legal and safe manner that does not adversely affect traffic flows on public roads.
- B. The Contractor is responsible for all cost associated with no parking postings.

3.04 ROAD MAINTENANCE AND SITE ACCESS

- A. Contractor shall establish entrances and exits to the site that are acceptable to Owner and do not adversely affect traffic flows on public roads.
- B. Contractor shall install and maintain wheel wash facilities at all project work areas.
- C. The Contractor shall retain the services of a street sweeper to remove all muck and dust tracked onto public roadways due to its operations. Sweeping shall be conducted to the satisfaction of the Owner in accordance with project requirements.

3.05 SEQUENCE OF CONSTRUCTION

- A. In accordance with Section 01810.

END OF TRAFFIC REGULATION

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SECTION 01576

POLICING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. When, in the opinion of the Owner or the Program Manager, public safety or convenience requires the services of police, the Owner or Program Manager may direct the Contractor to provide manpower to direct traffic within the location of work under this Contract.
- B. When so directed, the Contractor shall make all arrangements for obtaining the necessary manpower. All costs for policing will be paid by the Owner. The Contractor shall pay all incidental costs related to the coordination for these services. Contractor shall obtain police detail slips and transmit with applications for payment.
- C. Contractor will be responsible to pay all fines, fees, and costs imposed due to sudden cancellation of police details.
- D. The intent is to ensure public safety by police direction of traffic. Police are not to serve as watchmen to protect the Contractor's equipment and materials, or to warn pedestrians of such hazards as open trenches.
- E. Nothing contained herein shall be construed as relieving the Contractor of any of his responsibilities for protection of persons and property under the terms of the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF POLICING

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SECTION 01590

FIELD OFFICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Contractor's and Engineer's field offices.

1.02 CONTRACTOR'S FIELD OFFICE

- A. Maintain a temporary field office near the work for his own use during the period of construction at which readily accessible copies of all contract documents shall be kept. Locate field office where it will not interfere with the progress of the Work. In charge of this office there shall be a responsible contractor superintendent.

1.03 ENGINEER'S FIELD OFFICE

- A. Prior to starting work at the site, provide and equip a suitable office for the exclusive use of the Engineer, and maintain this office until the completion of the Work under this Contract. This office shall be a separate building located, as directed, where it will not interfere with the progress of the work. An approved, suitably constructed and equipped trailer of adequate size and design for the purpose may be furnished as the Engineer's office. The office, furniture, equipment, and services necessary shall be satisfactory to the Engineer.
- B. The office shall be of suitable height and of ample size to accommodate the furniture and equipment listed below, without crowding (at least 400 sq. ft. of floor area). It shall be weather tight; the walls and roof shall be insulated with at least 1/2-in. insulating board suitably ventilated; and the floor shall be tight and of double-thick construction. The office shall have at least three screened windows which can be both opened and locked shut and the door shall have a cylinder lock with two keys. There also shall be a screen door.
- C. Provide acceptable toilet facilities within the office for the exclusive use of the Engineer. The Contractor shall make all water and sewer connections and pay all charges for such connections.
- D. Furnish the following furniture, equipment, supplies, and services:
 - 1. One plan table or sloping plan shelves, each about 3 ft. by 5 ft., with a reasonably smooth top, and two suitable swivel stools.
 - 2. 6 foot long conference table with 8 chairs.
 - 3. Shelves as directed.

4. Electric lights and outlets as directed. The Contractor shall pay all charges for the energy used.
5. Broom and dustpan.
6. One desks for general office use, each about 3 ft. by 5 ft., with one desk chair of the armchair swivel type.
7. Plan rack, as directed.
8. One fireproof four-drawer, legal size, metal filing cabinets, each with lock.
9. Carbon dioxide type fire extinguisher of at least 4-lb. capacity.
10. A printer/copy/scanner machine with supplies and service.
11. Supply of drinking water in a suitable cooler or other approved container.
12. Janitor service.
13. Paper cups, paper towels, liquid soap, and toilet paper; each with suitable dispenser or holder.
14. Thermostatically controlled heating unit or system of adequate capacity to maintain a minimum temperature of not less than 68 degrees. F. under all cold weather conditions.
15. Thermostatically controlled, refrigerant type, air conditioners of adequate capacity to maintain a maximum temperature of not more than 72 degrees F. under all hot weather conditions.
16. Modem with Internet service.
17. Wireless Router

1.04 REMOVAL OF OFFICES

- A. Remove the Engineer's field office and all other temporary facilities from the site, after the date of completion of the Work as stated in the final estimate, unless otherwise directed by the Engineer. The field office and temporary facilities shall become the Contractor's property and the premises shall be left in a condition acceptable to the Engineer.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION NOT USED

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. Install equipment and materials as specified and as indicated in accordance with the requirements of the specification sections in Divisions 2 through 16, and in accordance with the general installation requirements specified herein.
- B. Provide transportation, handling, storage, and protection of all materials and equipment as specified herein.

PART 2 PRODUCTS

2.01 PRODUCTS

- A. Do not use materials and equipment removed from existing premises, except as specifically required by the Contract Documents.
- B. Where similar Products (such as grease fittings, flexible couplings, etc.) are used on different pieces of equipment or in different areas within the Work, standardize the Products by providing all Products from the same supplier.

2.02 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

- A. These requirements shall constitute the acceptable minimum standards for the equipment specified herein. Should these requirements conflict with the Supplier's recommendations or the requirements in Divisions 2 through 16, or in any way be less stringent than Supplier's requirements or the requirements in Divisions 2 through 16, they shall be superseded by the more stringent of the Supplier's requirements or the requirements in Divisions 2 through 16.
- B. Bolts, Anchor Bolts and Nuts:
 - 1. Furnish bolts, anchor bolts, nuts, washers, plates and bolt sleeves. Anchor bolts shall have washers and hexagonal nuts.
 - 2. Provide stainless steel anchor bolts, nuts, washers, plates, and bolt sleeves unless otherwise indicated or specified.
 - 3. Furnish expansion bolts with malleable iron and lead composition elements.
 - 4. Unless otherwise specified, stud, tap, and machine bolts and nuts shall conform to the requirements of ASTM Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307-80. Use Hexagonal nuts of the same quality of metal as the bolts. All threads shall be clean cut and shall conform to ANSI Standard B1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).
 - 5. Bolts, anchor bolts, nuts, and washers specified to be galvanized shall be zinc coated, after being threaded, by the hot-dip process in conformity with the ASTM Standard Specifications for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged

- Steel Shapes, Plates, Bars and Strip, Designation A123-78, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153-80.
6. Bolts, anchor bolts, nuts, and washers specified to be stainless steel shall be certified SAE Type 316 stainless steel.

C. Grease Fittings

1. Provide extension fittings and tubing on all grease fittings that are installed so that equipment can be lubricated from the operating level without the use of ladders, staging, or shutting down the equipment. Tubing shall be of corrosion resistant materials compatible with the material to which it is attached.

D. Concrete Inserts

1. Use concrete inserts for hangers to completely support the maximum load that can be imposed by the hangers used in the inserts. Provide inserts for hangers of a type which will permit adjustment of the hangers both horizontally (in one plane), and vertically, and locking of the hanger head or nut. Galvanize all inserts by the hot-dip process in conformity with the ASTM Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shape, Plates, Bars and Strip, Designation A123-78, or the ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel hardware, Designation A153-80.
2. Inserts cast in concrete shall be furnished by the Subcontractor for the trade whose work requires them and delivered to the Contractor for installation.

E. Sleeves

1. Unless otherwise indicated or specified, form openings for the passage of pipes, conduits, and circular ducts through floors and walls using sleeves of standard weight, galvanized-steel pipe conforming to ASTM A53. Provided sleeves shall be of ample diameter to pass the pipe and its insulation, if any, and to permit expansion. Provide sleeves that are flush at the walls and at the bottom of slabs. Sleeves must project one inch above the finished floor surface. Threaded nipples shall not be used as sleeves.
2. Sleeves in exterior walls below ground or in walls that have liquids on one or both sides shall have a 2-inch annular fin of 1/8 in. plate welded with a continuous weld completely around the sleeve at mid-length. Sleeves shall be hot-dipped galvanized after the fins are attached.
3. Sleeves cast in concrete shall be furnished by the Subcontractor for the trade whose work requires them and delivered to the Contractor for installation.
4. Sleeves in masonry walls shall be furnished by the Subcontractor for the trade whose work requires them and delivered to the Masonry subcontractor for installation.
5. Submit plan drawing on sleeves.

F. Equipment Drive Guards

1. Provide all equipment driven by open shafts, belts, chains, or gears with all-metal guards enclosing the drive mechanism. Construct guards of galvanized sheet steel, galvanized woven wire, or expanded metal set in a frame of galvanized steel members. Secure guards in position by steel braces or straps which will permit easy removal for servicing the equipment. The guards shall conform to all safety codes and regulations.

G. Protection Against Electrolysis

1. Where dissimilar metals are used in conjunction with each other, provide insulation between adjoining surfaces to eliminate direct contact and any resultant electrolysis. Provide bituminous insulation, heavy bituminous coatings, nonmetallic separators or washers, impregnated felt, or similar arrangement.

H. Equipment Foundations

1. The Contractor shall furnish the necessary materials and construct suitable concrete foundations for all equipment installed by him, even though such foundations may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.
2. All such equipment shall be installed by skilled mechanics and in accordance with the instructions of the manufacturer.

PART 3 EXECUTION

3.01 TRANSPORTATION, DELIVERY, AND HANDLING

- 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 month prior to installation without written authorization from the Program Manager.
- 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, storage, 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. Notify Program Manager 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.
- B. At least 30 days prior to storing equipment, submit to the Program Manager for approval, a protective maintenance schedule, based on Supplier's instructions, detailing proposed procedures for each piece of equipment placed into storage. On equipment placed in storage, permanently attach equipment maintenance record card. The record card shall indicate the protective procedure to be taken, the date work is actually performed, and signature of the Contractor's technician actually

performing the work. Equipment will not be approved for release from storage unless all record cards are signed and dated.

- C. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- D. 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 and 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 and cracking and keep spalling to a minimum.
- E. 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 Program Manager. 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 insure 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.
- F. Prior to installation 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 guaranty 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.
- G. All materials which, in the opinion of the Program Manager, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work and the Contractor shall receive no compensation for the damaged material or its removal.
- H. Storage locations must be approved by the Program Manager.

3.03 GENERAL MATERIAL AND EQUIPMENT INSTALLATION REQUIREMENTS

- A. These requirements shall constitute the acceptable minimum standards for installing the equipment specified herein. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements.

B. Bolts, Anchor Bolts, and Nuts

1. Set anchor bolts and expansion bolts as indicated and as specified. If anchor bolts are set before the concrete has been placed, use templates. Where indicated, or specified, provide anchor bolts with square plates at least 4 in. by 4 in. by 3/8 in., or with square heads and washers set in the concrete forms with pipe sleeves, or both. If anchor or expansion bolts are set after the concrete has been placed, do all drilling and grouting or caulking without damaging the structure or finish by cracking, chipping, or spalling.

C. Equipment Foundations and Grouting

1. In setting pumps, motors, and other grouted equipment, make an allowance of at least one inch for grout under the equipment bases. Use steel shims to level and adjust the bases. Shims may be left embedded in the grout, in which case they shall be installed neatly and inconspicuously in the completed work. Use non-shrinking grout.
2. Mix and place grout in accordance with the recommendations of the Supplier and as specified. Place grout through the grout holes in the base, work outward and under the edges of the base, and across the rough top of the concrete foundation to a peripheral form to provide a chamfer around the top edge of the finished foundation.
3. After the grout has hardened, remove all forms, hoppers, and excess grout. Patch all exposed grout surfaces, give a burlap-rubbed finish, and paint with at least two coats of an acceptable paint in accordance with specifications.

D. Sleeves and Openings

1. Provide all chases or openings for the installation of the Work or cut the same in existing Work. Provide all sleeves or forms at the Work, and set them as indicated and as specified, and in ample time to prevent delays. Locate all chases, openings, and sleeves as specified and indicated. If the location is not specified or indicated locate all openings to avoid interference with equipment and piping.
2. If these openings and/or sleeves were not provided prior to concrete placements, the Contractor shall provide and set them afterwards at no additional cost to the Owner. Confine the cutting to smallest extent possible. In no case shall piers or structural members be cut without the written consent of the Program Manager.
3. Fit around, close up, repair, patch, and point around the work specified herein to the satisfaction of the Program Manager.
4. Perform all of this work by workman using small hand tools. Do not use power tools except where, in the opinion of the Program Manager, the type of tool proposed can be used without damage to any work or structures and without interference with the operation of any facilities. The Program Manager's concurrence with the type of tools shall not in any way relieve or diminish the responsibility of the Contractor for such damage, or interference resulting from the use of such tools.
5. Do not cut or alter the work of any subcontractor or any other contractor, nor permit any subcontractor to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered, and with the written consent of the Program Manager. All cutting and patching or repairing made necessary by the Contractor or any subcontractors shall be done at no additional cost to the Owner.

END OF MATERIALS AND EQUIPMENT

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SECTION 01630

SUBSTITUTIONS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes the requirements related to substitutions.

1.02 EQUIVALENT MATERIALS AND EQUIPMENT

- A. Whenever a material, article or method is specified or described by using the name of a proprietary product or the name of a particular manufacturer(s) or vendor(s), the specific item mentioned shall be understood as establishing the type, function, dimension, appearance, and quality desired and is to be the basis upon which bids are to be prepared. Other manufacturer's materials, articles and methods not named will be considered as substitutions provided required information to determine conformance with the specifications is submitted in accordance with Section 01300 and provided substitution will not require substantial revisions of the Contract Documents. This applies to specific construction methods when such are required by the Contract Documents.

1.03 BASIS OF BIDS

- A. Bids shall be based on materials, articles and methods named and specified in the Contract Documents.

1.04 PROGRAM MANAGER'S DECISION

- A. The Program Manager will determine whether or not the material or article submitted is equal to the named material or article. The Program Manager's decisions regarding evaluation of substitutions shall be considered final and binding. Request for time extensions and additional costs based on submission of acceptance or rejection of substitutions will not be allowed.

1.05 REJECTION OF PROPOSED SUBSTITUTION

- A. The Program Manager's decision regarding evaluation of substitutions shall be final and binding. Request for time extensions and additional costs based on rejection of substitutions will not be allowed.
- B. Substitutions will not be considered at any time if:
 1. Acceptance will require substantial revision of Contract Documents.
 2. Acceptance will create problems in stocking of repair parts or future maintenance by Owner.
 3. The Program Manager determines that the material or article submitted is not equal to the named material or article.
 4. Additional costs are incurred by the Owner.
 5. A time extension is required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SUBSTITUTIONS

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SECTION 01631

USE OF OTHER THAN FIRST NAMED MANUFACTURER

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes requirements related to the Contractor's responsibilities when using a named manufacturer or product other than the first named.

1.02 EQUIVALENT MATERIALS AND EQUIPMENT

- A. Whenever a material, article, or method is specified or described by using the name of a proprietary product or the name of a particular manufacturer(s) or vendor(s), followed by the phrase "or equal," the specific item mentioned shall be understood as establishing the type, function, dimension, appearance, and quality desired and is to be the basis upon which bids are to be prepared, subject to the provisions of this Section.
- B. In every instance, the design was completed using criteria required to accommodate the first named manufacturer. When practical, other named manufacturers were included in the Technical Specifications based upon performance and design criteria comparable to the first named. However, in some instances, the size, shape, loadings, configuration, and/or other design criteria for other named manufacturers may require redesign of the Work. Other named manufacturers may be used subject to the requirements of this Section.
- C. When the Contractor uses any manufacturer or product other than the first named in the specifications, which use requires modification to the Work, the Contractor shall, to the satisfaction of the Program Manager, review and revise the design of the Work, including coordination with other Technical Specification sections to ensure that all component units fit and function as a whole, to properly accommodate the use of that product.
- D. The Contractor shall bear the costs and liability for all redesigned elements of the Work necessary to properly accommodate the proposed item.

1.03 SUBMITTALS

- A. In addition to the requirements of Section 01300, the Contractor shall submit complete data and engineering documents that provide a complete analysis of the proposed item and the extent of the redesign of the Work necessary to properly incorporate the proposed item into the Work. The Contractor shall:
 - 1. Accommodate the proposed item.
 - 2. Coordinate the proposed item with the overall design, inclusive of all related disciplines.
 - 3. Ensure the proper functioning of the entire system in which the item is to be incorporated.
- B. Identify each and every element of the design of the Work that must be modified to:

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- C. Include complete engineering drawings, bearing the seal of a Professional Engineer registered in the State of Rhode Island, addressing all requirements in 1.02 above.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF USE OF OTHER THAN FIRST NAMED MANUFACTURERS

SECTION 01665

SERVICES OF MANUFACTURER'S REPRESENTATIVES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for services provided by manufacturer's representatives.

1.02 SERVICES OF MANUFACTURER'S REPRESENTATIVES

A. General

1. Arrange for a qualified factory trained service representative from each company manufacturing or supplying certain equipment and systems, as listed in the Table at the end of this section and as specified in Division 11 through Division 16, to perform the duties described herein.
2. Qualified factory trained service representative shall be approved by the Engineer
3. All 8-hour days specified herein and in other sections of the specifications are exclusive of travel time
4. Since the specified pre-startup operator training and post-startup services will be integrated into a plant-wide schedule, the Owner may redistribute the total number of instructor hours between pre- and post startup services.

B. Supervision of Installation

1. Provide on-site supervision and advice to the Contractor to ensure that proper procedures are followed during equipment installation.

C. Equipment Checkout

1. Inspect, align, operate, test and adjust the equipment after equipment installation has been completed and equipment is presumably ready for operation, but before it is operated by others.
2. The inspection shall include, but shall not be limited to, the following points as applicable:
 - a. Soundness (without cracked or otherwise damaged parts)
 - b. Completeness in all details as specified
 - c. Correctness of setting, alignment, and relative arrangement of various parts
 - d. Adequacy and correctness of packing, sealing and lubricants.
3. Operate, test and adjust the equipment, as required, to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.
4. Upon completion of the work, submit a complete signed report of the result of the inspection, operation, adjustments and tests to the Engineer via the Contractor. The report shall include:
 - a. Detailed descriptions of the points inspected and work completed
 - b. Deficiencies noted and/or corrected
 - c. Tests and adjustments made
 - d. Quantitative results obtained if such are specified
 - e. Suggestions for precautions to be taken to ensure proper maintenance

- f. A certificate that specifically states that "... the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacture's warrantee null and void".

D. Field Acceptance Test

- 1. Tests shall be conducted by the Contractor, with assistance from the manufacturer's representative, after the Engineer has reviewed completed and equipment checkout report
- 2. Manufacturer's representative shall be present during field acceptance tests

E. Pre-Startup Operator Training

1. General

- a. Provision for classroom and hands on training to plant personnel in the operation and maintenance of the equipment prior to placing the equipment in full operation.
- b. Provide the Owner's personnel and their consultants with sufficient information and skills training on the theory, design, site specific operation and maintenance practices (including items such as routine monitoring with normal and abnormal parameters, troubleshooting techniques, and preventive and corrective maintenance requirements) to insure that equipment and systems can be efficiently and effectively operated and maintained by the trainees upon completion of the training.
- c. Training shall be a combination of classroom, field observance and hands-on applications.
- d. Provide the following as specified herein:
 - 1) Lesson Plans
 - 2) Trainee Manuals
 - 3) Catalog of training materials.
- e. The Contractor shall provide a credit to the Owner for any unused instructor hours.
- f. Training classes shall be based on the approved Contractor Operation and Maintenance Manual.
- g. Conduct the training at scheduled times in accordance with the Contractor's approved comprehensive training schedule for all equipment, system and components. All training shall be coordinated and scheduled with the Owner a minimum of 7 days in advance. All training sessions will be conducted during the day shift. Currently the day shift is approximately 7:00 AM to 3:00 PM. For scheduling and training effectiveness, no one class will be longer than 4 hours.

2. Operations Sessions

- a. Overview of the equipment and its' auxiliary support/systems covering nomenclature, function and theory of operation.
- b. General safety requirements for operation of the equipment and its' auxiliary/support systems, including suggested safety equipment.
- c. Pre-start-up safety and equipment check.
- d. Equipment and auxiliary/support systems start-up procedures covering manual and automatic modes, if available.
- e. Routine operation and monitoring requirements; including specifics on normally expected ranges for items such as oil, water pressure and temperatures, discharge pressures, sensory observations, etc., procedures to change operating parameters (such as air or flow rates).
- f. Equipment/systems shut down procedures covering manual and automatic modes (if applicable).
- g. Operational troubleshooting of equipment and auxiliary/support systems.

- h. Procedures for handling non-routine operational problems such as response to alarms, power failures, emergency shutdown, auxiliary/support system failures, etc.
- 3. Maintenance Sessions
 - a. If session is specific to a discipline; (e.g., electrical, mechanical, I&C), include only appropriate maintenance items for the discipline. If session is to include multiple disciplines, include all items for those disciplines and indicate in submittal outline which discipline the material refers to.
 - b. For All Disciplines provide:
 - 1) An overview of the equipment and its' auxiliary/support systems covering nomenclature, function and theory of operation.
 - 2) General safety requirements for maintenance of the equipment and its' auxiliary/support systems appropriate to each discipline including suggested safety equipment and practices. Cover local/remote lockout procedures, safe procedures for handling alarms and built in safety devices during preventive and corrective maintenance.
 - 3) Overview of pre-start-up, routine operation monitoring, and shutdown procedures covering automatic and manual modes (if applicable).
 - c. For Each Specific Discipline provide:
 - 1) Preventive maintenance procedures to be followed; include parts' lube quantities, types, frequencies, application points, time requirements to perform procedures, etc.
Note: Information should be provided to trainees from the O&M manuals which cross references manufacturer's lube requirements.
 - 2) Specific procedures to cover adjustment requirements for alignment, wear, calibration, etc. for all preventive maintenance and corrective maintenance procedures, including time required to perform.
 - 3) Special tools, techniques or procedures required for either preventive or corrective maintenance of equipment or its' auxiliary support systems.
 - 4) Assembly/disassembly procedures required for preventive or corrective maintenance, including time required to perform.
 - 5) Maintenance troubleshooting of equipment and auxiliary/support systems.

F. Post-Startup Services

- 1. Provision for assistance to the Owner in the calibration, tuning and troubleshooting, plus any additional training which may be required during the one-year guarantee period.

1.03 SUBMITTALS

- 1. Submit instructor qualifications, training outline, and lesson plans 90 calendar days prior to pre-startup operator training. Qualifications of the factory trained service representative, as defined below.
- 2. Submit trainee manuals at least 30 calendar days prior to scheduled training.
- 3. Training Outline/ Lesson Plans:
 - a. 4 copies
 - b. Training outline/lesson plans to cover each major trainee group (i.e.: operations, electrical maintenance, instrumentation, etc). If the same session outline is to be used for more than one type of trainee group, such as one which would cover equipment identification and principals of operation, this information should be so indicated on

- the outline. The outline should be detailed and include length of session for each major topic and type of session; i.e., field or classroom.
- c. The lesson plan shall be cross referenced to the trainee manuals provided and include instructor references for the use of training aids, training strategies, etc. They should contain sufficient technical material to guide the instructor in the delivery of the training material session. Lesson plans are to be provided for each separate technical discipline to be trained. Generic "informational" lesson plans may be used for multiple trainee discipline target groups. The specific number of lesson plans for each session will be determined by the complexity, content and objectives of the subject equipment covered.
 - d. The purpose of the manual is to provide specific guidance for the instructor and the trainees on what is to be taught and how, as well as to ensure consistency and completeness of the sessions when they are presented to different groups of the same target trainee group.
4. Trainee Manuals
- a. **4** copies for review. **6** final copies.
 - b. Key trainee manuals to the training outline. Copies should be available to pass out to each trainee at the session, they are to be retained by the trainee for future use. This trainee manual is not the O&M manual required in the specification, however, similar materials may be included as appropriate.
 - c. The purpose of the manual is to provide an organized package of information for the trainee, which will be used during the training sessions as well as for future reference material.
 - d. The organization of the manual should correspond to the training outline. Material in the manual should include information on the training topics, the training outline, and other relative reference material. Specifically, all manuals should be geared toward an eighth grade level of reading.
 - e. Manuals for Operations training sessions should include a description of the equipment, pre-start-up checks, start-up and shutdown procedure, specific monitoring checks including expected parameters, troubleshooting and safety procedures, etc. as described previously.
 - f. Manuals for Maintenance training sessions should include a description of the equipment, pre-start-up checks, start-up and shutdown procedure, specific monitoring checks including expected parameters, troubleshooting and safety procedures, etc. as described previously.
5. 2 copies of a catalog of all training materials including training outline, lesson plans and trainee manuals.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Factory trained service representative shall have the training and experience to provide technical and/or process related advice, and/or assistance, relating to the installation, operation, maintenance and utilization of the products that he represents. Additional qualifications may be specified elsewhere.
2. Representative is subject to acceptance by Engineer. No Substitute representatives will be allowed unless prior written approval by Engineer has been given.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

- A. Equipment and Components Requiring Services is listed in the Table at the end of this section.
- B. Provide a credit to the Owner for unused service manhours as specified below, at the manufacturer's published field service rate plus travel costs.

SERVICES OF MANUFACTURER'S REPRESENTATIVE
Manhour Requirements Table

Specification Section	Section Number	Supervision of Installation	Equipment Checkout	Field Acceptance Tests	Pre-Startup Operator Training	Post-Startup Services
Stainless Steel Sluice Gates, Actuator and Appurtenances	11292	8	8	4	4	8

EQUIPMENT CERTIFICATION

Owner: _____ Date: _____

Project : _____

Contractor: _____

Equipment Manufacturer: _____

Equipment: _____

Specification Section: _____

As an authorized representative of the Equipment Manufacturer, the undersigned certifies that the equipment listed above conforms to the requirements of the construction contract between the Contract and the Owner. The undersigned further certifies that the equipment has been installed in accordance with the Manufacturer's written instructions, that the equipment is ready for permanent operation and that nothing in the installation will render the Equipment Manufacturer's warranty null and void.

(Authorized Manufacturer's Representative)

Date: _____

(Witness)

Date: _____

Remarks: _____

EQUIPMENT TRAINING CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

Equipment Manufacturer: _____

Equipment: _____

Specification Section: _____

As an authorized representative of the Equipment Manufacturer, I certify that I have trained the Owner's personnel in the proper operation and maintenance of the above equipment.

(Authorized Manufacturer's Representative) Date: _____

The following personnel listed below attended the training session(s):

(Owner's Representative) Date: _____

(Beta Group, Inc. Witness) Date: _____

END OF SECTION

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SECTION 01680

EQUIPMENT AND SYSTEM CHECKOUT,
CERTIFICATIONS AND TESTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements and procedures for physical checkout certification, and testing of equipment.

1.02 DEFINITIONS

- A. Shop Testing is defined as testing that is done by the manufacturer either at the place of manufacture, the place of assembly, or at another location where the required testing apparatus is located, for the purpose of proving that the equipment meets the requirements of the pertinent technical specification(s).
- B. Equipment Checkout, Inspection and Certification is defined as the process of physically inspecting products after they have been installed in the work, and then certifying that the products have been properly and completely installed, and are ready for field and/or functional testing.
- C. Field Testing is defined as testing that is performed by the Contractor with supplier assistance on products they have been installed in the work and after the performance of physical checkout, for the purpose of proving that the tested products meet the requirements of the pertinent technical specifications. While field testing can be described as "shop testing in the field", it may be required regardless of whether or not shop testing was performed on the same piece of equipment or material.
- D. System Testing is defined as testing performed on a "system" normally comprised of two or more pieces of equipment, after the equipment has been installed in the work, and after physical checkout and field testing has been completed, for the purpose of providing that the system meets requirements as specified and as indicated.
- E. Manufacturer's Representative, sometimes referred to as the Factory-Trained Service Technician, is defined as a person or persons provided by the manufacturer, who is qualified by having the training and experience to provide technical and/or process related advice, and/or assistance, relating to the installation or utilization of the products provided by that same manufacturer, for installation and utilization in the work. Such training and experience shall include a minimum of three years participation in similar work including no less than three similar projects during this three year period. The qualifications of each representative must be submitted to the Engineer for approval at least 30 days prior to their first site visit.
- F. The Testing Checkout Coordinator is defined as the person provided by the contractor to coordinate and oversee the total spectrum of testing and inspection activities required by the contract documents. The testing and checkout coordinator shall have been in responsible charge of at least two similar projects in the last four years.

1.03 ROLES AND RESPONSIBILITIES

- A. The Contractor shall provide all outside services, materials, labor, supplies, test equipment and other items necessary to perform the testing specified herein. In addition, arrange for and provide the participation or assistance of survey crews, engineers, quality control technicians, manufacturers' representative(s), and required governmental agency representatives.

1.04 CHECKOUT PLAN

- A. The Contractor shall submit a checkout plan based upon the requirements defined herein to the Engineer. Six copies of checkout plan (preliminary) shall be submitted for review within 90 calendar days prior to the proposed date of the first test, whichever occurs first. The plan shall define:
 - 1. The logical and systematic performance of physical inspections, shop, field, and system tests.
 - 2. A list of all shop tests, and supplier certifications, including those required by the applicable technical specifications. Provisions shall also be included for retesting in the event it is required.
 - 3. Participants in the testing.
 - 4. Special test equipment.
 - 5. Sources of the test media (water, power, air) and the proposed method of delivery of the media to the equipment to be tested.
 - 6. Ultimate disposal of the test media.
- B. The plan shall be reviewed by the Engineer, modified or revised as necessary by the Contractor, then approved by the Engineer. The Contractor shall continue to update the checkout plan, working in conjunction with the Engineer prior to the start of the scheduled equipment checkout and functional testing activities.
- C. The Contractor shall designate, in the checkout plan, a testing and checkout coordinator to coordinate and manage the activities defined in the checkout plan, as approved by the Engineer.

1.05 EQUIPMENT AND SYSTEM CHECKOUT AND CERTIFICATIONS

- A. Checkout is defined as inspection by the Contractor, Engineer and Owner to verify conformance to the contract drawings and specifications. Checkout procedures will be conducted by the Contractor in the presence of the Engineer and Owner to verify the presence, appropriateness, and proper construction or installation of each being "checked out". Typical elements of the checkout include the following:
 - 1. Verify exterior areas for backfill, grading, surfacing, drainage, landscaping, roadways, fencing, and gates.
 - 2. Verify buildings for structure, masonry, architectural, mechanical systems, electrical/lighting, communications, and HVAC.
 - 3. Verify concrete structures for structural integrity, finish tolerance, durability, appearance, embedded and inserted items, painting and surface applications.
 - 4. Verify steel structures for member alignment, connection bolts torque, connection welds integrity, painting, fire proofing and surface applications.
 - 5. Verify mechanical systems and items for setting, alignment and securing, check and adjust packing and seals, lubrication, drying out, drive connection and alignment

including rotation and belt/chain tension, painting or surface applications, and tagging for project system.

6. Verify piping systems for material, size, components, direction, alignment of joints and bolts/welding, packing and seals, screens and filters and strainers, leak and pressure hydro tests, painting and color coding, hangers and anchors and expansion provision and supports, clean out of foreign matter and tagging for project system.
 7. Verify electrical and control/instrumentation systems for conduit and tray installation, wire/cable material and size, circuit continuity and identification, voltage testing, ground continuity and testing, terminal installation and identification, jar switches and circuit breakers and transformers tested, substation operation tested, and tagging for project system.
 8. Verify communication system including telephone, fire/smoke alarm, security, page/part, closed circuit TV similar to electrical above.
 9. Verify computer systems by station, function, and network interface.
- B. Each piece of equipment and system must be certified by the manufacturer's representative as specified in Section 01665 Services of Manufacturer's Representatives.

1.06 FIELD TESTING OF EQUIPMENT

- A. When required by the technical specifications, perform field testing on installed equipment. Field testing shall be in addition to and not in lieu of, any shop testing either required or otherwise performed. Perform field testing as a part of the overall equipment and system testing process defined herein and in accordance with the approved checkout plan.
- B. Provide ninety days written notice indicating the date and time for testing one piece of equipment, or a series of equipment pieces. Submit with this notice the following for approval by the Engineer:
 1. Description of the tests, specifically outlining how the test will prove conformance with the requirements in the technical specifications.
 2. Testing devices that will be used in the tests. Description shall state what portion of the tests that the devices will perform or measure, and device accuracy.
 3. Personnel used to perform the tests. Submit resumes, qualifications, and experience. As a minimum, personnel must have three years experience with the manufacturer and operation of the equipment to be tested and will have participated in five similar tests during this period of experience.
 4. Schedule of testing. Schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or test failure.
 5. Test forms. Provide test forms for recording reporting on the field test data, prior to the test.
 6. Material and equipment required for the test. This material and equipment shall be supplied at no additional cost to the Owner.
 7. Water and Power Requirements. Water and power requirements shall be identified in the plan by the Contractor and will be supplied by the Contractor for field testing purposes. The Contractor shall provide all temporary piping and wiring required for field testing; and equipment and labor for the reuse of the test water. When testing is performed with water during freezing conditions, the Contractor shall take measures to prevent damage to the work caused by freezing of the water.

8. Operational Requirements. Include valve positions, set-ups, gate positions, including temporary arrangements that are required to run the tests so that the Owner can anticipate and plan for the testing situation.
 9. Provide seven days written notice to the Engineer prior to the actual start of any testing. This will include a statement by the Contractor that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.
- C. Field test procedures will be reviewed and returned by the Engineer within 30 days of receipt. Incorporate minor comments on the procedures, equipment, or personnel prior to testing. Major comments by the Engineer will require a resubmission of the field test procedure and proposed test date. The Contractor will be notified, in writing, by the Engineer if a formal resubmission is required with the transmittal of the review comments.
- D. Submit within one week after completion of the tests, the following to the Engineer for approval:
1. Completed test forms for each device tested.
 2. Completed certification documentation.
 3. A written summary of testing, reporting on the results and summarizing the entire procedure.
 4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the intent of the technical specification test requirements at no additional cost to the Owner.

1.07 SYSTEM TESTING

- A. Specific system tests shall be performed by the general contractor in addition to the requirement for shop, field, and other tests called for in the technical specifications. System tests will be performed with fluid or gaseous substances that are generally non-septic, non-corrosive, non-toxic, and non-inflammable.
- B. Provide 30 days written notice indicating the date and time during which the specific functional test is proposed. Submit with this notice, the following to the Engineer for approval:
1. Testing devices that will be used in the tests. Description shall state what portion of the tests that the devices will perform or measure, and device accuracy.
 2. Personnel used to perform the tests. Submit resumes, qualifications, and experience. As a minimum, personnel must have three years experience with the manufacturer and operation of the equipment to be tested and will have participated in five similar tests during this period of experience.
 3. Schedule for Testing: Schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or system test failure.
 4. Test forms. Provide test forms for recording reporting on the field test data, prior to the test.
 5. Material and equipment required for the test. This material and equipment shall be supplied at no additional cost to the Owner.
 6. Water and Power Requirements. Water and power requirements shall be identified in the plan by the Contractor and will be supplied by the Contractor for system testing purposes. The Contractor shall provide all temporary piping and wiring required for field testing; and equipment and labor for the reuse of the test water. When testing is performed with

water during freezing conditions, the Contractor shall take measures to prevent damage to the work caused by freezing of the water.

7. Operational Requirements. Include valve positions, set-ups, and gate positions that are required to run the tests in the written request so that the Engineer can anticipate and plan for the testing.
 8. Provide seven days written notice to the Engineer prior to the actual start of any testing. This will include a statement by the Contractor that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.
- C. The Engineer, and the Owner may witness the performance of these tests, at their option.
- D. A review of the system test package by the Engineer will be made within two weeks of receiving the package. The Contractor shall incorporate minor comments on the procedures, equipment, and personnel prior to testing. Major comments by the Engineer will require a resubmission of the system test package and test date.
- E. Submit within one week after completion of the tests, the following to the Engineer for approval.
1. Completed test forms, for each device.
 2. Completed certification.
 3. A written summary of testing, reporting on the results and summarizing the entire procedure.
 4. A schedule for retesting, if necessary, including changes to procedures, testing devices, or personnel. Any retesting required to fulfill the intent of the test requirements due to negligence, poor workmanship, or products that fail to meet the contract requirements, shall be at no additional cost to the Owner.

1.08 CORRECTIONS TO THE WORK

- A. Correct any items of work failing to meet the specified requirements, at no additional cost to the Owner. Correct the nonconforming items by re-work, modification, or replacement, to the option of the Engineer. This includes the provision of all required labor, materials, and requirements for retesting as specified herein, to verify that the items conform with contract documents.

1.09 SAFETY

- A. Conduct all specified test procedures in compliance with all applicable safety standards and regulations.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project as-built documents
 - 5. Spare parts and maintenance materials
- B. Contract closeout shall verify that construction work is complete and in conformance with the plans and specifications and shall permit the formal contract documentation to be completed.

1.02 DEFINITION

- A. Contract Closeout is a planned series of activities that shall verify the completed construction and installed work for the Contract.
- B. The Contract Closeout will be comprised of the following components:
 - 1. Substantial Completion
 - 2. Final Completion
 - 3. Guarantee Period

1.03 SUBSTANTIAL COMPLETION:

- A. There will be a date of substantial completion certified by the PM/CM. Substantial completion will be determined as follows:
 - 1. The construction must be complete. For this purpose, completion of construction shall be defined in accordance with the following guidelines:
 - a. The Contractor has completed all site and structure demolition as shown on the Contract drawings and as specified herein.
 - b. The Contractor has completed the construction and erection of the Work in conformance to the Contract drawings and specifications.

- c. The Contractor has disconnected all utilities to the site, as shown on the Contract drawings and as specified herein.
 - d. The Contractor has completed all site restoration required by the Contract drawings and specifications
2. All shop drawings must have final approval.

1.04 FINAL COMPLETION

- A. Prior to final completion, the following tasks must be completed:
- 1. All items in the punch list must be completed.
 - 2. The Contract closeout documentation must be submitted to and approved by Owner.
 - 3. A response plan to address warranty issue must be submitted and approved by Owner.

1.05 GUARANTEE PERIOD

- A. During the guarantee period as defined in General Conditions, the Contractor shall correct all deficiencies.
- B. Corrective work will be identified by Owner. The Contractor will be notified of the item(s) requiring corrective work.
- C. The Contractor shall begin work on all corrective work within 72 hours of being notified of the deficiency by Owner and will then work continuously until the deficiency is corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Owner detailing a description of the deficiency and the corrective action that was taken. If the Contractor does not begin work within 72 hours of being notified or does not then work continuously to correct the work, the Owner may have the work completed by others and have all costs deducted from money that would otherwise be due to the Contractor.
- D. The Contractor will coordinate all corrective work with Owner.

1.06 RECORD DOCUMENTS

- A. Throughout the Contract Time, maintain on site, one set of the following Record Documents. Actual revisions to the Work shall be recorded in these documents:
- 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda
 - 4. Change Orders and other Modifications to the Contract Documents.
 - 5. Reviewed shop drawings, product data, and samples, including all sketches, drawings, diagrams, details and tables prepared or used by Contractor to construct or illustrate any portion of the Work.

6. Written interpretations and clarifications.
 7. Field Orders.
 8. Field test reports properly verified.
 9. Photographs.
- B. Store As-Built Documents separate from documents used for construction and protect from fire, vandalism, and theft.
- C. Record information concurrent with construction progress. Establish survey control onsite and conduct site survey of existing conditions and as-built conditions. Final survey data will be stamped by a Land Surveyor registered in the State of Rhode Island.
- D. Record Documents and Shop Drawings: Upon commencement of work and request by the Contractor, one set of reproducible Contract Drawings will be provided to the Contractor for use and reference. If any Drawings are reissued during construction due to approved changes in the Work, a revised copy of affected drawings in the same reproducible form will also be provided to the Contractor. If Contractor requests an electronic CAD version of the Drawings, a copy of CAD files in the latest version of AutoCAD software format will be provided for the Contractor's convenience in establishing a CAD system. CAD files will be provided as a courtesy only and are not part of the contract documents nor are they guaranteed or warranted for accuracy or completeness in any manner. The Contractor shall be fully responsible for any costs associated with use of the CAD files. Contractor solely assumes all risk in using the provided CAD files. If any Drawings are reissued during construction by Owner due to approved changes in the Work, an updated CAD file will also be provided to the Contractor in AutoCAD format to which all of the aforementioned provisions will also apply. For record documentation, the Contractor is required to legibly mark the reproducible Contract Drawings, and all shop drawings and construction drawings to record actual construction including:
1. Measured depths of excavations in relation to finish floor/invert datum.
 2. Measured horizontal and vertical locations of excavation limits, underground tunnels, pipelines, utilities, and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract Drawings.
 6. Make the complete set of Record Documents available to Owner for review prior to each Application for Payment. For each review, highlight changes made since the previous review by boldly encircling the change and by describing the change and change number in the revision block at the bottom of the Drawings. Updating the Record Documents by the Contractor is a condition precedent to acceptance of the Application for Payment by the Owner.

7. Prior to submittal of the Contractor's Final Application for Payment, submit two prints of all marked documents. The Owner or its designated representative, upon completion of all work, will record information of the permanent project as-built document based upon documentation furnished by the Contractor, PM/CM, and Program Manager.
 8. Point to point wiring diagrams and construction sketches which the electrical contractors have developed to detail project wiring.
 9. Lighting circuit wiring which was field designed and not on Contract Drawings.
 10. Layout shop drawings for field run construction such as piping, conduit, etc.
 11. Field changes to manufacturer's shop drawings.
 12. Referencing Request for Information (RFI) of field change notice numbers on as-built drawings.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name, address and telephone number and product model and serial number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and Modifications.
- F. Submit Record Documents to Owner with claim for final Application or Payment.

1.07 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner inspection.
- B. Accompany Owner in inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform with Contract Documents. Punch list items will include work items that are missing, incomplete, damages, not the correct item, or improperly installed or constructed. The Contractor shall correct the punch list items by re-work, modification, or replacement, as appropriate, until the items do conform to the Contract Documents. The punch list shall be produced and maintained by the Contractor, with copies to the Owner and their designated representatives.
- C. Provide submittals to Owner that are required by governing or other authorities.
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims, Affidavit of Payment of Debts and Claims, and remaining releases, waivers, guarantees, and all data required by the Contract Documents.

1.08 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion:
1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
 2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise directed by the Owner.
 3. Grade site to provide drainage flow to an approved catch basin or drainage system.

1.09 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CONTRACT CLOSEOUT

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SECTION 01710

STARTUP

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Startup requirements for processes, equipment and components, and the roles and responsibilities of the Contractor and the Owner.

1.02 DEFINITIONS

- A. **Startup:** The initial operation of a sufficiently completed facility and/or plant by the Owner, utilizing wastewater and related substances (sludge, wastewater, scum), or other media, which the facility has been designed to process.

1.03 DESCRIPTION OF WORK

- A. The primary responsibility for startup rests with the Contractor with assistance from the Owner as specified herein.
- B. The Contractor shall not operate any of the existing facilities at any time. This shall include the starting and stopping of equipment or opening and closing of valves. Whenever the Contractor believe his work will affect or be affected by the existing facilities operation, he shall so notify the Engineer in writing three (3) working days prior to the intended start of the work. This notification shall clearly detail the work to be completed, the method by which the existing facilities operation may be affected, and the assistance requested of the Owner.
- C. The Contractor shall, upon orders by the Engineer, startup, adjust and place in satisfactory operation all plant equipment constructed under each Phase of this Contract and shall be responsible to pay the cost of all utilities until the Engineer certifies the dates of substantial completion.
- D. At the discretion of the Engineer, individual startups may be required for various phases of the work. If this occurs, the phase startups will be ordered by the Engineer when the following has been completed for all equipment and systems within each Phase. The Engineer may order the startups prior to the completion of non-essential items of work.
 - 1. Compliance with Section 01665 Services of Manufacturer's Representatives, including:
 - a. Supervision of Installation
 - b. Equipment Checkout
 - c. Field Testing of Equipment
 - d. Pre-Startup Operator Training
 - 2. Compliance with requirements of Section 01680 Equipment and System Checkout, Certifications and Testing
 - 3. Compliance with requirements of Section 01730 Operation and Maintenance Manuals
 - 4. Compliance with requirements of Section 01750 Spare Parts
 - 5. Compliance with requirements of Section 01751 Lubricants

- E. The Contractor shall be responsible for maintaining all equipment until the dates of substantial completion.
- F. The Contractor shall assist the Owner during startup in any way deemed appropriate by the Engineer.
- G. There will be a date of substantial completion certified by the Engineer for each Phase of construction. These dates will not be certified until the following requirements have been satisfied by the Contractor:
 - 1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment processes are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance must meet acceptable standards for the particular unit.
 - 2. All field tests have been completed and satisfactory reports forwarded to the Engineer.
 - 3. All pre-startup training has been completed by the manufacturer's representatives.
 - 4. All spare parts and lubricants have been satisfactorily delivered to the Owner.

1.04 ROLES AND RESPONSIBILITIES

A. Contractor's Responsibilities

- 1. Startup
 - a. Develop specific startup plans and schedule.
 - b. Provide specific startup material and operating supplies until substantial completion or until acceptance of a specific system. Supplies include lubricants, chemicals, gases, specialized fluids, electric power, water (City and non-potable process water) and all other required appurtenances.
 - c. Provide the necessary craft or labor assistance, in the event of an emergency equipment failure requiring immediate attention, (emergency is defined as a failure of function which precludes the further operation of a critical segment of; or the whole of the work) with a response time of not less than four hours from the time of notification. The time of notification is defined as the time of contact between the Engineer's representative and the Contractor's representative.
 - d. Clarify submittals, testing requirements, schedules, or other items related to the startup of the equipment and facilities specified and indicated in the Contract Documents.
 - e. Correct all failures or equipment problems identified during startup when notified by the Engineer.
 - f. Attend meetings related to the review of startup plan(s).
- 2. Performance Testing (where specified in individual technical specifications Sections 11 through 16).
 - a. Review procedures for performance testing.
 - b. Provide manufacturer's representative to provide guidance during performance testing.
 - c. Provide manufacturer's representatives and operating supplies for retesting of systems that fail to pass the initial performance tests due to deficiencies in products or workmanship at no additional cost to the Owner.
 - d. Resolve and correct all equipment or system failures during the performance testing.

3. Provide to the Engineer a list of 24 hour, "on call" representative supervisory persons who will monitor the startup and performance testing.
- B. Owner's Responsibilities
1. Assist in the startup testing activities. The Owner will endeavor to be cooperative with the Contractor when required. However, it is emphasized that the existing facilities operations and treatment take precedence and only requests that do not adversely affect the flow or treatment will be considered. Additionally, any assistance given to the Contractor must be completed when the Owner's schedule and manpower permit. There may be instances when the Owner cannot provide assistance at the time of the Contractor's request and this shall not be the basis for a claim by the Contractor.
 2. Provide staff to operate and maintain equipment, systems, and facilities requiring startup.

1.05 SUBMITTALS

- A. Specific Startup Plans and schedule for all phases of startup.
- B. List of 24-hour "on call" representative supervisory persons.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01730

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for compiling and submitting operation and maintenance manuals.

1.02 OPERATION AND MAINTENANCE MANUALS

A. General

1. Include all elements and components of the system including instrumentation. Provide a description of how the equipment or complete system works. Additionally, where a number of components are furnished to provide a complete system, describe the operation of components as they relate to the complete system.
2. Include all necessary instruction for the maintenance and operation of the equipment or system in accordance with the manufacturer's recommendations, and as herein specified.
3. Customize the manual so that only data pertaining to the specific equipment or system to be furnished is included. If a standard type manual is utilized, it shall be neatly annotated to highlight the data pertaining to, and deleting the data not pertaining to, the specific equipment or equipment being furnished.
4. Bind each manual for each type of equipment or system separately as specified below

B. Content of Manuals

1. Table of Contents and index. Provide title of Contract and schedule of products and systems, indexed to content of the volume.
2. Brief description of each system and components. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests. Include equipment Nameplate Data (Serial No., Model No., rating, voltage, etc.).
3. Names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
4. One copy of each approved shop drawing and each Contractor's coordination and layout drawing
5. Record drawings of wiring diagrams and control schematics including external connection diagrams.
6. Test and balancing reports, calibration data, alignment records, and other information.
7. Copy of any applicable warranties, guarantees and bonds
8. Operating Procedures:
 - a. Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - b. Manufacturer's printed operating instructions.
9. Maintenance Procedures:
 - a. Complete maintenance instructions (include routine, preventive and corrective maintenance).

- b. Manufacturer's printed maintenance instructions, parts list, illustrations, and diagrams.
 - c. Include maintenance schedule and types of lubricants. Cross-reference lubricants to products offered by at least three major lubricant suppliers.
10. Spare Parts:
- a. List of recommended spare parts, manufacturer's current price, and recommended quantity
 - b. Parts lists to include the specific part or identification number used by the manufacturer of the parts. Arbitrary sequential numbers or letters keyed to a sectional diagram are not satisfactory.
11. Additional Requirements: As specified in individual product specification sections.

C. Format

1. Binder

- a. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers; two inch maximum ring size. When multiple binders are used, correlate data into related, consistent groupings. Provide a table of contents in each binder.
- b. All binders to be of similar design and color, but sized to suit the individual manuals with a minimum allowable edge of width of 1 inch.
- c. Identify each manual with a permanent label affixed to the outside binding of the binder and include the following information:
 - 1) Name of Contract, Contract Number
 - 2) Location of equipment or system (i.e. Primary Settling Tanks)
 - 3) Common name of equipment or system (i.e. Chain and Flight Sludge Collectors)
- d. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

2. Material for Content

- a. Loose leaf on 60 pound, punched paper
- b. Holes reinforced with plastic cloth or metal
- c. Page size, 8 1/2 by 11 inches
- d. Diagrams, illustrations, and attached foldouts as required, of original quality, reproduced by dry copy method
- e. Drawings: Provide with reinforced punched, binder tab. Bind in with text; fold larger drawings to size of text pages

1.03 SUBMITTALS

- A. Sample of typical binder, cover and tabbed fly leaf.
- B. Provide six (6) copies of O&M manuals for approval no later than the time that the equipment is delivered to the site. If the manual is satisfactory, the Engineer will retain all six (6) copies. If the manual is not satisfactory, the Engineer will retain one (1) copy and return five (5) copies to the Contractor. When manuals are resubmitted, six (6) copies will again be required. When the manual is satisfactory, except for some missing information, the Engineer may, at his option, retain all six (6) copies of the manual and request six (6) copies of the additional information to be provided.
- C. All manuals pertaining to equipment or a system within each specific components of construction must be completely approved prior to the Field Acceptance Tests of that component.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01740

WARRANTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1.02 SUBMITTAL

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than a date of Substantial Completion for the Work, or a designed portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner prior to acceptance of this portion of the Work.
- C. Refer to individual Sections of Division 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.

1.03 WARRANTY REQUIREMENT

- 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 with an equitable adjustment for depreciation.
- 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. 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.

1.04 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are 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.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01750

SPARE PARTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Spare parts which are identical and interchangeable with original parts shall be provided with equipment as specified in each Section of the Specifications. Spare parts shall be individually packaged in boxes bearing the equipment reference, tag number, and part identification (Example: Primary Scum Pump No. 1).
- B. Subsequent to the approval of the appropriate operation and maintenance manuals but prior to the delivery of the spare parts, the Contractor shall prepare and submit an itemized tabulation of all spare parts to be provided. The tabulation shall include the name of the equipment for which the spare part is intended, type of spare part, manufacturer of spare part, manufacturer model or manufacturer identification number of spare part, quantity of spare part, and page in the appropriate operation and maintenance manual detailing the parts list.
- C. Spare parts shall be stored by the Contractor in a location approved by the Engineer. Unless otherwise directed by the Engineer, the Contractor shall deliver the spare parts to the Owner at the time of "Substantial Completion." Spare parts shall be stored in accordance with the manufacturer's written recommendations, and shall be protected against theft, vandalism, weather, and all other adverse conditions. Spare parts delivered to the Owner shall be in new, undamaged condition. Upon delivery to the Owner, spare parts shall be logged in against the above noted tabulation and inspected by the Contractor in the presence of the Engineer. Any missing or damaged spare parts shall be replaced by the Contractor at no expense to the Owner.

1.02 SPECIAL TOOLS

- A. Provide special tools required for operation, service, or maintenance of the products as specified or as needed, as determined by the manufacturer's representative.
- B. Pack items to protect them during storage. Tag items and containers to clearly identify them.

1.03 CONTRACT SPECIFIC REQUIREMENTS

- A. Specific requirements for spare parts for this contract are included in the technical specifications.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01751

LUBRICANTS

PART 1 GENERAL

1.01 REQUIREMENTS

- A. The Contractor shall furnish and deliver to the Owner such oil, grease and any special lubricants that are necessary for proper operation of all equipment furnished under this contract. The quantity furnished shall be sufficient for one year's operation after the date of substantial completion. The grade of lubricants furnished shall be in accordance with the recommendations of the equipment manufacturers.
- B. Subsequent to the approval of the appropriate operation and maintenance manuals but prior to the delivery of the lubricants, the contractor shall prepare and submit an itemized tabulation of all lubricants to be provided. The tabulation shall include the name of the equipment for which the lubricant is intended, its tag number, type of lubricant, manufacturer of lubricant, frequency of lubrication, quantity of lubricant required for one year, and page in the appropriate operation and maintenance manual referencing the lubricant.
- C. All lubricants shall be delivered to the Owner prior to the start-up of the equipment. They shall be delivered in the manufacturer's unopened containers and shall be labeled with the equipment name for which it is to be used. At the time of delivery they shall be logged in against the above noted tabulation and inspected by the Contractor in the presence of the Engineer.
- D. The Contractor shall also furnish and deliver to the Engineer such grease guns and auxiliary lubricating devices as are required to conveniently maintain all equipment furnished. As a minimum, one grease gun and accessories will be furnished for each individual item of equipment requiring lubrication.
- E. Prior to substantial completion, the Contractor shall submit an "Equivalent Lubrication Table" which shall list equivalent products from at least four major oil companies for all lubricants that will be required for all the equipment provided under this Contract.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01800

MAINTENANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for maintaining work completed under this Contract.

1.02 MAINTENANCE PERIOD

- A. The general maintenance period for all construction or materials under this Contract shall be one (1) year subsequent to the date of the acceptance of the work by the Owner, or as provided by other sections of this Specification.
- B. If the Owner puts any structure or equipment to use prior to acceptance of all work under the Contract, the maintenance period for such structures or equipment shall be calculated from the time use begins.
- C. Contractor agrees to replace the material which does not conform to the Contract requirements, and to repair any damage of material or work without cost to the Owner, to satisfaction of Program Manager, in conformance with Contract Documents provided orders for replacement and/or repairs are received in writing by the Contractor within the one-year period.
- D. This Section shall in no way limit the duration of the Contractor's responsibility for the correction of any defect due to workmanship or materials provided by the Contractor which are not in compliance with the Contract Documents.

1.03 ABUSE OF WORK

- A. Contractor is not obligated to perform work of replacement or repair that he may prove is required because of abuse by parties other than the Contractor, after the date the Owner puts to continuous use the work requiring replacements or repair, or after date the Owner has approved the Certificate of Completion.

1.04 EMERGENCY REPAIRS

- A. If the Owner deems necessary, the Owner shall order replacement or repairs be undertaken within 24 hours.
- B. If the Contractor delays or fails to make the ordered replacement or repairs within the time specified, the Owner shall have the right to make such replacements or repairs and the expense shall be deducted from moneys due the Contractor, or moneys of the Contractor retained by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF MAINTENANCE

SECTION 01810

MAINTENANCE OF OPERATIONS AND
SEQUENCE OF CONSTRUCTION

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. The existing combined sewers, sanitary sewers, drains, water mains, gas service, electrical service, telephone, and other existing utilities will be maintained in continuous operation by the NBC, Pawtucket Water Supply Board, National Grid, Verizon, City of Pawtucket Department of Public Works, etc. at all times during the entire construction period. The Contractor shall schedule his operations to conform to the requirements specified herein and shall include in his construction progress schedule all events which will impact operation of the existing facilities.
- B. The Contractor shall at all times conduct his operations so as to interfere as little as possible with existing utilities. All work of connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time and when the demands on the facilities best permit such interference, even though it may be necessary to work outside of normal working hours to meet these requirements. Before starting work which will interfere with the operation of existing facilities, the Contractor shall perform all preparatory work and shall see that all labor, tools, materials, and equipment are made ready and at hand.
- C. Contractor shall maintain access to electrical substation by National Grid employees at all times during the performance of the work.
- D. The Contractor shall make minor modifications in the work relating to existing structures as may be necessary to satisfactorily complete the work, without additional compensation.

1.02 RELATED WORK

- A. Section 01000 - General Specifications
- B. Section 01010 - Summary of Work
- C. Section 01300 - Submittals
- D. Section 01311 - Construction Scheduling
- E. Section 01510 – Protection of Existing Facilities

1.03 SCOPE OF WORK

- A. The general items of work included in this construction contract are described in Section 01010 – Summary of Work.

1.04 CONTRACTOR'S AND OWNER'S RESPONSIBILITIES AND LIMITATIONS

- A. The Contractor's construction activities shall not disrupt operation of existing utilities, no matter how minor, without the approval of Owner and the utility. Existing infrastructure removed and disposed of as part of the work must be replaced as soon as possible so that service and/or drainage within the area under construction is not adversely affected.
- B. The Contractor shall notify the Program Manager in writing of any construction activity that will affect any operations of the Owner, municipality, or public water supplier. Contractor shall also notify Program Manager if he requires assistance from the Owner, municipality, or public water supplier in operating any existing facilities. This notification shall be received at least one week prior to the planned construction work. The request shall clearly detail the Contractor's planned work, how his work will affect the operation of the existing facilities, the estimated duration of the work, and any assistance required of the Owner.
- C. The Contractor shall coordinate and cooperate with the public water supplier and local fire department to maintain water distribution and fire protection capability.
- D. The Contractor shall notify the Owner, public water supplier, and the local fire department at least forty-eight (48) hours in advance of the time of connecting and disconnecting temporary and permanent facilities so that representatives of the water supplier and fire department may be present at installation or removal of permanent and temporary connections and to permit the public water supplier to inform customers and users as they deem necessary. Pressure testing and/or chlorination shall require a two (2) business day notification. A representative from the public water supplier must witness all testing.
- E. Contractor shall be required to submit a temporary bypass plan to the Program Manager for review and approval prior to commencement of work when water bypass is required. The Contractor shall review available water distribution plans to determine the extent of the bypass necessary, especially where dead ends and division gates may require bypass piping.
- F. It is emphasized that the operations of the existing facilities take precedence over all construction activities. Denials of requests from the Contractor for assistance of the Owner, municipality, or public water supplier in modifying their operations shall not be a basis for any claim by the Contractor. Any approved assistance given to the Contractor from the Owner, municipality, or public water supplier will be provided when the parties' schedule and manpower permit. The Contractor shall also provide access to Owner, municipality, and public water supplier to all existing facilities at all times throughout the construction period.

1.05 SEQUENCE OF CONSTRUCTION

- A. The detailed schedule for construction shall be based upon the schedule submitted by the Contractor and approved by Owner as specified above. However, as a guide for bidders in the preparation of their bid and for the Contractor in the preparation of his schedule, scheduling

requirements and anticipated sequence of construction are described below. Some construction activities may occur simultaneously.

1. Mobilization
 2. Reinforce retaining wall
 3. a. Construct SOE at Gate and Screening Structure / GSS – 2 / Approach Channel
 - b. Consolidation Conduit construction from Junction Chamber to MH 217-1
 4. Water Main Replacement – Taft Street
 5. a. Construction SOE at Junction Chamber
 - b. Consolidation Conduit pipe jacking from MH 217-2 to MH 217-1 / Installation of MH 217-1
 6. Utility Tunnel Construction from GSS-2 to Junction Chamber
 7. Consolidation Conduit pipe jacking from MH 217-2 to MH 217-3 / Installation of MH 217-2
 8. Drainage Replacement – Taft Street
 9. Construction of GSS-2 and Junction Chamber
 10. Consolidation Conduit construction from MH 217-3 to MH 217-4 / Installation of MH 217-3
 11. Construction of GSS / Approach Channel
 12. Temporary Water Bypass – Roosevelt Avenue Extension
 13. Construction of Prefabricated Control Building
 14. Consolidation Conduit construction from Junction Chamber to Diversion Structure 214
 15. Diversion Structure 214 construction and associated drainage replacement
 16. Consolidation Conduit construction from Diversion Structure 214 to Diversion Structure 213
 17. Consolidation Conduit pipe jacking from Diversion Structure 213 to MH 213-3
 18. Diversion Structure 213 construction and associated drainage replacement
 19. Consolidation Conduit construction from MH 213-3 to MH 213-2 / installation of MH 213-3
 20. Consolidation Conduit construction from MH 213-2 to MH 213-1 / installation of MH 213-2
 21. Water Main replacement – Roosevelt Avenue Extension
 22. Installation of 20” water main insertion valve at Main Street
 23. Consolidation Conduit pipe jacking from Diversion Structure MH 213-1 to Diversion Structure 210 / Installation of MH 213-1
 24. Consolidation Conduit construction from Diversion Structure 210 to MH 210-1
 25. Water main replacement – Main Street
 26. Site Restoration
- B. The order of construction shall be subject to the approval of the Owner; such approval or direction, however, shall in no way relieve the Contractor's responsibility to perform the work in strict accordance with the Contract Documents. The Contractor shall note the requirements of Section 01010 and as provided on the drawings with regard to the phasing of construction when developing his work sequence. The Contractor's work sequence must be specifically detailed in a bar chart schedule, which is required under Section 01311.
- C. Contractor should note that other investigations being performed under separate contracts may be underway at the time this contract is awarded (e.g., environmental sampling and

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analysis). Contractor shall coordinate activities, as required, to minimize conflicts with other activities being performed at the site or in the project area.

END OF MAINT. OF OPERATIONS AND SEQ. OF CONSTRUCTION

DIVISION 02

SECTION 02075

SOIL MANAGEMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work specified in this Section includes work associated with soil management and management of contaminated materials within the Right of Way and on City Property, as defined herein. The Contractor shall be responsible for excavation, handling, stockpiling, characterization, transport, and disposal of contaminated materials in accordance with applicable federal state and local regulations governing disposal of urban fill and jurisdictional waste.
- B. Proper controls for worker health and safety protection shall be taken during soil excavation. Excavated soil materials may be re-used on-site as fill within the public right-of-way or publicly owned land, provided the material meets the requirements in Section 02200 – Earth Excavation, Backfill, Fill, and Grading. The Contractor shall be responsible for the disposal of excess and/or unsuitable excavated materials in accordance with applicable Federal, State, and local regulations governing the disposal and reuse of urban fill.
- C. The Contractor shall dispose of contaminated materials encountered on City Property and within City Streets in accordance with all applicable laws.
- D. In the event of Contractor generated contamination, the Contractor shall be solely responsible for response, notification procedures, clean-up, removal, and disposal at no expense to the Owner. The Contractor shall not be allowed any compensation for "down time" while a determination is made.
- E. In the event that the Contractor excavates material for its convenience or temporary facilities outside the limits of excavation and such materials are found to be contaminated and/or hazardous, the Contractor shall be wholly responsible for disposal of the material.
- F. Related work and activities associated with the management of contaminated soils are described in the following Sections:
 - 1. Section 01000, General Specifications
 - 2. Section 01060, Permits and Regulatory Requirements
 - 3. Section 01065, Project Safety and Health Specifications
 - 4. Section 01300, Submittals
 - 5. Section 01500, Construction Facilities and Temporary Services
 - 6. Section 02100, Mobilization, Site Preparation, and Demobilization
 - 7. Section 02200, Earth Excavation, Backfill, Fill and Grading
 - 8. Section 02240, Construction Water Handling
 - 9. Section 02370, Stormwater Pollution Prevention

1.02 DEFINITIONS

- A. Category 1 Soil – Material that exceeds RIDEM R DEC concentrations but is suitable for reuse as alternate daily cover at a non-hazardous solid waste facility (in accordance with RIRRC Alternative Cover Policy or as defined in DEP Policy #COMM-97-001 if the material is proposed for reuse at a Massachusetts landfill).

- B. Category 2 Soil – Material which is suitable for solid waste disposal at a non-hazardous solid waste facility, such as the RIRRC Central Landfill.
- C. Category 3 Soil: Material tested as being a hazardous waste as defined by the Toxic Substances Control Act (TSCA) or Resource Conservation and Recovery Act (RCRA). Such waste must be disposed off-site as a hazardous waste at an appropriately permitted RCRA facility.
- D. Category 4 Soil: Material which tests positive for asbestos (i.e., containing greater than one percent (1%) asbestos) must be handled and disposed at an appropriately permitted facility. Dust mitigation shall be performed during excavation of asbestos-containing material.
- E. Suspect Soil: material that exhibits indicators (olfactory, visual, or field screening) of contamination inconsistent with the results of previous investigations.

1.03 SUBMITTALS

- A. Submittals shall be made in compliance with the requirements of Section 01300 except as provided for herein.
- B. No Work will be permitted to proceed until the required submittals have been received and approved by the Program Manager/Construction Manager. In the event the Program Manager/Construction Manager requests additional information, it shall be the CONTRACTOR's responsibility to provide such additional information in a complete and timely manner, so that construction can proceed by the date stipulated in the Notice to Proceed.
- C. Contaminated soil will be encountered during the work. Prior to the commencement of work, the CONTRACTOR shall submit the following to the Program Manager/Construction Manager for approval:
 - 1. Submittal of required certifications demonstrating that personnel are properly trained and qualified to perform the Work in accordance with applicable OSHA regulations and laws governing the Work.
 - 2. Names and qualifications of proposed subcontractors, if any, identifying the tasks to be performed by each proposed Subcontractor.
 - 3. A Proposed Soil Management Plan, including a description of the proposed equipment and decontamination procedures, identification of staging areas for the loading of the contaminated soil, and project schedule.
 - 4. The CONTRACTOR's Site-Specific Health & Safety Plan pursuant to OSHA 1910.120 requirements.
 - 5. Landfills/facilities identified to accept the four categories of soil
- D. Approval of submittals by the Program Manager/Construction Manager shall not impose any liability upon the Program Manager/Construction Manager, nor shall any such approval relieve the CONTRACTOR of his/her responsibilities to meet the requirements and comply with applicable laws, regulations and other applicable requirements under this Contract.
- E. The Contractor shall submit to the Program Manager copies of all bills of lading or manifests accompanying any wastes or soils designated for disposal, analytical data, permits and any documents submitted to RIDEM.

1.04 EXISTING ENVIRONMENTAL CONDITIONS

- A. Appendix B contains figures, tables, and other summaries of analytical data characterizing anticipated soils contamination along the alignment.
- B. The CONTRACTOR shall satisfy himself/herself as to the conditions existing at the Site, the type of equipment required to perform this Work, and the quality and quantity of the materials to be removed.
- C. Failure of the CONTRACTOR to become fully acquainted with the available information will not relieve him/her of the responsibility to completely and properly perform the work in full compliance with the Contract Documents. The Program Manager/Construction Manager assumes no responsibility for any conclusion or interpretation made by the CONTRACTOR on the basis of information made available by the Owner Program Manager/Construction Manager.

1.05 NOTIFICATION FOR SUSPECT SOIL

- A. It shall be the responsibility of the Contractor to immediately notify the Program Manager upon encountering any suspect soil; and to advise as to whether such materials could represent a Reportable Concentration for Soil as defined by RIDEM. It shall also be the responsibility of Contractor to notify RIDEM office of Compliance and Inspection in the event of an emergency release or spill.

1.06 APPLICABLE LAWS AND REGULATIONS

- A. The CONTRACTOR is advised that Work under this Section may need to be performed under the requirements of RIDEM's remediation regulations.
- B. Work under this Section shall be performed in strict compliance with applicable Federal, State and local laws, rules, regulations related to the handling and off-site management of contaminated wastes and regulated soil.
- C. Pertinent Federal and State Authorities having jurisdiction over this project include:
 - 1. Occupational Safety and Health Administration (OSHA)
 - 2. U.S. Environmental Protection Agency (EPA)
 - 3. Rhode Island Department of Environmental Management (RIDEM)
- D. The following OSHA regulations will apply:
 - 1. Occupational Safety and Health Standards, Hazardous Waste Operations and Emergency Response - 29 CFR 1910.120.
 - 2. Safety and Health Regulations for Construction - 29 CFR 1926.

1.07 REFERENCES

- A. Rhode Island Department of Environmental Management (RIDEM) Regulations:
 - 1. Rules and Regulations for Hazardous Waste Management (4/19/92, as amended);

2. Rules and Regulations for Investigation and Remediation of Hazardous Materials (8/96, as amended);
 3. Oil Pollution Control Regulation (1/31/91); and
 4. Solid Waste Regulation No. 1 General Requirements (1/97).
- B. OSHA regulation 29 CFR 1910.120.
- C. The Occupations Safety & Health Act of 1970, 29 U.S.C. 651 et seq., as amended.
- D. Documents
1. "Drop Shaft 213 Consolidation Conduit & OF-217 Consolidation Conduit, Phase III CSO Program: Contract IIIA-4 & IIIA-5, Environmental Technical Memorandum", dated June, 2020, prepared by BETA Group, Inc.
 2. "NBC Phase III CSO Program Consolidation Conduits IIIA-4 and IIIA-5 Geotechnical Data Report" May 2020, prepared by McMillen Jacobs and Associates.
 3. Supplemental B21-series test borings and associated analytical data at the Drop Shaft 213 area (Masonic Temple) performed by the PM/CM and provided to BETA April 2021.
- E. All other applicable Federal, State, or local regulations.

PART 2 PRODUCTS

2.01 GENERAL

- A. The Contractor shall provide all employees and Subcontractors with personal protective equipment and protective clothing, and training and hazard awareness consistent with the levels of protection for this Work consistent with anticipated soils and groundwater concentrations summarized in Appendix B. The Work shall be coordinated and specifically addressed in Contractor's Health and Safety Program in accordance with Section 01065.

2.02 MATERIALS

- A. Polyethylene Sheeting: The material shall be UV resistant and cold crack resistant to -40 degrees F. The material shall be manufactured in a minimum 12-ft seamless width. Label on rolls shall identify thickness, length, width, and manufacturer's mark number. Provided below are material specifications:
1. Bottom Layer – minimum twenty (20) mils thick.
 2. Top Layer – minimum ten (10) mils thick
- B. Use suitable rope, weighted with tires or sandbags, for hold-downs ties.

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall perform excavation of contaminated materials in accordance with Contractor's Health and Safety Program and Section 02200. Contaminated soil excavation work may include contaminated soils excavation, test pits, removal of obstructions, and any incidental work.

- B. Excavated soil materials may be re-used on-site as fill within NBC Property, public right-of-way, or publicly owned land, provided the material meets the requirements outlined in Section 02200. Excavated soil materials on privately owned land shall not be reused on-site as fill. Excavated materials shall be disposed of in accordance with all applicable laws and shall be the responsibility of the Contractor.
- C. The Contractor shall maintain all required field controls as specified herein throughout the performance of the work.
- D. All site health and safety controls shall be fully established and in operation prior to beginning any soil excavation.

3.02 PREPARATION

- A. Temporary Storage Areas: Prior to storing contaminated soils in stockpiles at temporary storage areas approved by the Program Manager, the Contractor shall install berm or other perimeter controls around the base of the stockpile area as specified in approved plan.

3.03 EXCAVATION

- A. Work and decontamination procedures in areas containing contaminated materials shall be performed in accordance with standard engineering practices.
- B. The Contractor shall employ appropriate methods to isolate contaminated soils from non-contaminated areas.
- C. The Program Manager may direct the Contractor to excavate additional soils outside the defined area. The Contractor shall perform the Work in accordance with paragraph 3.08 and Bid Allowance.

3.04 STORAGE AND HANDLING OF EXCAVATED MATERIAL

- A. The Contractor shall provide a suitable on-site location, located on the work site for the temporary storage/stockpiling of contaminated soils for appropriate laboratory analytical testing prior to disposal.
- B. The Contractor shall temporarily stockpile excavated contaminated soil on the construction site in stockpiles pending soil characterization and analytical results. Soil shall be stockpiled in accordance with this Section. The Contractor shall prevent stormwater pollution from stockpiled material by employing perimeter controls, check dams, temporary dewatering and stilling basins as detailed by Section 02370.
- C. Prior to storing uncontainerized contaminated soils in stockpiles at temporary storage areas approved by the Program Manager/Construction Manager, the Contractor shall install berm or other perimeter controls around the base of the stockpile area as specified in approved plan.
- D. Polyethylene sheeting shall cover the stockpiles and appropriate perimeter controls shall be constructed to prevent generation and migration of leachate and diversion of stormwater runoff.
- E. Place appropriate bottom layer polyethylene sheeting beneath all stockpiles with a minimum overlap of 18-inches. The polyethylene sheeting shall extend past the limits of the berm a minimum of 12-inches.
- F. The Contractor shall inspect perimeter controls at least twice per week and provide immediate maintenance as necessary.
- G. At a minimum, the storage location must be of sufficient size to stockpile those soils and material which are anticipated to be contaminated, separately from those which are not anticipated to be contaminated. The Contractor shall maintain appropriate space between

- separated piles for the soil volumes expected by the Contractor to be in storage at any one time based on the Contractor's projected work rate, the environmental site conditions described in the reference materials, and the laboratory testing requirements in this section.
- H. Off-site storage of contaminated soils is not permitted without prior written approval of the Program Manager. Prior to stockpiling excavated materials at offsite staging area(s), the Contractor shall pre-characterize the surface soils (0-6") to document the existing conditions relative to contamination which may result from using the area to stage excess or unknown materials. A minimum of two surface soil samples or one surface soil sample for every 500 square feet of staging area (whichever is greater) shall be collected by the Contractor prior to staging materials at the location unless soil is staged on an impervious surface.
 - I. Contaminated soils shall in no case be stockpiled for more than ninety (90) days.
 - J. The Stockpiles shall be securely barricaded and clearly labeled.
 - K. Soils shall be suitably dewatered prior to their leaving the site, to prevent free water from developing during transport to the disposal facility
 - L. Hay bales shall be placed around the stockpile as per Section 02370.
 - M. The Contractor shall also maintain appropriate dust control, per Section 01500.
 - N. If stockpiles contain oily soils or debris, the Contractor shall place a minimum 8-inch diameter continuous oil absorbent boom around the entire perimeter of the stockpile.
 - O. The Contractor shall inspect perimeter controls at least twice per week and provide immediate maintenance as necessary.

3.05 CLEAN FILL

- A. Contractors will be required to demonstrate that all imported fill material brought onto the site, or any on-site material proposed to be reused as clean fill, is free of contaminants exceeding the RIDEM R DEC concentrations.
 - 1. Contractor shall indicate source of all imported soil and fill materials proposed for use on the project.
 - 2. Imported and/or onsite soils proposed for reuse shall be sampled and analyzed at a minimum frequency of one sample per 1,000 cubic yards, and at least two samples shall be analyzed for each source. Analysis shall be performed by a laboratory certified in the State of Rhode Island.
 - 3. Contractor shall furnish certificates of analysis and chain of custody documentation of all soil sampling and analysis and shall certify that the material meets project requirements through comparison to the RIDEM R DEC concentrations (including that it meets all other physical requirements stipulated elsewhere in the project specifications). The Contractor shall provide to the Program Manager/Construction Manager on a daily basis during excavation copies of field records documenting the location of stockpiled material and stockpile identification data.

3.06 SOIL TRACKING

- A. The Contractor shall provide to the Program Manager/Construction Manager on a daily basis during excavation copies of field records documenting the location of stockpiled material and stockpile identification data.
- B. The Contractor shall document and track all contaminated soils from excavation to final off-site disposal.

3.07 SOIL CHARACTERIZATION

- A. Soil and fill material shall be classified based on the criteria established in the accepted SWMP.
- B. A summary of existing conditions and investigation findings performed by the Program Manager/Construction Manager during design, including a summary of analytical results, shall be available to the Contractor.
- C. The Contractor shall review all the existing conditions information supplied by others. The Contractor shall use the information and shall either perform independent sampling and characterization of soil/fill waste strata to be encountered during construction in advance of excavation such that excavated soil can be segregated and directly transported to an appropriate facility or the contractor shall make the necessary arrangements to secure a staging area(s) suitable for storing soil stockpiles pending analyses, at no additional cost to the Owner.
- D. Soil characterization shall be the responsibility of the Contractor. The Contractor shall be responsible for determining the characterization requirements of each disposal facility in advance to facilitate timely disposal and to adequately estimate the disposal costs. The Contractor shall perform additional segregation based on disposal requirements. Disposal or off-site reuse of the material shall depend on sampling and characterization analytical results. At the request of the Program Manager/Construction Manager or Owner, the Contractor shall provide a split sample. The Contractor shall perform or observe all sampling and shall provide notice in advance to the Program Manager/Construction Manager so that the Program Manager/Construction Manager may observe the sampling procedure.
- E. Stockpiles within the staging area shall be sampled and characterized within a timely manner so as not to impede construction activities or preclude the reuse of soil/fill on site. If soil/fill cannot be reused on site due to the Contractor's delay in sampling material, the Contractor shall dispose of the soil/fill at no additional cost to the Owner including the additional cost of imported fill material used in its place to meet project requirements.
- F. The Contractor shall perform analyses on stockpiles or *in situ* as necessary to fulfill any disposal testing requirements of the approved facilities.
 - 1. The Contractor shall perform sampling and analyses for those tests required by the facilities in excess of those previously performed by the Program Manager/Construction Manager.
 - 2. The Contractor shall submit a copy of all sampling analyses to the Program Manager/Construction Manager within 2 days of receipt of the laboratory report. Analytical data shall be kept confidential, distributed to facility, Program Manager/Construction Manager and RIDEM only.
 - 3. The Contractor shall provide disposal facility letters of final waste acceptance, addressed to RIDEM, based on the stockpile or *in situ* sample analysis.

3.08 EQUIPMENT AND VEHICLE DECONTAMINATION

- A. The Contractor shall design and construct a decontamination pad to be used to decontaminate equipment and vehicles existing from contaminated areas. The Contractor shall be responsible for the maintenance and operation of the decontamination station (decontamination pad and wash down equipment, if necessary) throughout the duration of the work activities. The Contractor shall collect, treat and dispose of decontamination pad wash water, if necessary. At the completion of the project, the Contractor shall dismantle and properly dispose of the decontamination pad and resulting contaminated waste products.

3.09 DISPOSAL

- A. The Contractor shall be responsible for disposal of Contaminated Material as documented in Appendix B. The Contractor shall be responsible for preparing and submitting to the Program Manager/Construction Manager for review all waste profile applications and questionnaires, and coordination, with disposal facilities and all Federal and State environmental agencies.
- B. The Contractor shall submit to the Program Manager/Construction Manager, prior to receiving payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility.
- C. Dispose of materials described herein shall be in accordance with all Federal, State, and Local regulations.
- D. The Contractor shall perform analyses on stockpiles or *in situ* as necessary to fulfill any disposal testing requirements of the approved facilities. At a minimum, the Contractor shall sample at a frequency of one per 1,000 CY of excavated material. The Contractor shall submit a copy of all sampling analyses to the Program Manager/Construction Manager within 2 days of receipt of the laboratory report. The Contractor shall provide disposal facility letters of final waste acceptance, based on the stockpile or *in situ* sample analysis.
- E. The Contractor shall provide to the Program Manager/Construction Manager copies of all manifests and truck load forms, with original certified scale weight slips, both tare and gross, for every load weighted and disposed of at the accepted landfills. Individual truck load weight slips shall be tracked by the original manifest document number that was assigned by the Program Manager/Construction Manager at the site.
- F. Failure to provide manifests and other required forms, truck load tracking sheets, and the weight slips required as payment request backup, may be cause for the Program Manager/Construction Manager to withhold payment in an amount which the Program Manager/Construction Manager determines is equivalent to the work until such documentation is provided the Contractor.
- G. The Contractor shall be responsible for preparing and submitting to the Program Manager/Construction Manager for review all waste profile applications and questionnaires, and coordination, with disposal facilities and all Federal and State environmental agencies.
- H. The Contractor shall be responsible for preparing all waste profiles, hazardous waste manifests and bills of lading with all applicable analytical backup, notification, and control forms. Contractor shall submit these to the Program Manager/Construction Manager for review and approval at least 5 days before transport.
- I. The Contractor shall also provide certified tare and gross weight slips for each load received at the designated disposal facility which shall be attached to each returned manifest and bill of lading.

- J. The Contractor shall furnish all copies of the waste manifests to the Program Manager/Construction Manager for submittal to appropriate Federal and/or State Environmental Agencies and to retain for the Owner's records.
- K. The Contractor shall submit to the Program Manager/Construction Manager, prior to receiving payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility.
- L. Disposal of materials described herein shall be in accordance with all Federal, State, and Local regulations. The Contractor shall select excavation techniques that will minimize the amounts of excavated material and shall select the most economical disposal option allowable in accordance with Federal, State, and local environmental agencies having jurisdiction.

3.10 SUSPECT SOIL

- A. In the event that the Contractor suspects it has encountered suspect soil, the Contractor shall immediately discontinue its work and make safe the work area. The Contractor shall immediately notify the Program Manager/Construction Manager, notify RIDEM in accordance with Section 5.0 of the RIDEM's Rules and Regulations of Hazardous Material Releases and implement the Contractor's Environmental Response Plan for Contaminated Media as required by Section 01065, PROJECT SAFETY AND HEALTH SPECIFICATIONS. Prior to recommencing work at the site of the suspected contamination the Contractor shall be responsible for submitting and receiving approval for its proposed actions from both RIDEM and the Program Manager/Construction Manager.

3.11 DUST CONTROL

- A. Dust shall be controlled during excavation of soil/fill waste material to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.
- B. During construction, real-time dust monitoring shall be conducted under windy and/or excessively dry working conditions or when directed by the Program Manager/Construction Manager. The monitoring shall consist of total dust testing using MIE, INC. MINIRAM PDM-3 DUST MONITORS, or like instruments. The total dust criteria at the site shall conform to the requirements of the HASP. Should fugitive dust quantities exceed 20 percent of the ambient level or action levels indicated within the HASP, the Contractor shall perform additional measures to reduce the total dust concentrations.
- C. Nuisance dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor, and Odor Control Plan shall describe the procedures and materials to minimize dust. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.
- D. Areas of exposed earth to be excavated shall be lightly sprayed with water before excavation if there is potential for nuisance dust generation. Additional water spray may be utilized only when any indication of excessive dust is observed. To the extent feasible, the Contractor shall minimize the use of water within the limits of excavation.
- E. Unimproved access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

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SECTION 02100

MOBILIZATION, SITE PREPARATION, AND DEMOBILIZATION

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. The work specified in this section includes mobilization of all personnel and equipment, preparing construction sites for construction operations, and identifying and verifying survey control points as shown on the Drawings. Also included is protecting survey monuments from injury or defacement, utilities, traffic control, cleanup along access and haul roads, and demobilization of all personnel and equipment.
- B. Related Work Described Elsewhere:
 - 1. Section 01100 - Miscellaneous and Special Project Requirements
 - 2. Section 01500 – Construction Facilities and Temporary Services
 - 3. Section 01570 – Traffic Regulations
 - 4. Section 02240 – Construction Water Handling
 - 5. Section 02370 - Stormwater Pollution Prevention
- C.

1.02 SUBMITTALS BY CONTRACTOR TO PROGRAM MANAGER/CONSTRUCTION MANAGER:

- A. Construction Facilities Plan in accordance with Section 01500, Construction Facilities and Temporary Services
- B. Vehicle wheel wash facility plan in accordance with paragraph 3.06 of this Section.
- C. Traffic control plan in accordance with paragraph 3.07 of this Section.

1.03 CONSTRUCTION SITES:

- A. Obtaining staging areas is the responsibility of the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

- A. Signs: Conform to requirements of Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY SERVICES, and Section 01570, TRAFFIC REGULATIONS.

- B. Temporary chain-link fence shall be provided, installed, and maintained at all sites. At the completion of all work at the site, the CONTRACTOR shall remove all temporary fencing and restore the site to its original or better condition.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS:

A. Unpaved construction site entrance roads and parking areas shall be paved or covered with crushed stone to reduce vehicle tracking of sediments. Streets used to access the work sites shall be swept daily in accordance with Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY SERVICES, to remove any excess mud, dirt, or rock originating from the site. Trucks hauling material shall be covered and equipped with refuse gates that prevent material from falling out. Catch basins shall be maintained within 100 feet of site entry and exit locations.

- B. Structural strength of temporary facilities shall be sufficient to safely support all dead, live and impact loads that can reasonably be anticipated during the construction period.
- C. Protect all survey monuments and adjacent contractors' work and facilities.
- D. Protect all geotechnical instrumentation and groundwater observation wells. Replace at CONTRACTOR's cost if damaged by CONTRACTOR.
- E. Protect existing culverts, sewers, and all other utilities including gas, telecommunications, electricity, and water. Replace at CONTRACTOR's cost if damaged by CONTRACTOR.
- F. Barricade or backfill all open holes, trenches, shafts, and depressions occurring at construction sites or occurring as part of this work.
- G. Groundwater Control and Treatment: Conform to Section 02240, CONSTRUCTION WATER HANDLING.
- H. Wheel Wash Facilities: Conform to Subsection 3.06 of this specification.
- I. Traffic Control: Conform to Subsection 3.07 of this specification.

3.02 TEMPORARY CONSTRUCTION FACILITIES AND UTILITIES:

- A. Make arrangements for storage of materials and equipment in locations at the construction sites.
- B. Chain link fences fencing shall be maintained in good condition. Provide fencing around excavations and trenches as required for safety. Temporary fencing shall be removed and the area restored to a condition equal to or better than existed prior to the start of the work.
- C. Limit the operations and storage of equipment and materials to the designated staging areas.

3.03 PRECONSTRUCTION INSPECTION AND SURVEY:

- A. In accordance with Section 01381.

3.04 FIELD OFFICES:

- A. CONTRACTOR's Field Office: The CONTRACTOR shall maintain a temporary field office near the Work for the CONTRACTOR's own use during the period of construction at which readily accessible copies of all Contract Documents and approved Shop Drawings shall be kept. The office shall be located in the CONTRACTOR's staging area where it will not interfere with the progress of the Work.

3.05 SITE MAINTENANCE:

- A. Keep all surface irregularities of construction sites and access and haul roads well graded to prevent the generation of impact noise and ground vibrations by passing vehicles.
- B. Control dust from CONTRACTOR operations in accordance with dust control measures specified herein and in Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY SERVICES.
- C. Maintain the sites during construction in a manner that will not obstruct operations on any existing railroad tracks or street areas. Proceed with the work in an orderly manner, maintaining the construction site free of debris and unnecessary equipment or materials.
- D. Dispose of all debris, rubbish, hazardous materials, oil, and grease in accordance with Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY SERVICES and all regulations.
- E. Maintain safety and security of the construction sites.

3.06 TRAFFIC CONTROL:

- A. For all of his operations, the CONTRACTOR shall provide traffic control in accordance with Section 01570, TRAFFIC REGULATIONS, of this specification. The purposes of the traffic control are to ensure that his operations in the community are done in a safe and orderly manner and that the impact of truck traffic and noise on the community are minimized. The Contractor shall be responsible for obtaining the required permits and approvals, setting up and coordinating the necessary police details in accordance with the town and state regulations, and submitting invoices to the Owner for approved traffic control detail costs.

END OF SECTION

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SECTION 02149

MAINTAINING EXISTING FLOW

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to maintain existing flow and implement and complete all flow diversions and/or bypass pumping required to complete the Work indicated on the Drawings.

1.02 PERFORMANCE REQUIREMENTS

- A. It is essential to the operation of the existing combined sewerage system that there be no interruption of the wastewater and stormwater flow throughout the duration of this project. An interruption shall be considered, but may not be limited to, any condition that in the sole opinion of the Program Manager/Construction Manager adversely affects or alters operation of the existing sewage system and/or any other portion or component of the existing collection system including the associated flows; allows the level of combined flow to increase, rise, collect, surcharge and/or overflow existing facilities in any manner; or results in any operational or permit violations being issued to the Owner.
- B. The contractor shall coordinate and sequence construction to limit the need to manage existing flow. Contractor shall monitor flow in an existing line prior to execution of the work, and shall present the information to the Owner for review. To the extent practical, work on existing combined sewer pipes shall be limited to dry weather conditions.
- C. The Contractor shall provide, maintain, and operate temporary facilities such as dams, bulkheads, pumping equipment (both primary and backup units as required) conduits, electrical power, and all other labor and equipment to intercept and maintain the existing sewage flow before it reaches the point where it would interfere with his work, carry it past his work, and return it to the existing facilities beyond his work.
- D. The Contractor's attention is directed to the fact that the existing wastewater and stormwater flow is a result of a combined system. Increases in normal flow should be expected during periods of wet weather. The Contractor shall therefore take all precautions necessary including monitoring weather forecasts to fully accommodate, control and sufficiently handle the increases in flow during periods of wet weather and/or storms as well as periods of normal flow.
- E. The Program Manager/Construction Manager may prohibit the carrying out of any work at any time when in his sole judgment, increased flow conditions are unfavorable or not suitable, or at any time, regardless of the existing flows, when proper precautions are not being taken to safeguard the existing sewerage system, previously constructed work, work in progress and/or the general public.

- F. In case of damage caused by the failure of the Contractor to take adequate precautions, the Contractor shall repair or replace equipment damaged and shall make such repairs or rebuild such parts of the damaged work, as the Owner may require, at no additional expense to the Owner.

- G. The Contractor shall provide a system capable of bypassing expected flow.

1.03 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:
 - 1. Detailed plans and descriptions outlining all provisions and precautions to be taken regarding the control and handling of existing sewage flows.
 - 2. Include such items as schedules, locations, elevations, capacities of equipment, materials, traffic maintenance plans, and all other incidental items necessary and/or required by the Owner to insure proper protection of the facilities and compliance with the requirements herein specified.
 - 3. Qualifications as described herein.
 - 4. Detailed proposal for noise prevention measures for review.
 - 5. Shop drawings for all pumping, piping, and appurtenances for type and size of equipment required to perform the flow diversion and/or bypass pumping work as required herein.

1.04 QUALITY ASSURANCE

- A. Qualifications
 - 1. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Program Manager/Construction Manager that he specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of similar size and complexity in wastewater applications performed by his firm within the past three years within New England. The bypass system shall meet the requirements of codes and regulatory agencies having jurisdiction.
 - 2. The vendor shall demonstrate the bypass pumping equipment is automated and is capable of functioning without the assistance of an operator.
 - 3. The vendor shall demonstrate the pumping equipment can operate for an extended period of time running dry. After this period of time, the pump shall have the capability of pulling a 25" Hg vacuum without adjustment or repair.
 - 4. The vendor shall demonstrate sufficient service resources and repair parts in stock to fulfill service or repair of rental equipment within one hour of a service call, twenty-four hours per day, seven days per week.
 - 5. Temporary components of the bypass system including pumps, pipe, hose, valves, and fittings shall be provided by one bypass vendor. Hydraulic calculations and drawings

required by the submittals shall be provided by the bypass vendor and stamped and certified by a Professional Engineer licensed in the State of the installation.

B. Pre-Installation Meeting

1. Contractor to schedule and attend a pre-installation meeting with the vendor, Owner and Program Manager/Construction Manager prior to installation of by-pass system.

PART 2 PRODUCTS

2.01 GENERAL

- A. At a minimum, all equipment shall be supplied in duplicate for emergency situations. Provide adequate on-line backup facilities so that no interruption in service is encountered. Equipment and installation are subject to the approval of the Owner and the Program Manager/Construction Manager.

2.02 PUMPING SYSTEM(S)

- A. All pumping units (primary and secondary) and appurtenances shall be sized properly to handle the flows encountered including increased flows due to wet weather.
- B. Pumps shall be centrifugal, end suction, fully automatic self-priming pumps that do not require the use of foot-valves, vacuum pumps, diaphragm pumps, or isolation valves in the priming system. The pumps may be electric or diesel powered. Pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows and shall immediately develop 25" Hg vacuum without adjustment or repair or employ level control devices to regulate on/off or variable speed of the pump. Pumps shall be a CD unit as manufactured by Godwin Pump of America, Inc, or approved equal. All pumping units and appurtenances shall be sized in accordance with the design parameters provided. Pumps shall not be connected by a common suction manifold.
- C. Pumps shall be critically silenced and equipped with sound attenuating enclosures capable of reducing noise levels to less than 70 dBA at 30'.
- D. Seals shall be high pressure, mechanical self-adjusting type with silicon carbide faces capable of withstanding suction pressures to 100 psi running. The mechanical seal shall be cooled and lubricated in an oil bath reservoir, requiring no maintenance or adjustment. Pump shall be capable of running dry, with no damage, for extended periods of time. All metal parts shall be of stainless steel. Elastomers shall be Viton.
- E. The Contractor shall provide the necessary start/stop controls for each pump.
- F. The Contractor shall be responsible to meet noise requirements in specified elsewhere in this section. All diesel driven primary and standby pumps shall be sound attenuated. The use of

Critical Silenced Canopy pumps or acoustical Whisper Pac enclosures for sound attenuation are required.

2.03 PIPING SYSTEM(S)

- A. All piping systems (primary and secondary) and appurtenance shall be sized properly to handle the flows encountered including increased flows due to wet weather.
- B. Provide temporary bypass suction piping from the upstream manhole(s) to the bypass pumps, and temporary discharge piping from the bypass pumps to the downstream discharge manhole(s).

2.04 POWER GENERATING FACILITIES

- A. Include power generating facilities capable of providing all power necessary to operate any primary and secondary pumping systems.
- B. Maintain facility to be ready for use if required.

2.05 NOISE PREVENTION

- A. Noise prevention measures for all equipment shall be used to insure minimum noise impact or surrounding areas.
- B. Measures may include but shall not be limited to enclosures, insulation, electric pumping units, and hospital grade silencers or mufflers.
- C. Noise levels shall be maintained such that increase shall not exceed 10 dBA over background at the nearest property line.
- D. Should at any time prior to or during the performance of above mentioned work, the Program Manager/Construction Manager determines the noise prevention measures being used are not adequate, the Contractor shall at no additional cost to the Owner suspend all work until acceptable measures are incorporated.

PART 3 EXECUTION

3.01 PUBLIC SAFETY AND CONVENIENCE

- A. General
 - 1. The Contractor shall at all times keep the streets, highways, roads, driveways, parking lots, private walks, and public sidewalks open for pedestrian and vehicular traffic unless otherwise authorized by the Program Manager/Construction Manager.

B. Public Travel Ways

1. Any authorized temporary closure of any streets, highways or roads shall be coordinated with the local Fire, Police and/or Department of Public Works as required by the municipality.

C. Municipal, Commercial and Private Property

1. Any authorized, temporary closure of any municipal, commercial or private driveway or access route will require the Contractor provide 48 hour notice to abutters of the temporary restriction of access to their property. The Contractor will make every attempt to schedule his work with as little inconvenience to the property owner as possible

3.02 INSTALLATION

- A. Keep the Program Manager/Construction Manager advised at all times of any changes made to the overall operation(s) to accommodate field conditions.
- B. Flow diversions and/or bypass pumping shall be maintained at all times as long as it is necessary to maintain the flow through the limits of the project during construction.
- C. Maintain auxiliary and/or emergency equipment at the site to continue flow division and/or by-pass pumping operations in the event of a breakdown and/or loss of normal power.
- D. The Contractor shall be responsible for the proper functioning and operation of the backup pumping units. Back-up pump(s) shall be on-line, isolated from the primary system by a valve.
- E. No work shall begin until all provisions and requirements of this Section have been reviewed and approved by the Program Manager/Construction Manager.
- F. The Program Manager/Construction Manager reserves the right to limit and/or otherwise restrict the Contractor's overall activities and/or operations at any time without claim should the Engineer deem it to be in the Owner's or public's best interest to do so.

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SECTION 02200

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for; excavating in earth for trenches and structures; backfilling excavations; furnishing necessary material; compaction; constructing embankments and fills; miscellaneous earth excavations and miscellaneous grading.

B. Related Sections

1. Section 01025 – Measurement and Payment
2. Section 01400 – Quality Control
3. Section 01410 – Testing Laboratory Services
4. Section 01800 – Maintenance
5. Section 02149 – Maintaining Existing Flow
6. Section 02215 – Aggregate Materials
7. Section 02218 – Impermeable Earth Fill
8. Section 02240 – Construction Water Handling
9. Section 02260 – Support of Excavation
10. Section 03300 – Cast-In-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
2. ASTM C117 - Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
3. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
4. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.
5. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ [600 kN-m/m³]).
6. ASTM D1557 – Test for Moisture - Density Relations of Soils Using 10 lb. Hammer and 18-inch Drop (Modified Proctor).
7. ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil.
8. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes.
9. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
10. ASTM D4972-19 - Standard Test Methods for pH of Soils.
11. ASTM D5856-15 - Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter.
12. ASTM D2434 – 19 - Standard Test Method for Permeability of Granular Soils (Constant Head).

13. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
14. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.03 SHOP DRAWINGS AND/OR DESCRIPTIVE LITERATURE

- A. Prior to execution of the work, the Contractor shall submit to the Engineer for documentation ONLY, complete description and detail drawings of proposed methods to protect the retaining wall through the construction period. The submission shall include the Contractor's Engineer's State of Rhode Island Professional Seal and signature. Said submission shall be for informational purposes only as a means of documenting the work to be performed and will not be considered an approval or disapproval of the design and/or the implementation thereof. This submission will not relieve the Contractor of the sole responsibility for the adequacy of the proposed system nor shall it be construed as an approval or guarantee that the Contractor's proposed equipment, materials and methods for protecting the existing retaining walls will be adequate for the work required at the locations of and for the Work required by this Contract.
- B. Included as part of this submission, the Contractor's Engineer must provide a complete listing of all references, codes and specifications used by the Contractor's Engineer and required by any federal, state or local agency having jurisdiction, and to which the design conforms.
- C. Specific design calculations are not to be submitted to the Engineer. In the event design calculations are submitted to the Engineer, they shall be returned to the Contractor without review nor checking by the Engineer.

1.04 CERTIFICATE OF DESIGN

- A. The Contractor's special attention is directed to the required "Certificate of Design", the form of which is provided at the end of this Section. The Contractor and Contractor's Engineer shall complete this "Certificate" in its entirety for each location of work to be done, and any revisions associated there with, and submit it simultaneously with, the support of excavation and dewatering submissions. Any submission made without the completed "Certificate", appropriately signed and sealed, shall be returned to the Contractor. The Owner and/or Engineer hereby reserves the right to delay sheeting work and/or any work associated with, or dependent upon, the proper implementation of protection measures, without cause for claim against the Owner or Engineer, until a complete and appropriate submission is rendered. This Certification shall indicate that the protection measures and all appurtenances related thereto are designed to withstand the required loads, forces to be encountered, and to provide soil and water control, and are in compliance with these specifications and all federal, state or local agencies having jurisdiction over the Work to be performed.

1.05 QUALITY ASSURANCE

- A. Field Samples
 1. Provide samples of materials as requested by the Engineer, to the Quality Control Engineer hired by the Program Manager, prior to delivery of materials on site, in order to facilitate field testing of compaction operations and material properties.

1.06 PROJECT/SITE CONDITIONS

A. Existing Conditions

1. There are pipes, drains, and other utilities in locations not indicated on drawings, no attempt has been made to show all services, and completeness or accuracy of information given is not guaranteed.

1.07 MAINTENANCE

- A. Maintain all work in accordance with SECTION 01800.

PART 2 PRODUCTS

2.01 MATERIALS

A. Suitable Aggregate

1. The nature of materials will govern both acceptability for backfill and methods best suited for placement and compaction.
2. All material whether from excavations or from borrow pits, after being placed and properly compact, will make a dense stable fill and containing no vegetation, masses of roots, individual roots more than 18 inches long, or more than 1/2 inch in diameter, stones over 6 inches in diameter, or porous matter.
3. Organic matter to be well distributed and not to exceed minor quantities.

B. Trench and Excavation Backfill

1. In general, and unless other material is indicated on drawings or specified, material used for backfilling trenches and excavations shall be suitable material which was removed in the course of making the construction excavations. If sufficient suitable material is not available from the excavations, the backfill material shall be crushed stone, gravel borrow or select borrow as directed by the Program Manager, in according to respective Specification Sections.

C. Structure Backfill

1. Unless otherwise indicated or specified, all fill and backfill under structures and pavement adjacent to structures shall be compacted gravel borrow containing not more than 10 percent material passing a 200 sieve. When coarse aggregate and fine aggregate are indicated or specified for use under structures, they shall conform to the requirements for coarse and fine aggregate specified in SECTION 02215.

D. Filling and Embankment Backfill

1. Suitable selected materials available from the excavations and not required for backfill around pipes or against structures may be used for filling and building embankments, except as otherwise specified. Material needed in addition to that available from construction operations shall be obtained from suitable gravel banks or other suitable deposits. The Contractor shall furnish, at his own expense, all borrow material needed on the work.

E. Additional materials

1. Concrete: In accordance with SECTION 03300.
2. Crushed stone: In accordance with SECTION 02215.
3. Gravel borrow: In accordance with SECTION 02215.
4. Select borrow: In accordance with SECTION 02215.

2.02 EQUIPMENT

A. Well Points

1. Designed to drain soil and prevent saturated soil from flowing into excavation.

B. Pumping Units

1. Designed for use with the wellpoints, capable of maintaining a high vacuum and, handling large volumes of air and water at the same time.

C. Underdrain Pipe

1. HDPE pipe enclosed in crushed stone encased in filter fabric.
2. Sewer pipe of quality know as "seconds".

2.03 SOURCE QUALITY CONTROL

- A. Provide Program Manager with access to location of off-site sources of materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify all existing utilities and facilities prior to excavation.

3.02 PROTECTION

A. Retaining Walls

1. Support and protect from damage existing retaining walls.
2. Contractor shall preserved the retaining walls in place with the exception of the areas identified to be removed and reconstructed.
3. Restore items damaged during construction without compensation, to a condition at least equal prior to construction.

B. Utilities

1. Support and protect from damage existing pipes, poles, wires, fences, curbing, property line markers, and other structures, which the Program Manager decides must be preserved in place without being temporarily or permanently relocated.
2. Restore items damaged during construction without compensation, to a condition at least equal prior to construction.

C. Trees

1. Enclose the trunks of trees adjacent to work with substantial wooden boxes of height necessary to protect trees from injury from piled material, equipment, operations or otherwise.
2. Employ excavating machinery and cranes of suitable type and size and operate with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.
3. When trimming is required, make all cuts smooth and neat without splitting or crushing.
4. Cover cut areas with an application of grafting wax or tree healing paint.
5. Branches, limbs, and roots shall not be cut except by permission of the Program Manager.

D. Plantings

1. Protect by suitable means or temporarily replant and maintain cultivated hedges, shrubs, and plants which may be injured by the Contractor's operations
2. Replant in their original positions and care for until growth is re-established, once the construction operations have been substantially completed.
3. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to which existed prior to the start of the Work.

E. Paved surfaces

1. Do not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels shaped as to cut or injure paved surfaces.
2. All surfaces which have been injured by the Contractor's operations shall be restored to a condition at least equal to which existed prior to start of the Work.
3. Suitable materials and methods shall be used for such restoration.

3.03 PREPARATION

A. Pavement Removal

1. Remove only existing pavement as necessary for the prosecution of the work.
2. Program Manager may require that pavement be cut with pneumatic tools or saws without extra compensation to Contractor, where in the opinion of the Program Manager it is necessary to prevent damage to the remaining road surface.
3. Dispose large of pieces of broken pavement before proceeding with excavation.

B. Top Soil Removal

1. From areas which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

C. Subgrade

1. Remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas where embankments will be built or material will be placed for grading.
2. Shape as indicated on the drawings and prepare by forking, furrowing, or plowing to bond first layer of the new material placed.

3.04 RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

- A. The structures to which the provisions of this article apply include pipes, wires, and other structures which meet all of the following:
 - 1. Are not indicated on the drawings or otherwise provided for.
 - 2. Encroach upon or are encountered near and substantially parallel to the edge of the excavation.
 - 3. In the opinion of the Program Manager will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.
- B. In removing existing pipes or other structures, the Contractor should use care to avoid damage to materials, and the Program Manager shall include for payment only those new materials which, in his judgment, are necessary to replace those unavoidably damaged.
- C. Whenever the Contractor encounters certain existing structures as described above and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed to change the location of, remove and later restore, or replace such structures, or to assist the Program Manager thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.
- D. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) later restore them to a condition which existed prior to the start of the Work, all without additional compensation. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

3.05 SUPPORT OF EXCAVATION

- A. Provide in accordance with specification SECTION 02260.

3.06 DEWATERING

- A. Provide in accordance with specification SECTION 02240.

3.07 EXCAVATION

- A. Execute operation of dewatering, support of excavation without undermining or disturbing foundations of existing structures or of work previously completed under this contract.
- B. Excavate to widths that provide suitable room for:
 - 1. Building structures or laying and jointing piping.
 - 2. Placing all support of excavation.
 - 3. Cofferdamming, pumping and draining.
- C. Render bottom of excavations firm, dry and acceptable in all respects.
- D. Do not plow, scrap or dig by machinery, earth at finished subgrade which results in disturbance of material below subgrade, unless indicated or specified, and remove with pick

and shovel, last of material to be excavated, just before placing pipe, masonry or other structure.

- E. Make all excavations in open, except as otherwise specified or permitted.
- F. Excavation Near Existing Facilities
 - 1. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools. Such manual excavation when incidental to normal excavation shall be included in the work to be done under items involving normal excavation.
- G. Unauthorized Excavation
 - 1. If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with thoroughly compacted gravel borrow, if the excavation was for a pipeline, or with Class B concrete, if the excavation was for a masonry structure.
- H. Excavation in Fill
 - 1. Where fills are encountered along the alignments, over-excavate by a minimum of two feet below normal design depth, and backfill with compacted sand and gravel, crushed stone or screened gravel. Place geotextile and encapsulate.
- I. Unsuitable Material
 - 1. If material unsuitable for foundation (in the opinion of the Program Manager) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, crushed stone, gravel borrow, fine aggregate or concrete as directed.

3.08 TRENCHING

- A. Trench Excavation
 - 1. Where pipe is to be laid in specified bedding material or concrete cradle, the trench may be excavated by machinery to, or to just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.
 - 2. Where pipe is to be laid directly on the trench bottom, the lower part of trenches in earth shall not be excavated to subgrade by machinery, but, just before the pipe is to be placed, the last of the material to be excavated shall be removed by means of hand tools to form a flat or shaped bottom, true to grade, so that the pipe will have a uniform and continuous bearing and support on firm and undisturbed material between joints except for limited areas where the use of pipe slings may have disturbed the bottom.
- B. Depth of Trench
 - 1. Excavate trench to depths permitting the pipe to be laid at the elevations, slopes, or depths of cover indicated on the drawings, and at uniform slopes between indicated elevations.
- C. Width of Trench

1. Excavate trench as narrow as practicable and do not widen by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
2. Excavate trenches with approximately vertical sides between the elevation of the center of the pipe and an elevation 1 ft. above the top of the pipe.

D. Trench Excavation in Fill

1. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least 1 ft. above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall then be excavated as though in undisturbed material.
- E. Length of trench open at any one time will be controlled by conditions, subject to any limits that may be prescribed by Program Manager.**

3.09 BACKFILLING

A. General

1. Frozen material shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed or shall be otherwise treated as required, before new backfill is placed.

B. Fill and Backfill Under Structures

1. Place geotextile to provide a separation barrier between bedding materials and subgrade soils. The fill and backfill materials shall be placed in layers not exceeding 6 in. in thickness. Unless otherwise indicated or specified, each layer shall be compacted to 95 percent in accordance with ASTM D1557.

C. Backfilling Around Structures

1. Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been done, special leakage tests, if required, shall be made. Promptly after the completion of such tests, the backfilling shall be started and then shall proceed until its completion. The best of the excavated materials shall be used in backfilling within 2 ft. of the structure. Unequal soil pressures shall be avoided by depositing the material evenly around the structure.
2. The material shall be placed and compacted to 90 percent in accordance with ASTM D1557 unless otherwise indicated or specified.

D. Backfilling Pipe Trenches

1. As soon as practicable after the pipes have been laid and the joints have acquired a suitable degree of hardness, if applicable, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started and thereafter it shall proceed until its completion.
2. With the exception mentioned below in this paragraph, trenches shall not be backfilled at pipe joints until after that section of the pipeline has successfully passed any specified

tests required. Should the Contractor wish to minimize the maintenance of lights and barricades and the obstruction of traffic, he may, at his own risk backfill the entire trench, omitting or including backfill at joints as soon as practicable after the joints have acquired a suitable degree of hardness, if applicable, and the related structures have acquired a suitable degree of strength. He shall, however, be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.

3. No stone or rock fragment larger than 12 in. in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than 5 ft. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.
 4. Zone Around Pipe
 - a. Place geotextile to provide a separation barrier between bedding materials and subgrade soils.
 - b. Backfilled with the materials and to the limits indicated on the drawings.
 - c. Material shall be compacted to 90 percent by tamping.
 5. Remainder of Trench
 - a. Compact by water-jetting, or tamping, in accordance with the nature of the material to 95 percent in accordance with ASTM D1557. Water-jetting may be used wherever the material does not contain so much clay or loam as to delay or prevent satisfactory drainage. However, tamping shall be used if water-jetting does not compact the material to the density required.
 6. Excavated material which is acceptable to the Program Manager for surfacing or pavement subbase shall be placed at the top of the backfill to such depths as may be specified elsewhere or as directed. The surface shall be brought to the required grade and stones raked out and removed.
- E. Placing And Compacting Embankment Material
1. After the subgrade has been prepared as hereinbefore specified, the material shall be placed thereon and built up in successive layers until it has reached the required elevation.
 2. Layers shall not exceed 12 in. in thickness before compaction. In embankments at structures, the layers shall have a slight downward slope away from the structure; in other embankments the layers shall have a slight downward slope away from the center. In general, the finer and less pervious materials shall be placed against the structures or in the center, and the coarser and more pervious materials, upon the outer parts of embankments.
 3. Each layer of material shall be compacted by the use of approved rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.
 4. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.

5. The portion of embankments constructed below proposed structures shall be compacted to 95 percent in accordance with ASTM D1557. The top 2 ft. of an embankment below a pavement base shall be compacted to 95 percent. All other embankments shall be compacted to 90 percent in accordance with ASTM D1557.

3.10 METHODS OF COMPACTION

A. Water-Jetting

1. Saturate backfill material throughout its full depth and at frequent intervals across and along the trench until all slumping ceases.
2. Furnish one or more jet pipes, each of sufficient length to reach the specified depth and of sufficient diameter (not less than 1-1/4 in.) to supply an adequate flow of water to compact the material.
3. Equip jet pipe with a quick-acting valve, supply water through a fire hose from a hydrant or a pump having adequate pressure and capacity to achieve the required results.

B. Tamping and Rolling

1. Deposit backfill material and spread in uniform, parallel layers not exceeding 8 in. thick before compaction. Before the next layer is placed, each layer shall be tamped to obtain a thoroughly compacted mass. Care shall be taken that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar power equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling, and compacting.
2. If necessary to ensure proper compaction by tamping (or rolling), the backfill material shall first be wet by sprinkling. However, no compaction by tamping (or rolling) shall be done when the material is too wet either from rain or too great an application of water to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compaction.

C. Miscellaneous Requirements.

1. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. Only suitable quantities of stones and rock fragments shall be used in the backfill; the Contractor shall, as part of the work done under the items involving earth excavation and rock excavation as appropriate, furnish and place all other necessary backfill material.
2. All voids left by the removal of support of excavation shall be completely backfilled with suitable materials, and thoroughly compacted.

3.11 DISPOSAL OF SURPLUS EXCAVATED MATERIALS

- A. No excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted by the Program Manager.

- B. Surplus excavated materials suitable for backfill shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes within a haul of 1 mile from the point of excavation; all as directed or permitted and without additional compensation.
- C. Surplus excavated materials not needed as specified above shall be hauled away and dumped by the Contractor, at his expense, at appropriate locations, and in accordance with arrangements made by him.

3.12 DISPOSAL OF SPECIAL WASTES (IN RHODE ISLAND)

- A. The Contractor's attention is directed to the requirements set forth by the State of Rhode Island, Department of Environmental Management, (RIDEM) regarding "Special Hazardous Wastes" and the proper disposal thereof. All waste materials and debris, as designated by the Program Manager, including but not limited to any sewers, storm drains, catch basins, and combined system pipelines and associated structures, or any portions thereof, including but not limited to sludge, grit, sediment, dirt, sand, rock, grease, roots and other liquid, solid or semi-solid materials contained therein, shall be considered "Type 5 - Rhode Island Special Hazardous Waste (005)" In addition, any excavated soils contaminated in any manner, as designated by the Program Manager, shall also fall under this category and shall be handled the same. When so encountered, all such materials and debris shall be removed to the extent so ordered by the Program Manager and properly disposed of in strict compliance with the requirements of the RIDEM, Division of Waste Management, Rules and Regulations for Hazardous Waste Management, amended 4/19/92, and other regulating authorities to an approved and certified waste disposal site. It shall remain the sole responsibility of the Contractor to apply for and obtain all required permits, bonds and/or insurance relative to such disposal. The Contractor shall also pay all costs associated with the disposal, required permits, bonds and insurance with no additional expense to the Owner. All handling of such "Special Hazardous Waste" shall be done in strict compliance with the RIDEM requirements and/or any other federal, state or local agency having jurisdiction or authority over the same. Under no circumstances shall sewage, solids or other "Special Hazardous Wastes" removed from the sewer lines be dumped or spilled onto the streets or into ditches, catch basins or storm drains. The Contractor must use watertight and State approved vehicles in transporting any wastes as hereinbefore designated.
- B. The Contractor shall indemnify and save harmless the Owner and Program Manager and all persons acting for or on behalf of the Owner and Program Manager from all claims and liability of any nature or kind, and all damages, costs and expenses, including attorney's fees and penalties, arising from the improper handling, transportation or disposal of "Special Hazardous Wastes" as determined by the RIDEM and/or any other federal, state or local agency having jurisdiction or authority over the same.

3.13 DUST CONTROL

- A. During the progress of the Work, maintain the area of activities, by sweeping and sprinkling of streets to minimize the creation and dispersion of dust. If the Program Manager decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed.

3.14 BRIDGING TRENCHES

- A. Provide suitable and safe bridges and other crossings where required for the accommodation of travel, and to provide access to private property during construction. Remove once bridges and crossings are no longer needed.

3.15 FIELD QUALITY CONTROL

- A. Site Tests
 - 1. In accordance with SECTION 01400

3.16 CARE AND RESTORATION OF PROPERTY

- A. Restoration of existing property or structures done as promptly as practicable and not left until the end of the construction period.

END OF SECTION

SECTION 02210
ROCK EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Requirements for removal and disposal of rock.
- B. Related Sections
 - 1. Section CA – Contract Agreement
 - 2. Section 01000 – General Specifications
 - 3. Section 02200 – Earth Excavation, Backfill, Fill and Grading

1.02 DEFINITIONS

- A. Rock-as defined in SECTION CA.

1.03 REQUIREMENTS

- A. Excavate rock if encountered, to the lines and grades indicated on the drawings or as directed, dispose of the excavated material, and furnish acceptable material for backfill in place of the excavated rock.
- B. Excavate rock in pipe trenches to a limit which provides 6-inches clearance minimum from the pipe after it has been laid. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted, suitable material or, when so specified or indicated on the drawings, with the same material as that required for bedding the pipe, furnished and placed at the expense of the Contractor.
- C. The use of explosives will not be allowed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXCESS ROCK EXCAVATION

- A. If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Program Manager, the excess excavation, whether resulting from overbreakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below in this section.

- B. In pipe trenches, excess excavation below the elevation of the top of the bedding, cradle, or envelope shall be filled with material of the same type, placed and compacted in the same manner, as specified for the bedding, cradle, or envelope. Excess excavation above said elevation shall be filled with earth as specified in the article titled "Backfilling Pipe Trenches" in SECTION 02200.
- C. In excavations for structures, excess excavation in the rock beneath foundations shall be filled with 3000 psi concrete. Other excess excavation shall be filled with earth as specified in the article titled "Backfilling Around Structures" in SECTION 02200.

3.02 SHATTERING ROCK

- A. In the event use of explosives are not allowed, shattering rock at ends of pipe and elsewhere as indicated on the drawings, shall be done by mechanical methods. Shattering shall be completed before any pipe or fitting is placed within 50 ft. of rock to be shattered.

3.03 SHATTERED ROCK

- A. If the rock below normal depth is shattered due to rock removal operations of the Contractor, and the Program Manager considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches screened gravel shall be used for backfill. All such removal and backfilling shall be done by and at the expense of the Contractor.

3.04 PREPARATION OF ROCK SURFACES

- A. Whenever so directed during the progress of the work, remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly, using steam to melt snow and ice, if necessary. Water in depressions shall then be removed as required so that the whole surface of the designated area can be inspected to determine whether seams or other defects exist.
- B. The surfaces of rock foundations shall be left sufficiently rough to bond well with the masonry and embankments to be built thereon, and if required, shall be cut to rough benches or steps.
- C. Before any masonry or embankment is built on or against the rock, the rock shall be scrupulously freed from all vegetation, dirt, sand, clay, boulders, scale, excessively cracked rock, loose fragments, ice, snow, and other objectionable substances. Picking, barring, wedging, streams of water under sufficient pressure, stiff brushes, hammers, steam jets, and other effective means shall be used to accomplish this cleaning. Remove free water left on the surface of the rock.

3.05 REMOVAL OF BOULDERS

- A. Remove piles of boulders and loose rock encountered within the limits of excavations and earth embankments and dispose in a suitable place.

3.06 DISPOSAL OF EXCAVATED ROCK

- A. Excavated rock may be used in backfilling trenches subject to the following limitations:
 - 1. Pieces of rock larger than permitted under the article titled "Backfilling Pipe Trenches" in SECTION 02200 shall not be used for this purpose.
 - 2. The quantity of rock used as backfill in any location shall not be so great as to result in the formation of voids.
 - 3. Rock backfill shall not be placed within 36 in. of the surface of the finish grade.
- B. Surplus excavated rock shall be disposed of as specified for surplus excavated material as specified in SECTION 02200.

3.07 BACKFILLING ROCK EXCAVATIONS

- A. Where rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified in SECTION 02200. If material suitable for backfilling is not available in sufficient quantity from other excavations, the Contractor shall, at his own expense, furnish suitable material from outside sources.

END OF SECTION

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SECTION 02215

AGGREGATE MATERIALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and placing materials, which include Crushed Stone, Gravel Borrow and Select Borrow.
2. Location of specified materials as detailed on the Drawings or as directed by the Program Manager for excavation below normal depth, utility support, replacement of unsuitable material or elsewhere, as ordered.

B. Related Sections

1. Section 01400 – Quality Control
2. Section 02200 - Earth Excavation, Backfill, Fill and Grading.
3. Section 02500 - Paving

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO).

1. T11, Amount of Material Finer than 0.075 mm Sieve in Aggregate
2. T27, Sieve Analysis of Fine and Coarse Aggregates.

B. American Society for Testing and Materials (ASTM).

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).

1.03 DEFINITIONS

- A. The term Screened Gravel as used in the Contract Documents shall mean Crushed Stone.

1.04 SUBMITTALS

A. Shop Drawings

1. Provide Shop Drawings in accordance with Specification Section 02200.

B. Samples

1. Furnish representative sample including location of source with Shop Drawing transmittal sheet.

1.05 QUALITY ASSURANCE

A. Field Samples

1. The attention of the Contractor is directed to the fact that under Specification SECTION 01000 1.03 Materials – Samples - Inspection, all materials furnished by the Contractor to be incorporated into the Work shall be subject to the inspection of the Program Manager. The Program Manager shall be the sole judge as to the acceptability of proposed materials and said judgement shall be final, conclusive, and binding.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. In accordance with Specification SECTION 01000, 1.05 Storage of Materials and Equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone

1. For bedding and pipe zone material for pipe larger than 3 inches diameter. Well graded in size from 3/8 inches to 3/4 inches or such other sizes as may be approved.
2. For bedding and pipe zone material for plastic pipe 3 inches diameter and less, maximum particle size shall be 3/8 inches.
3. Clean, hard, and durable particles or fragments, free from dirt, vegetation, or other objectionable matter, and free from an excess of soft, thin elongated, laminated or disintegrated pieces.
4. Screened Stone of similar size and grading to this specification may be used instead of Crushed Stone.

B. Gravel Borrow

1. Granular material well graded from fine to coarse with a maximum size of 3 inches, obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted.
2. Gravel shall not contain vegetation, masses of roots, or individual roots more than 18 inches long or more than 1/2 inches in diameter.
3. Gravel shall be substantially free from loam and other organic matter, clay and other fine or harmful substances.
4. Gradation requirements for gravel shall be determined by AASHTO-T11 and T27 and conform to the following:

<u>Sieve</u>	<u>Percent Passing</u>
1/2 inch	60-95
No. 4	50-85
No. 50	8-28
No. 200	0-8

C. Select Borrow

1. Use inorganic natural soils and/or rock, having not more than 8 percent by weight passing the No. 200 sieve and having a maximum stone size no greater than 6-inches.

2. Use only material well-graded throughout entire size range, free of roots, leaves and other organic material, ice or frost and aggregations of frozen soil particles.
3. Moisture content to be within plus minus 3 percent optimum at the borrow source.
4. Material must meet compaction requirements indicated or as specified.

D. Gravel Base Course

1. In accordance with SECTION 02500.

2.02 SOURCE QUALITY CONTROL

A. Test, Inspection

1. Engineer may elect to sample material supplied at the source.
2. Assist the Engineer and/or personnel from the designated testing laboratory in obtaining samples.

PART 3 EXECUTION

3.01 INSTALLATION

A. Crushed Stone

1. Spread in layers of uniform thickness not greater than 6 inches.
2. Compact thoroughly by means of a suitable vibrator or mechanical tamper.

B. Gravel Borrow

1. Spread in layers of uniform thickness not exceeding 12 inches before compaction and moistened or allowed to dry as directed.
2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment.
3. Compaction shall conform to 95% of minimum dry density per ASTM D1557.

C. Select Borrow

1. Spread in layers of uniform thickness not exceeding 12 in. (loose lift) before compaction and moistened or allowed to dry.
2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment unless otherwise directed by the Engineer.
3. Compaction shall conform to 95% of minimum dry density per ASTM D1557.

3.02 FIELD QUALITY CONTROL

A. Material and compaction testing

1. In accordance with SECTION 01410.

END OF SECTION

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SECTION 02218

IMPERMEABLE EARTH FILL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for impervious material to be used for earth water stops and check dams.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
2. D2487, Test Method for Classification of Soils for Engineering Purposes.

1.03 SUBMITTALS

A. Samples

1. Submit twenty (20) pounds of representative sample.
2. Submit three (3) weeks prior to scheduled use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source of Supply

1. The material source shall be at the option of the Contractor, with the acceptance of the Engineer.

2.02 MATERIALS

A. Impermeable Earth Fill

1. The material shall be an impervious material principally of clay.
2. Containing select, natural, inorganic fine material.
3. Soil classification in accordance with ASTM D2487, designation CL.
 - a. 100 percent finer than a No. 4 sieve.
 - b. 50 percent finer than a No. 200 sieve.

PART 3 EXECUTION

3.01 PREPARATION

A. Protection

1. No frozen material to be used in the construction of the impermeable fill.
2. Cover and maintain in a granular and loose condition at all times.
3. No material to be placed on portions of the Work which are frozen.
4. Protect trenches and excavations from freezing which will receive impermeable earth fill.

B. Surface Preparation

1. Prior to placing a new layer of impermeable material, the surface of the preceding layer is to be scarified to a depth of 2 inches to enable a bond between layers.

3.02 INSTALLATION

A. Placing and Spreading

1. Spread material evenly and in uniform layers not to exceed eight (8) inches in uncompacted depth.
2. Joints and laps in or between layers shall be carefully made to insure the continuity of each layer in all directions.
3. Compact each layer prior to placement of the next layer.

B. Compaction

1. Compact all layers to at least 90 percent in accordance with ASTM D1557.
2. Moisture content to be plus or minus 2 percent of optimum.
3. Compact in according to Tamping as specified in SECTION 02200.
4. Contractor may propose an alternate method of compaction, which proves adequate and is acceptable to the Engineer.
5. Compaction by use of a hand operated power driven tamper weighting not less than 100 pounds will be required where compaction by other means is impracticable.
6. Materials shall be compacted having the best practicable moisture content required for the desired results.

END OF SECTION

SECTION 02220

RIPRAP

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for the installation of riprap, including: loading, hauling, placing, spreading, grading and other related and incidental work.

B. Related Sections

1. Section 02215 - Aggregate Materials
2. Section 02200 - Earth Excavation, Backfill and Grading
3. Section 02272 - Geotextile Materials

PART 2 PRODUCTS

2.01 MATERIAL

- A. All riprap used shall be sound, tough and durable stone, not lumpy or frozen, and free from slag, cinders, ashes, rubbish or other deleterious materials. All riprap will be of the size required for each specific application, as shown on the Drawings.
- B. The material for riprap shall consist of broken stone produced from sound ledge or large boulders with at least three fractured faces on each particle and shall be free from overburden, spoil, shale or organic material. The stone shall have a minimum density of 160 pounds per cubic foot. It shall be angular in shape with its minimum dimension not less than one third of the maximum dimension.
- C. Stone for placed riprap shall have one flat face and shall be roughly square or rectangular to facilitate laying up.
- D. Riprap shall conform to the following gradation and shall be well graded within the size required:

National Stone Association Modified NSA No.	Size Inches (square opening)		
	Maximum	Average	Minimum
R-1	2	1	No. 4
R-2	4	2	1
R-3	8	4	2
R-4	14	7	4
R-5	20	10	6
R-6	26	13	8
R-7	34	18	14
R-8	50	24	18

- E. "Average size" is that size exceeded by at least 50 percent of the total weight of the tonnage shipped; i.e., 50 percent of the tonnage shall consist of pieces larger than the "average" size (normally half the specified nominal top size).
- F. Pieces smaller than the minimum size shown shall not exceed 15 percent of the tonnage shipped.
- G. Geotextile material in accordance with SECTION 02272.

PART 3 EXECUTION

3.01 INSTALLATION

A. Preparation

1. Areas to receive riprap shall be free of brush, trees, stumps, and other objectionable material and be dressed to a smooth surface. All soft or spongy material shall be removed to the depth shown on the plans or as authorized and replaced with gravel borrow conforming to SECTION 02215. Filled areas will be compacted as specified in SECTION 02200.
2. Install Geotextile material at locations indicated on the Contract Drawings in accordance with SECTION 02272.

B. Dumped Riprap

1. Stone for riprap shall be paced on the prepared area in a manner, which will produce, and evenly graded mass of stone with the minimum practical percentage of voids. The entire mass of stone shall be placed so as to conform with the lines, grades, and thicknesses shown on the plans. Riprap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of riprap in layers, or by dumping into chutes, or by similar methods likely to cause degradation will not be permitted.
2. All riprap shall be placed and distributed with no large accumulations of either the larger or smaller size of stone.
3. It is the intent of these specifications to produce a compact riprap installation in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to secure the results specified.
4. When riprap and bedding material are dumped under water, thickness of the layers shall be increased as shown on the Drawings.

C. Placed Riprap

1. Stone for placed riprap shall be placed on a prepared surface in a pattern that contains minimum voids. Top surface of riprap shall conform to a true and even plane with a tolerance of plus or minus 4-inches.
2. Joints shall be broken as much as practicable, chocking openings with smaller stones.
3. Larger stones placed near base of slopes, stones laid to rest on the prepared surface and not on other stones, Stones placed on slopes shall be done from the top down.

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- D. Riprap placed outside the specified limits will not be measured or paid for, and the Contractor may be required to remove and dispose of the excess riprap without cost to the Owner.

END OF SECTION

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SECTION 02224

CONTROLLED DENSITY FILL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for controlled low strength material (CLSM) to be used in place of compacted soil for general backfill of trenches.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading
2. Section 03300 - Cast-In-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. C33, Standard Specification for Concrete Aggregates.
2. C150, Standard Specification for Portland Cement.
3. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
4. C494, Standard Specification for Chemical Admixtures for Concrete
5. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
6. C989, Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

B. American Concrete Institute (ACI)

1. ACI Committee 229, Standard Specification for Controlled Low Strength Materials (CLSM).

C. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification prior to preparation and installation of any materials.

1. Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, 2004 Edition, including all addenda, issued by the State of Rhode Island Department of Public Works, (referred to as the Standard Specification).

1.03 DEFINITIONS

- A. Controlled Low Strength Material, also known as “Flowable Fill”, “Controlled Density Fill” and “Ready-mix Fill.” Self-compacting, self-leveling, cementitious material used for backfills, fills and structural fills.

- B. Very Flowable, Exhibits characteristics needed for small or confined areas and required to flow over long distances.
- C. Flowable, Where the above flowability characteristics are not required.
- D. Excavatable, may be removed in the future if required.
- E. Non excavatable, not expected to be removed in the future.

1.04 DESIGN REQUIREMENTS

- A. Provide a mixture of Portland cement, aggregates, water and mineral admixtures with a low cement content and high slump to reduce strength development for possible removal and minimize settlement after placement.
- B. The proposed mix should maximize the flow characteristics of the material while producing the necessary strength.
- C. The design mixes shall have the following strengths at 28 days:
 - 1. Excavatable fill,
 - a. Class I (flowable) and II (very flowable), Range: 30 to 100 psi.
 - b. Maximum: 100 psi maximum at 28 days, 200 psi at 6 months.
 - 2. Non excavatable fill,
 - a. Class III (flowable) and IV (very flowable), Range: 100 to 1200* psi.
 - b. Maximum: 1200 at 28 days

* Specific compressive strength(s) for structural applications are noted on the Contract Drawings
- D. Air Content to be minimum 15 %
- E. Slump, using the modified method consisting of a six inch long by three inch inside diameter straight tube of non porous material.
 - 1. Class I and III: 6" to 8" diameter
 - 2. Class II and IV: 9" to 14" diameter

1.05 PERFORMANCE REQUIREMENTS

- A. Provide fill of homogeneous structure which when cured, will have the required strength, water tightness, and durability. To this end, it is essential that careful attention be given to the selection of materials, mixtures, placing and curing of the fill.

1.06 SUBMITTALS

- A. In accordance with Section 01300, submit the following,
 - 1. Mix design data not limited to, but including maximum and minimum strengths, air content, setting times, flowability and yield.
 - 2. Certification by the supplier stating compatibility with the project requirements and the Contractor's installation methods.

1.07 QUALITY ASSURANCE

- A. Furnish the supplier with information as to the intended use of the CLSM.

PART 2 PRODUCTS

2.01 MATERIALS

- A. In general conformance with the Standard Specification and the following:
1. Portland Cement: ASTM C150, Type II American-made. (AASHTO M85)
 2. Water: Clean, potable and complying with ASTM C94. (AASHTO M157)
 3. Aggregates: ASTM C33 or a non-reactive aggregate source free of contaminants which exhibits high flow properties for controlled density fill. (AASHTO M6, M80)
 4. Air entraining admixture conforming to ASTM C260, (AASHTO M154)
 5. Chemical Admixtures: In accordance with ASTM C494. (AASHTO M194)
 6. Fly Ash: Meet requirements of ASTM C618 Class C or Class F. (AASHTO M295)
 7. Granulated Blast Furnace Slag: In accordance with ASTM C989.

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall follow the guideline set forth in ACI 229, except non standard materials shall not be used.

3.02 PREPARATION

- A. Pipes and all other members to be encased in CLSM shall be temporarily secured in place to prevent displacement during fill placement.
- B. To reduce hydrostatic pressure and limit displacement potential, Contractor may use a high air generator in the fill mixture to lower unit weights.
- C. Pre-job test all pump applications prior to day of placement with actual equipment.
- D. Secure site during the placement for the CLSM. Cautions include but are not limited to barricades, fences, lights and steel plates.
- E. Work shall be sequenced so as to keep traffic flowing within the project area.

3.03 INSTALLATION

- A. CLSM shall be batched at concrete plants and hauled to job sites in ready-mix trucks with continuous agitating drums.
- B. During waiting period prior to discharge, truck drums shall agitate mixture.

C. CLSM shall be installed in accordance with suppliers recommendations.

3.04 FIELD QUALITY CONTROL

A. All CLSM to be used in the work shall be subject to testing to determine whether it conforms to the requirements of the specifications. The methods of testing shall be in accordance with the Standard Specification.

B. The place, time, frequency, and method of sampling will be determined by the Engineer in accordance with the particular conditions of this project.

3.05 PROTECTION

A. Open trenches shall not be left uncovered overnight.

END OF SECTION

SECTION 02240

CONSTRUCTION WATER HANDLING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, power, and equipment for designing, furnishing, installing, operating, monitoring, maintaining, and removing temporary dewatering systems and water handling systems necessary to collect, treat, and dispose of all Construction Water.
- B. Construction Water refers to all water, whatever the source, including, but not limited to, the following:
 - 1. Groundwater and storm water inflows into any excavation.
 - 2. Groundwater from any dewatering wells or other dewatering or depressurization activity.
 - 3. Water collected from material stockpiles.
 - 4. Wet weather surface flows entering the construction site.
 - 5. Water utilized by the Contractor during the course of construction, including water from microtunneling, grouting, and other activities.
 - 6. Water from concrete washout and waste concrete containment structures.
 - 7. Water collected from sumps or other areas in excavations.
- C. The Contractor shall obtain and comply with all required permits, discharge authorizations, and regulatory approvals to discharge, treat and discharge, or collect, transport, and dispose of any Construction Water in accordance with the Rhode Island Department of Environmental Management (RIDEM) Rhode Island Pollutant Discharge Elimination System (RIPDES) Permit. Refer to Section 01060 for additional requirements.
- D. The Contractor shall design and operate the dewatering systems and water handling systems to allow for release to an NBC discharge point. Discharge of Construction Water is anticipated to be into the NBC Sewer System in accordance with the Rules and Regulations for the Use of Wastewater Facilities within the Narragansett Bay Water Quality Management District Commission. Refer to Section 01060 for additional requirements.
- E. The Contractor shall coordinate the design of the groundwater control systems with the design of temporary excavation support systems specified in Section 02260 and Section 02465.
- F. Special Considerations
 - 1. The Contractor shall be prepared to handle contaminated. Refer to the Environmental Data Report prepared for the Project and included as part of the Contract Documents.

2. The Contractor shall collect samples of the dewatering effluent as required by the permits and provide the services of a laboratory certified for the analyses of the samples collected to determine the quality of dewatering effluent prior to disposal.
3. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.
4. The Contractor shall install groundwater monitoring wells and -piezometers and measure, record, and report the groundwater levels during the project.
5. The Contractor shall coordinate the design and submittals of the water handling systems specified with excavation support systems in Section 02260.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
1. Section 01060 – Permits and Regulatory Requirements
 2. Section 01300 – Submittals
 3. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
 4. Section 02260 – Support of Excavation
 5. Section 02295 – Geotechnical Instrumentation and Monitoring
 6. Section 02315 – Pipe Jacking
 7. Section 02316 – Shield Driven Tunnel Excavation
 8. Section 02465 – Secant Pile Wall

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
1. American Water Works Association (AWWA)
 - a. A100 Standard for Water Wells
 2. Narragansett Bay Commission (NBC)
 - a. Rules and Regulations for the Use of Wastewater Facilities within the Narragansett Bay Water Quality Management District Commission.
<https://www.narrabay.com/programs-and-initiatives/pretreatment/discharge-limitations/>
 3. State of Rhode Island, Department of Environmental Management (RIDEM)
 - a. Rules and Regulations for Hazardous Waste Management, as amended.
 - b. RI Pollutant Discharge Elimination System (RIPDES) Permit

4. U. S. Environmental Protection Agency (EPA).
 - a. The Federal Clean Water Act (33 U.S.C. 1251 et seq., as amended),

1.04 DEFINITIONS (NOT USED)

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. The quality of water discharged under this Contract to the NBC treatment facilities shall, at a minimum, meet the NBC pre-treatment requirements noted in the referenced NBC Rules and Regulations.
- C. Qualifications
 1. Dewatering design shall be performed by a Professional Engineer licensed in the State of Rhode Island having designed not less than five (5) successful projects of similar type, size, and complexity.
 2. Dewatering wells shall be installed by a Specialty Subcontractor licensed in the State of Rhode Island with a minimum of five (5) completed dewatering projects including at least two (2) successful projects using pumped dewatering wells.
 3. The dewatering work shall be under the supervision of a Superintendent(s) having not less than three (3) years of recent experience and have successful projects of similar type, size, and complexity.
- D. The Contractor shall employ a Testing Agency using trained and experienced personnel to perform the required water quality testing to verify that the biological, chemical, and physical condition of the water to be discharged from the site complies with the permit conditions.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submittals for design, shop drawings, and work plans required herein shall be submitted at the same time and in full coordination with the required submittals of Section 02260 and Section 02465.
- C. Submit shop drawings and engineering calculations signed and sealed by a Licensed Professional Engineer registered in the State of Rhode Island at least thirty (30) days prior to the start of the work. Include, at a minimum, the following:
 1. Plans, sections, and details that clearly describe the system to be installed. Include location, layout, and depth of system components as well as monitoring and discharge locations.
 2. Details of construction and installation of fabricated items including materials, sizes, dimensions, and connections.
 3. Anticipated flows and volume at each location of discharge.
 4. Design computations including a dewatering drawdown analysis demonstrating that the required design criteria have been met.

5. Calculations demonstrating that the system designer has evaluated the potential impacts of the dewatering and incorporated adequate precautions in the design to protect existing structures and avoid damage.
 6. A schedule that includes the time required for installation and development of dewatering wells in order to meet the design criteria specified herein and any discharge criteria required in accordance with the regulations.
 7. A narrative comparing the site groundwater quality data with the water quality standards to be followed per the required permits for the project.
- D. Submit a Construction Water Handling and Treatment Work Plan at least thirty (30) days prior to the start of construction. Include, at a minimum, the following:
1. Construction schedule, methods and procedures of installation, proposed construction sequence, and maintenance schedule.
 2. Provisions and protocols for measuring pumped water, monitoring water, and testing water.
 3. Interface details and protection measures for existing structures and utilities, as necessary.
 4. A Construction Water Handling and Treatment Plan that identifies treatment process, materials, and equipment to be employed to treat contaminated and non-contaminated construction water prior to discharge.
 - a. The Construction Water Handling and Treatment Plan must use sediment removal measures and activated carbon treatment systems at a minimum.
 5. Contingency plans complete to address potential emergencies including, but not limited to, power failures, overflows and effluent parameters exceeding the discharge limits specified in the required permits.
 6. List of equipment including standby equipment and power supply.
 7. A list of proposed hazardous waste transporters and hazardous waste disposal facilities acceptance to transporting any hazardous waste for off-site disposal. The submittal shall include a copy of the proposed hazardous waste transporter's permit and the proposed hazardous waste disposal facility's license and operating permit.
 8. A well decommissioning plan to include, at a minimum, the following for each dewatering system:
 - a. A schedule of activities.
 - b. The method and procedures of decommissioning in accordance with the regulations.
 - c. A list of materials and equipment to be used.
 - d. Waste management procedures.
- E. Quality Control Submittals
1. Submit qualifications and experience records for personnel as specified herein.

2. Submit manufacturers' product data, calibration records, certificates, and manufacturers' test data for any manufactured materials incorporated.
3. Submit copies of all permits applications and permits obtained.
4. Submit installation documentation within seven (7) days of completion of well development to include the following:
 - a. Drillers logs including drilling method, surveyed location, subsurface ground and groundwater conditions, and depth.
 - b. Drillers notices and dewatering well tag identification numbers.
 - c. For each dewatering well, casing material and diameter; total depth; well screen material, slot size, length, and interval depth; filter material, sealing material, and interval depths.
 - d. Well development record including date, method, rate and length of development, drawdown, discharge and solids concentrations at the beginning and end.
5. Submit a Weekly Construction Water Handling Report to include rate of flow measured daily, total flow indicated on flowmeter, sand content measured weekly in accordance with AWWA A100, groundwater level, results of any laboratory testing, and manifest or bills of lading for any offsite disposal.
6. Submit Verification Form (s) for dewatering system operations and performance inspection completed by the Contractor's Engineer following each site visit.
7. Submit copies of all disposal documents for treatment system components that require disposal as hazardous or special wastes.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. The Contractor shall select the method of dewatering and control of water inside and outside the excavations and shall be solely responsible for the location, arrangement, and depth of any system(s) selected to accomplish the work.
- B. The Contractor shall maintain groundwater levels to a point no higher than 2 feet below the prevailing excavation level so as to preserve the undisturbed characteristics of the subgrade soils and to preserve the bearing capacity. Groundwater levels shall be lowered for a time period as deemed necessary by the Contractor to ensure adequate factor of safety to construct the permanent structures.
- C. The Contractor shall design and implement the dewatering system so as to maintain a minimum factor of safety against the uplift groundwater pressures in any soil strata. The factor of safety shall be calculated by considering the stabilizing pressure consisting of overburden soil weight alone. The dewatering system shall be maintained operational until the dead weight of the overburden soil plus any completed portion of the structure is able to provide the required factor of safety at static (normal) groundwater level/pressure.
- D. The Contractor shall coordinate with all utility companies to verify all utility locations prior to commencing work.

- E. The Contractor shall install a sufficient number of groundwater monitoring wells and piezometers and shall monitor the water levels weekly, at a minimum, to demonstrate that the performance criteria is being met.
- F. If the Contractor is excavating and encounters large amounts of water draining into the excavation, the Contractor shall take immediate steps to control the water source. Large amounts of water requiring control shall be defined as those that adversely affect the performance of work under the Contract and/or amounts that have the potential of resulting in improper operation of sedimentation basins or other treatment components, or cause a loss or damage to adjacent properties. The Contractor shall have equipment, materials, manpower and all accessories necessary to deal with such an occurrence.
- G. The Contractor shall design containment and treatment systems capable of handling 125 percent of anticipated flows and treating discharged water to the levels specified herein. The water treatment system shall include provisions for a minimum of 100 percent stand-by equipment for essential components and systems to include mobile electric generating equipment and spare pumps.
- H. The water treatment system shall include the consideration of the following deleterious effects on Construction Water:
 - 1. Constituents derived from cementitious products.
 - 2. Constituents generated by the excavation process, microtunneling and muck handling.
 - 3. Constituents derived from dewatering, groundwater depressurization, and groundwater inflows to excavations.
 - 4. Oil and grease derived from the proper use and maintenance of equipment in accordance with legal requirements.
 - 5. Existing groundwater.
- I. Acceptance of the Construction Water Handling Work Plan shall not in any way relieve the Contractor from full responsibility for the complete and adequate design and performance for the dewatering system and water handling system.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule and anticipated performance for dewatering systems installation, operation, monitoring, and removal.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufactures recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide materials that are either new or in serviceable condition and free from defects that impair their strength or performance.
- B. Materials and equipment used shall adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of the dewatering work.

2.02 MATERIALS

- A. Filter material shall consist of clean, rounded, washed select silica gravel and sand, free from silt, clay, and other deleterious material. Use filters and filter packs such that soils are not subject to removal of fines upon pumping.
- B. Well screens shall consist of factory-slotted pipe and sized appropriately for the filter pack and formation to prevent the removal of fines from the filter pack or formation. Groundwater entrance velocities through the well screen shall equal 0.01 feet per second or less.

2.03 EQUIPMENT

- A. Provide all necessary tanks, sumps, pumps, motors, electrical and mechanical equipment, power lines, poles, piping discharge lines, valves, controls, oil skimmers, bag filtration, activated carbon system, water meters, and other appurtenances required for functional dewatering systems and water handling systems.
- B. Sumps shall include a slotted or perforated casing surrounded by filter pack to prevent movement of fines.
- C. Flow Meters
 - 1. Shall be capable of measuring the flow from the well within ten percent of the actual flow.
 - 2. Shall be capable of reporting current flow in gallons per minute and total flow volumes in gallons per cubic feet.
 - 3. Shall be factory calibrated within one year of data acquisition.
- D. Provide stand-by equipment and replacement components to ensure the dewatering systems and water handling systems function at all times.

2.04 SOURCE QUALITY CONTROL

- A. Only materials meeting the requirements of these specifications shall be used.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence installation of systems only after design calculations, shop drawings, and the work plan has been reviewed and accepted by the PM/CM and applicable permits have been obtained.
- B. Conduct all work within the construction limits established for the project.
- C. At a minimum, place fencing, gates, lights, and signs as necessary around the work areas to provide for public safety.
- D. Operate all systems in accordance with permits, design requirements, and manufacturer's instructions.
- E. Provide all necessary settling tanks, bag filtration, carbon treatment at a minimum and other acceptable means, as necessary, to prevent undesirable constituents from being discharged in accordance with the Bucklin Point Wastewater Treatment Facility (BPWWTF) local limits.
- F. Collected water shall be pumped to the discharge location or to the water treatment system as required before discharge.
- G. Water from system operations shall not enter flowing or dry watercourses without compliance with the required permit. The Contractor shall provide and construct all necessary intercepting ditches, barriers, sedimentation basins, holding ponds, or other accepted means to eliminate the undesirable constituents.
- H. Monitor system operation and performance and conduct sampling and laboratory testing as required by the RIPDES permit. Refer to Section 01060 for additional requirements.
- I. During construction, the Contractor's Engineer shall make regular site visits and complete a Verification Form to verify that installation of dewatering systems are installed and operating in accordance with their design and the performance criteria included herein.
- J. Maintain adequate supplies of spare parts and treatment supplies to keep treatment system in continuous operation.
- K. The dewatering systems and water handling systems shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground below the bearing level and shall not influence the stability of surrounding areas. Wells or well points shall be properly sanded in and sumps shall be sheeted and provided with proper filter material.
- L. Open pumping with sumps and ditches resulting in boils, loss of fines, softening of the ground or instability of slopes will not be permitted.
- M. Dewatering effluent may be affected by rainfall. The Contractor shall provide adequate equalization and holding tanks to allow work to proceed in the case of restricted discharge capability during rain events.
- N. The Contractor shall provide sufficient clean water to flush all sewers and drains when necessary. If any sewer, drain, catch basin, or inlet becomes filled or partially

filled with sediment or debris, the Contractor shall promptly and satisfactorily remove such deposits.

- O. The Contractor shall be responsible for periodically monitoring groundwater inflows into excavations, and water accumulating in excavations for visual and olfactory indications of contamination.
- P. The dewatering system and water handling system shall keep the water in the excavation sufficiently controlled to develop a workable subgrade and maintain the groundwater levels as specified.

3.02 DEWATERING WELLS

- A. Prepare a Well Construction Record after installation is completed, including appropriate items from the following list:
 - 1. Project name, contract name, and number.
 - 2. Drillers logs including drilling method, location, subsurface ground and groundwater conditions, and depth. Strata soil nomenclature shall be based on boring logs contained in the Geotechnical Data Report.
 - 3. Drillers notices and dewatering well tag identification numbers.
 - 4. For each dewatering well, casing material and diameter; total depth; well screen material, slot size, length, and interval depth; filter material, sealing material, and interval depths.
 - 5. Well development record including date, method, rate and length of development, drawdown, discharge and solids concentrations at the beginning and end.
 - 6. Notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on well behavior.
- B. Develop each well after installation is complete to remove fines from drilling and installation.
 - 1. Develop wells until fines content of the discharge water during surging is less than 20 parts per million (ppm) as determined by a centrifugal, separating meter such as Rossum Sand Tester or acceptable equivalent in accordance with AWWA A100.
 - 2. Monitoring System and Reporting
 - 3. Install flow meters in accordance with the manufactures recommendations.
 - 4. Maintain accurate and continuous records of water level, quality, sand content, and flow information in accordance with the project permits and regulations.
- C. Decommission wells and dewatering system and instrumentation used to monitor the system in accordance with the submitted well decommissioning plan.

3.03 CONCRETE WASHOUT

- A. All concrete, grout, and any other cementitious product washout shall be directed to a leakproof container or containment pit in accordance with the applicable permits, codes, and standards.

- B. Washout discharge onto pavement or the ground is prohibited.
- C. Decant water must be checked for TSS concentration and pH prior to discharge. Only decant water meeting design criteria for TSS and pH is allowed to be discharged through any onsite treatment and discharge system.
- D. Water and liquids from grouting operations is prohibited from discharge through the construction water handling system and must be removed and disposed offsite.
- E. Waste, excess, or spilled concrete, grout, and grout (and any other cementitious material) on the ground or pavement must be promptly cleaned-up and placed in an appropriate waste container.

3.04 RESPONSIBILITY FOR DAMAGE

- A. Structures including, but not limited to, footings, foundations, above and below grade walls, driveways, utilities, streets, curbs, and sidewalks that become unstable and vulnerable to collapse, or settlement due to removal or disturbance of groundwater shall be corrected immediately by the Contractor. Provide all means necessary to rectify the particular problem identified.
- B. The Contractor shall be responsible for any and all loss or damage arising from removal or disturbances of groundwater, including, but not limited to, any such claims for subsidence of soil, utilities, cracked slabs or walls, foundations, concrete driveways and any such claims for slumping and the loss of lateral support rendering walls unstable and vulnerable to collapse, that may occur in the prosecution of the work shall be sustained and borne by the Contractor at his expense.
- C. If the Contractor fails to correct the damage or destruction resulting from his operations, the PM/CM may proceed to repair, rebuild, or otherwise restore such damaged property as may be deemed necessary. The cost of this work shall be deducted from any compensation that may be (or become) due the Contractor under this Contract.
- D. In any event, the Contractor shall indemnify and save the NBC and the PM/CM harmless from claims by property owners for damages to their property as a result of his dewatering operations regardless of whether or not such claims for damages are covered by his insurance and regardless of whether or not such dewatering operations were reviewed or accepted by the PM/CM.

3.05 HAZARDOUS WASTE DISPOSAL

- A. Contaminated construction water treatment system components that require disposal as a hazardous waste shall be disposed in accordance with applicable federal, state, and local rules and regulations.
- B. The Contractor shall use a licensed hazardous waste transporter to transport all hazardous waste to an off-site hazardous waste disposal facility.
- C. The Contractor shall only dispose of hazardous waste at a hazardous waste disposal facility accepted by the PM/CM.

3.06 SITE CLEAN UP AND RESTORATION

- A. After construction has been completed, the Contractor shall dismantle and remove all temporary facilities associated with the collection, handling, and treatment of

construction water. Areas impacted by construction water handling systems shall be returned to original condition unless otherwise specified on the Contract Drawings.

3.07 FIELD QUALITY CONTROL

A. Notifications

1. Notify the PM/CM immediately of any permit compliance limit or standard exceedance.
2. Notify the PM/CM and the permitting agencies immediately of any improper or unanticipated discharge.
3. Notify the PM/CM immediately of any sign of subgrade disturbance due to seepage or unaccountable reduction in effluent flow rate and take immediate steps immediately to correct the condition at no additional cost to the NBC.
4. Notify the PM/CM of any indication that suspected contaminated groundwater has been encountered.

END OF SECTION 02240

SECTION 02240

CONSTRUCTION WATER HANDLING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, power, and equipment for designing, furnishing, installing, operating, monitoring, maintaining, and removing temporary dewatering systems and water handling systems necessary to collect, treat, and dispose of all Construction Water.
- B. Construction Water refers to all water, whatever the source, including, but not limited to, the following:
 - 1. Groundwater and storm water inflows into any excavation.
 - 2. Groundwater from any dewatering wells or other dewatering or depressurization activity.
 - 3. Water collected from material stockpiles.
 - 4. Wet weather surface flows entering the construction site.
 - 5. Water utilized by the Contractor during the course of construction, including water from microtunneling, grouting, and other activities.
 - 6. Water from concrete washout and waste concrete containment structures.
 - 7. Water collected from sumps or other areas in excavations.
- C. The Contractor shall design and operate the dewatering systems and water handling systems to allow for release to an NBC discharge point. Discharge of Construction Water is anticipated to be into the NBC Sewer System in accordance with the Rules and Regulations for the Use of Wastewater Facilities within the Narragansett Bay Water Quality Management District Commission. Refer to Section 01060 for additional requirements.
- D. The Contractor shall coordinate the design of the groundwater control systems with the design of temporary excavation support systems specified in Section 02260 and Section 02465.
- E. Special Considerations
 - 1. The Contractor shall be prepared to handle contaminated. Refer to the Environmental Data Report prepared for the Project and included as part of the Contract Documents.
 - 2. The Contractor shall collect samples of the dewatering effluent as required by the permits and provide the services of a laboratory certified for the analyses of the samples collected to determine the quality of dewatering effluent prior to disposal.
 - 3. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.

4. The Contractor shall install groundwater monitoring wells and -piezometers and measure, record, and report the groundwater levels during the project.
5. The Contractor shall coordinate the design and submittals of the water handling systems specified with excavation support systems in Section 02260.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
1. Section 01060 – Permits and Regulatory Requirements
 2. Section 01300 – Submittals
 3. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
 4. Section 02260 – Support of Excavation
 5. Section 02295 – Geotechnical Instrumentation and Monitoring
 6. Section 02315 – Pipe Jacking
 7. Section 02316 – Shield Driven Tunnel Excavation
 8. Section 02465 – Secant Pile Wall

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
1. American Water Works Association (AWWA)
 - a. A100 Standard for Water Wells
 2. Narragansett Bay Commission (NBC)
 - a. Rules and Regulations for the Use of Wastewater Facilities within the Narragansett Bay Water Quality Management District Commission.
<https://www.narrabay.com/programs-and-initiatives/pretreatment/discharge-limitations/>
 3. State of Rhode Island, Department of Environmental Management (RIDEM)
 - a. Rules and Regulations for Hazardous Waste Management, as amended.
 - b. RI Pollutant Discharge Elimination System (RIPDES) Permit
 4. U. S. Environmental Protection Agency (EPA).
 - a. The Federal Clean Water Act (33 U.S.C. 1251 et seq., as amended),

1.04 DEFINITIONS (NOT USED)

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. The quality of water discharged under this Contract to the NBC treatment facilities shall, at a minimum, meet the NBC pre-treatment requirements noted in the referenced NBC Rules and Regulations.
- C. Qualifications
 - 1. Dewatering design shall be performed by a Professional Engineer licensed in the State of Rhode Island having designed not less than five (5) successful projects of similar type, size, and complexity.
 - 2. Dewatering wells shall be installed by a Specialty Subcontractor licensed in the State of Rhode Island with a minimum of five (5) completed dewatering projects including at least two (2) successful projects using pumped dewatering wells.
 - 3. The dewatering work shall be under the supervision of a Superintendent(s) having not less than three (3) years of recent experience and have successful projects of similar type, size, and complexity.
- D. The Contractor shall employ a Testing Agency using trained and experienced personnel to perform the required water quality testing to verify that the biological, chemical, and physical condition of the water to be discharged from the site complies with the permit conditions.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submittals for design, shop drawings, and work plans required herein shall be submitted at the same time and in full coordination with the required submittals of Section 02260 and Section 02465.
- C. Submit shop drawings and engineering calculations signed and sealed by a Licensed Professional Engineer registered in the State of Rhode Island at least thirty (30) days prior to the start of the work. Include, at a minimum, the following:
 - 1. Plans, sections, and details that clearly describe the system to be installed. Include location, layout, and depth of system components as well as monitoring and discharge locations.
 - 2. Details of construction and installation of fabricated items including materials, sizes, dimensions, and connections.
 - 3. Anticipated flows and volume at each location of discharge.
 - 4. Design computations including a dewatering drawdown analysis demonstrating that the required design criteria have been met.
 - 5. Calculations demonstrating that the system designer has evaluated the potential impacts of the dewatering and incorporated adequate precautions in the design to protect existing structures and avoid damage.

6. A schedule that includes the time required for installation and development of dewatering wells in order to meet the design criteria specified herein and any discharge criteria required in accordance with the regulations.
 7. A narrative comparing the site groundwater quality data with the water quality standards to be followed per the required permits for the project.
- D. Submit a Construction Water Handling and Treatment Work Plan at least thirty (30) days prior to the start of construction. Include, at a minimum, the following:
1. Construction schedule, methods and procedures of installation, proposed construction sequence, and maintenance schedule.
 2. Provisions and protocols for measuring pumped water, monitoring water, and testing water.
 3. Interface details and protection measures for existing structures and utilities, as necessary.
 4. A Construction Water Handling and Treatment Plan that identifies treatment process, materials, and equipment to be employed to treat contaminated and non-contaminated construction water prior to discharge.
 - a. The Construction Water Handling and Treatment Plan must use sediment removal measures and activated carbon treatment systems at a minimum.
 5. Contingency plans complete to address potential emergencies including, but not limited to, power failures, overflows and effluent parameters exceeding the discharge limits specified in the required permits.
 6. List of equipment including standby equipment and power supply.
 7. A list of proposed hazardous waste transporters and hazardous waste disposal facilities acceptance to transporting any hazardous waste for off-site disposal. The submittal shall include a copy of the proposed hazardous waste transporter's permit and the proposed hazardous waste disposal facility's license and operating permit.
 8. A well decommissioning plan to include, at a minimum, the following for each dewatering system:
 - a. A schedule of activities.
 - b. The method and procedures of decommissioning in accordance with the regulations.
 - c. A list of materials and equipment to be used.
 - d. Waste management procedures.
- E. Quality Control Submittals
1. Submit qualifications and experience records for personnel as specified herein.
 2. Submit manufacturers' product data, calibration records, certificates, and manufacturers' test data for any manufactured materials incorporated.
 3. Submit copies of all permits applications and permits obtained.

4. Submit installation documentation within seven (7) days of completion of well development to include the following:
 - a. Drillers logs including drilling method, surveyed location, subsurface ground and groundwater conditions, and depth.
 - b. Drillers notices and dewatering well tag identification numbers.
 - c. For each dewatering well, casing material and diameter; total depth; well screen material, slot size, length, and interval depth; filter material, sealing material, and interval depths.
 - d. Well development record including date, method, rate and length of development, drawdown, discharge and solids concentrations at the beginning and end.
5. Submit a Weekly Construction Water Handling Report to include rate of flow measured daily, total flow indicated on flowmeter, sand content measured weekly in accordance with AWWA A100, groundwater level, results of any laboratory testing, and manifest or bills of lading for any offsite disposal.
6. Submit Verification Form (s) for dewatering system operations and performance inspection completed by the Contractor's Engineer following each site visit.
7. Submit copies of all disposal documents for treatment system components that require disposal as hazardous or special wastes.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. The Contractor shall select the method of dewatering and control of water inside and outside the excavations and shall be solely responsible for the location, arrangement, and depth of any system(s) selected to accomplish the work.
- B. The Contractor shall maintain groundwater levels to a point no higher than 2 feet below the prevailing excavation level so as to preserve the undisturbed characteristics of the subgrade soils and to preserve the bearing capacity. Groundwater levels shall be lowered for a time period as deemed necessary by the Contractor to ensure adequate factor of safety to construct the permanent structures.
- C. The Contractor shall design and implement the dewatering system so as to maintain a minimum factor of safety against the uplift groundwater pressures in any soil strata. The factor of safety shall be calculated by considering the stabilizing pressure consisting of overburden soil weight alone. The dewatering system shall be maintained operational until the dead weight of the overburden soil plus any completed portion of the structure is able to provide the required factor of safety at static (normal) groundwater level/pressure.
- D. The Contractor shall coordinate with all utility companies to verify all utility locations prior to commencing work.
- E. The Contractor shall install a sufficient number of groundwater monitoring wells or piezometers and shall monitor the water levels weekly, at a minimum, to demonstrate that the performance criteria is being met.
- F. If the Contractor is excavating and encounters large amounts of water draining into the excavation, the Contractor shall take immediate steps to control the water source. Large amounts of water requiring control shall be defined as those that adversely

affect the performance of work under the Contract and/or amounts that have the potential of resulting in improper operation of sedimentation basins or other treatment components, or cause a loss or damage to adjacent properties. The Contractor shall have equipment, materials, manpower and all accessories necessary to deal with such an occurrence.

- G. The Contractor shall design containment and treatment systems capable of handling 125 percent of anticipated flows and treating discharged water to the levels specified herein. The water treatment system shall include provisions for a minimum of 100 percent stand-by equipment for essential components and systems to include mobile electric generating equipment and spare pumps.
- H. The water treatment system shall include the consideration of the following deleterious effects on Construction Water:
 - 1. Constituents derived from cementitious products.
 - 2. Constituents generated by the excavation process, microtunneling and muck handling.
 - 3. Constituents derived from dewatering, groundwater depressurization, and groundwater inflows to excavations.
 - 4. Oil and grease derived from the proper use and maintenance of equipment in accordance with legal requirements.
 - 5. Existing groundwater.
- I. Acceptance of the Construction Water Handling Work Plan shall not in any way relieve the Contractor from full responsibility for the complete and adequate design and performance for the dewatering system and water handling system.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule and anticipated performance for dewatering systems installation, operation, monitoring, and removal.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufactures recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide materials that are either new or in serviceable condition and free from defects that impair their strength or performance.
- B. Materials and equipment used shall adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of the dewatering work.

2.02 MATERIALS

- A. Filter material shall consist of clean, rounded, washed select silica gravel and sand, free from silt, clay, and other deleterious material. Use filters and filter packs such that soils are not subject to removal of fines upon pumping.
- B. Well screens shall consist of factory-slotted pipe and sized appropriately for the filter pack and formation to prevent the removal of fines from the filter pack or formation. Groundwater entrance velocities through the well screen shall equal 0.01 feet per second or less.

2.03 EQUIPMENT

- A. Provide all necessary tanks, sumps, pumps, motors, electrical and mechanical equipment, power lines, poles, piping discharge lines, valves, controls, oil skimmers, bag filtration, activated carbon system, water meters, and other appurtenances required for functional dewatering systems and water handling systems.
- B. Sumps shall include a slotted or perforated casing surrounded by filter pack to prevent movement of fines.
- C. Flow Meters
 - 1. Shall be capable of measuring the flow from the well within ten percent of the actual flow.
 - 2. Shall be capable of reporting current flow in gallons per minute and total flow volumes in gallons per cubic feet.
 - 3. Shall be factory calibrated within one year of data acquisition.
- D. Provide stand-by equipment and replacement components to ensure the dewatering systems and water handling systems function at all times.

2.04 SOURCE QUALITY CONTROL

- A. Only materials meeting the requirements of these specifications shall be used.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence installation of systems only after design calculations, shop drawings, and the work plan has been reviewed and accepted by the PM/CM and applicable permits have been obtained.
- B. Conduct all work within the construction limits established for the project.
- C. At a minimum, place fencing, gates, lights, and signs as necessary around the work areas to provide for public safety.
- D. Operate all systems in accordance with permits, design requirements, and manufacturer's instructions.
- E. Provide all necessary settling tanks, bag filtration, carbon treatment at a minimum and other acceptable means, as necessary, to prevent undesirable constituents from being discharged in accordance with the Bucklin Point Wastewater Treatment Facility (BPWWTF) local limits.
- F. Collected water shall be pumped to the discharge location or to the water treatment system as required before discharge.
- G. Water from system operations shall not enter flowing or dry watercourses without compliance with the required permit. The Contractor shall provide and construct all necessary intercepting ditches, barriers, sedimentation basins, holding ponds, or other accepted means to eliminate the undesirable constituents.
- H. Monitor system operation and performance and conduct sampling and laboratory testing as required by the RIPDES permit. Refer to Section 01060 for additional requirements.
- I. During construction, the Contractor's Engineer shall make regular site visits and complete a Verification Form to verify that installation of dewatering systems are installed and operating in accordance with their design and the performance criteria included herein.
- J. Maintain adequate supplies of spare parts and treatment supplies to keep treatment system in continuous operation.
- K. The dewatering systems and water handling systems shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground below the bearing level and shall not influence the stability of surrounding areas. Wells or well points shall be properly sanded in and sumps shall be sheeted and provided with proper filter material.
- L. Open pumping with sumps and ditches resulting in boils, loss of fines, softening of the ground or instability of slopes will not be permitted.
- M. Dewatering effluent may be affected by rainfall. The Contractor shall provide adequate equalization and holding tanks to allow work to proceed in the case of restricted discharge capability during rain events.
- N. The Contractor shall provide sufficient clean water to flush all sewers and drains when necessary. If any sewer, drain, catch basin, or inlet becomes filled or partially

filled with sediment or debris, the Contractor shall promptly and satisfactorily remove such deposits.

- O. The Contractor shall be responsible for periodically monitoring groundwater inflows into excavations, and water accumulating in excavations for visual and olfactory indications of contamination.
- P. The dewatering system and water handling system shall keep the water in the excavation sufficiently controlled to develop a workable subgrade and maintain the groundwater levels as specified.

3.02 DEWATERING WELLS

- A. Prepare a Well Construction Record after installation is completed, including appropriate items from the following list:
 - 1. Project name, contract name, and number.
 - 2. Drillers logs including drilling method, location, subsurface ground and groundwater conditions, and depth. Strata soil nomenclature shall be based on boring logs contained in the Geotechnical Data Report.
 - 3. Drillers notices and dewatering well tag identification numbers.
 - 4. For each dewatering well, casing material and diameter; total depth; well screen material, slot size, length, and interval depth; filter material, sealing material, and interval depths.
 - 5. Well development record including date, method, rate and length of development, drawdown, discharge and solids concentrations at the beginning and end.
 - 6. Notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on well behavior.
- B. Develop each well after installation is complete to remove fines from drilling and installation.
 - 1. Develop wells until fines content of the discharge water during surging is less than 20 parts per million (ppm) as determined by a centrifugal, separating meter such as Rossum Sand Tester or acceptable equivalent in accordance with AWWA A100.
 - 2. Monitoring System and Reporting
 - 3. Install flow meters in accordance with the manufactures recommendations.
 - 4. Maintain accurate and continuous records of water level, quality, sand content, and flow information in accordance with the project permits and regulations.
- C. Decommission wells and dewatering system and instrumentation used to monitor the system in accordance with the submitted well decommissioning plan.

3.03 CONCRETE WASHOUT

- A. All concrete, grout, and any other cementitious product washout shall be directed to a leakproof container or containment pit in accordance with the applicable permits, codes, and standards.

- B. Washout discharge onto pavement or the ground is prohibited.
- C. Decant water must be checked for TSS concentration and pH prior to discharge. Only decant water meeting design criteria for TSS and pH is allowed to be discharged through any onsite treatment and discharge system.
- D. Water and liquids from grouting operations is prohibited from discharge through the construction water handling system and must be removed and disposed offsite.
- E. Waste, excess, or spilled concrete, grout, and grout (and any other cementitious material) on the ground or pavement must be promptly cleaned-up and placed in an appropriate waste container.

3.04 RESPONSIBILITY FOR DAMAGE

- A. Structures including, but not limited to, footings, foundations, above and below grade walls, driveways, utilities, streets, curbs, and sidewalks that become unstable and vulnerable to collapse, or settlement due to removal or disturbance of groundwater shall be corrected immediately by the Contractor. Provide all means necessary to rectify the particular problem identified.
- B. The Contractor shall be responsible for any and all loss or damage arising from removal or disturbances of groundwater, including, but not limited to, any such claims for subsidence of soil, utilities, cracked slabs or walls, foundations, concrete driveways and any such claims for slumping and the loss of lateral support rendering walls unstable and vulnerable to collapse, that may occur in the prosecution of the work shall be sustained and borne by the Contractor at his expense.
- C. If the Contractor fails to correct the damage or destruction resulting from his operations, the PM/CM may proceed to repair, rebuild, or otherwise restore such damaged property as may be deemed necessary. The cost of this work shall be deducted from any compensation that may be (or become) due the Contractor under this Contract.
- D. In any event, the Contractor shall indemnify and save the NBC and the PM/CM harmless from claims by property owners for damages to their property as a result of his dewatering operations regardless of whether or not such claims for damages are covered by his insurance and regardless of whether or not such dewatering operations were reviewed or accepted by the PM/CM.

3.05 HAZARDOUS WASTE DISPOSAL

- A. Contaminated construction water treatment system components that require disposal as a hazardous waste shall be disposed in accordance with applicable federal, state, and local rules and regulations.
- B. The Contractor shall use a licensed hazardous waste transporter to transport all hazardous waste to an off-site hazardous waste disposal facility.
- C. The Contractor shall only dispose of hazardous waste at a hazardous waste disposal facility accepted by the PM/CM.

3.06 SITE CLEAN UP AND RESTORATION

- A. After construction has been completed, the Contractor shall dismantle and remove all temporary facilities associated with the collection, handling, and treatment of

construction water. Areas impacted by construction water handling systems shall be returned to original condition unless otherwise specified on the Contract Drawings.

3.07 FIELD QUALITY CONTROL

A. Notifications

1. Notify the PM/CM immediately of any permit compliance limit or standard exceedance.
2. Notify the PM/CM and the permitting agencies immediately of any improper or unanticipated discharge.
3. Notify the PM/CM immediately of any sign of subgrade disturbance due to seepage or unaccountable reduction in effluent flow rate and take immediate steps immediately to correct the condition at no additional cost to the NBC.
4. Notify the PM/CM of any indication that suspected contaminated groundwater has been encountered.

END OF SECTION 02240

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SECTION 02260

SUPPORT OF EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, power, and equipment for designing, furnishing, installing, and maintaining support of excavation systems for all surface excavations.
- B. The support of excavation system for the Gate and Screening Structure, the Approach Channel, and the Junction Chamber shall consist of a secant pile wall systems socketed into bedrock. Other support of excavation systems may be either single or multi-staged, comprised of soldier pile and lagging, secant pile walls, internal bracing supports (ring beams, walers, and/or struts), traffic/sidewalk decking, or other system designed by the Contractor and submitted to the PM/CM for review and acceptance.
- C. Trench boxes or slide rail shoring systems shall not be used as support of excavation systems for Launching and Receiving Shafts for trenchless operations. Trench boxes or slide rail shoring systems may be used at the Contractor's risk in areas where excavations are 20 feet or less in depth and known to be free of obstructions.
- D. Refer to Section 02465 for additional requirements for secant pile walls in addition to those stated herein.
- E. The Contractor shall coordinate the design and submittals of the excavation support systems with the dewatering systems and the water handling systems specified in Section 02240.
- F. The Contractor shall be responsible for sizing the support of excavation systems.
 - 1. The support of excavation systems shall be adequately sized for construction of the permanent structures and pipelines indicated on the Contract Drawings and to provide adequate space to meet the requirements of the Contractor's selected means and methods of construction.
 - 2. Shaft excavation sizes larger than those indicated on the Contract Drawings shall be subject to review and acceptance of the PM/CM.
 - 3. Modifications to approved traffic control measures and utility relocations shall be subject to review and acceptance of the PM/CM and completed at no additional cost.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
 - 1. Section 01300 – Submittals
 - 2. Section 03300 – Cast-in-Place Concrete

3. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
4. Section 02240 – Construction Water Handling
5. Section 02261 – Support of Utilities
6. Section 02295 – Geotechnical Instrumentation and Monitoring
7. Section 02315 – Pipe Jacking
8. Section 02316 – Shield Driven Tunnel Excavation
9. Section 02465 – Secant Pile Wall

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
1. American Association of State Highway and Transportation Officials (AASHTO)
 - a. LRFD Bridge Design Specifications, 9th Ed., 2020
 2. American Concrete Institute (ACI)
 - a. 301 Specifications for Structural Concrete
 - b. 318-14 Building Code Requirements for Structural Concrete
 3. American Institute of Steel Construction (AISC)
 - a. 2016 Specification for Structural Steel Buildings
 4. ASTM International Standards (ASTM)
 - a. A36 Specification for Carbon Structural Steel
 - b. A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - c. A490 Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
 - d. A572 Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
 - e. A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - f. A690 Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments
 - g. A722 Specification for High Strength Steel Bars for Prestressed Concrete
 - h. A992 Specification for Structural Steel Shapes
 - i. C150 Specification for Portland Cement
 5. American Welding Society (AWS)

- a. D1.1 Structural Welding Code-Steel
- 6. American Wood-Preservers Association (AWPA)
 - a. U1-19 Use Category System: User Specification for Treated Wood
- 7. U.S. Department of Labor, Occupation Safety and Health Administration (OSHA)
 - a. Construction Standards and Interpretations, 29 CFR Part 1926, Subpart S. Section 1926.800, "Underground Construction.

1.04 DEFINITIONS

- A. Launching Shaft: A shaft from which the trenchless operations are conducted including pipe placement and spoils removal.
- B. Receiving Shaft: A shaft used for which the retrieval operations is conducted.

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Qualifications
 - 1. The design of the excavation supports systems shall be performed by a Professional Engineer licensed in the State of Rhode Island having not less than five successful projects of similar type, size, and complexity. Experience shall include designing excavation support systems in similar site and ground conditions.
 - 2. Any welding required shall be performed by certified welders in accordance with AWS D1.1.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submittals for design, shop drawings, and work plans required herein shall be submitted at the same time and in full coordination with the required submittals of Section 02240.
- C. Submit 30 days prior to the work, signed and sealed design calculations and working drawings by a Professional Engineer licensed in the State of Rhode Island to include, at a minimum, the following:
 - 1. A written summary, applicable code and design standard references, and design loading criteria for all stages of installation and excavation.
 - 2. Plans, elevations, sections, and details that clearly describe the excavation support systems to be installed.
 - 3. Show location, arrangement, bracing levels, and interface details at existing structures.
 - 4. Include materials, sizes, dimensions, reinforcement, and connections of fabricated items.

5. Design for any utilities required to be supported in place. Include a description of the method and procedures to be implemented during construction. Coordinate with Section 02261.
 6. Methods for protecting waterproofing when removing excavation supports systems.
- D. Submit a Support of Excavation Work Plan at least thirty (30) days prior to the start of construction. Include, at a minimum, the following:
1. Construction schedule, list of equipment, methods and procedures of installation, and proposed construction sequence.
 2. The method of groundwater control and estimated discharge rates.
 3. Interface details and protection measures for existing structures and utilities as necessary
 4. Include contingency plans for excessive movement of ground, support wall system, or existing structures or utilities in excess of allowable movement indicated on the Contract Drawings. Contingency plans shall include positive measures by the Contractor to limit further movement of ground, support wall system, or existing structures or utilities. Coordinate the contingency plans with Section 02295.
- E. Quality Control Submittals
1. Submit qualifications and experience records for personnel as specified herein.
 2. Manufacturers' product data, certificates, and manufacturers' test data for any manufactured materials incorporated.
 3. Submit as-built record data within one week of each installation completion that includes plans, elevations, dimensions, and installed excavation support system.
 4. Submit Verification Forms for excavation support system installation inspection and testing and base subgrade stability inspection completed by the Contractor's Engineer following each site visit.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. The Contractor shall design of the excavation support systems to include, at a minimum, the loading criteria indicated on the Contract Drawings and any other loads that may be imposed.
- B. The Contractors design shall include all phases of construction with appropriate factors of safety.
- C. The Contractors design shall consider conditions that may occur during the various stages of construction including, but not limited to following:
 1. Temporary or permanent alteration of the soils' in-situ properties caused by the selected methods of construction.
 2. Installation, relocation, and removal of temporary bracing.
 3. Excavation below bracing.
 4. Dewatering of excavation.

5. Time related effects.
 6. Load transfer to permanent structures.
- D. At trenchless operation Launching Shafts, the Contractor shall consider pipe jacking thrust loads developed based on the jacking procedures selected by the Contractor. Coordinate the design of the excavation supports systems with the thrust block and pipe design.
 - E. The Contractor is solely responsible for design of each shaft bottom to provide a stable support for guide rails, thrust block, and other construction operations. Include, at a minimum, a working slab (mudmat), a drainage layer, and geotextile fabric.
 - F. The Contractor shall design the excavation support system to limit movements in accordance with Section 02295.
 - G. Excavations below the level of the base of any adjacent foundation or retaining wall shall not be permitted unless the design of the excavation system includes an analysis of the stability of the adjacent structure and includes, as necessary, any required bracing/underpinning of the adjacent structure.
 - H. Traffic/sidewalk decking shall be designed in accordance with AASHTO LRFD Bridge Design Specifications.
 - I. Elements supporting vertical loads as well as lateral pressures shall be analyzed as members subjected to combined axial loads and bending.
 - J. The maximum lateral deflection along the full depth of the excavation shall be limited as indicated in the Contract Documents.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule, and anticipated performance for the support of excavation system installation, operation, monitoring, and removal.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for installation of support of excavation systems according to the performance requirements. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufactures recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall either new or in serviceable condition.
- B. The Contractor shall furnish all installation tools, materials, and miscellaneous components.

2.02 MATERIALS

- A. Structural Steel shall conform to ASTM A 36/A 36M, ASTM A 572/A 572M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- B. Bolts and Nuts for Structural Steel shall conform to ASTM A325 or ASTM A490 as appropriate.
- C. Reinforcing Bars shall conform to ASTM A 615/A 615M, Grade 60.
- D. Timber for lagging shall be any species, rough-cut, mixed hardwood, nominal 3 inches thick and shall conform to the requirements of AWPA. Lagging need not be new, but shall be in serviceable condition, free of cracks splits, decay or other types of damage and deterioration.
- E. Grout shall be suitable for service when used for excavation support systems. Conform to ASTM C150, Type I, II, or III Portland Cement.
- F. Concrete shall conform to Section 03300 when used for excavation support systems. Conform ACI 318 for compressive strength required for application.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence installation of support of excavations systems only after design calculations, shop drawings, and work plans have been reviewed and accepted by the PM/CM and applicable permits have been obtained.
- B. Conduct all work within the construction limits established for the project.
- C. At a minimum, place fencing, gates, lights, and signs as necessary around the support of excavation work areas to provide for public safety.
- D. Methods of construction for support of excavations systems shall be such as to ensure the safety of the Contractor's employees, the Owner's employees and inspectors, the public, and adjacent property owners.
- E. During construction, the Contractor's Engineer shall make regular site visits and shall perform excavation support systems(s) inspection and testing, as necessary. The PM/CM shall witness inspection and testing when deemed appropriate. The Contractor's Engineer shall complete a Verification Form for each visit to include the following:
 - 1. Verify that installation of all components, materials, member sizes, connection details, and anchor components, if used, are installed in accordance with their design.

2. Identify any differences between the proposed design and installed conditions.
 3. Verify that the stability of the subgrade at the base of excavations is stable in accordance with the performance criteria included herein.
- F. Perform the work to achieve the minimum required clearances and tolerances necessary for the permanent structures.
 - G. If the PM/CM is of the opinion that at any point sufficient or proper supports have not been provided, additional supports may be ordered to be placed at no additional cost. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports.
 - H. If unstable material is encountered during excavation, all necessary measures shall be taken immediately to prevent ground movement.
 - I. Maintain a sufficient quantity of materials throughout the conduct of the work for installation of temporary excavation support systems, protection of the work, or in cases of accident or emergency.
 - J. Excavations shall be kept free of water at all times and a stable subgrade shall be maintained. Refer to Section 02240 for additional requirements.
 - K. Care shall be taken to prevent voids outside of the excavation support system. If voids are formed, they shall be immediately filled with sand or stone. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete or other material as accepted by the PM/CM.
 - L. Maintain temporary excavation support systems in place and functioning properly until no longer necessary.

3.02 UTILITIES

- A. All underground utility lines shall be identified, located, and protected from damage or displacement.
- B. Utility companies and other responsible authorities shall be contacted to locate and mark the locations and, if they so desire, direct or assist the Contractor with protecting existing utilities.
- C. When required, the Contractor shall obtain an excavation permit from the local authority having jurisdiction prior to the initiation of any excavation support system work.
- D. Perform the work to limit movements in accordance with Section 02295.

3.03 SOLDIER PILE AND LAGGING

- A. Install soldier piles to the minimum embedment depths as shown on the reviewed shop drawings.
- B. Soldier piles shall be installed in predrilled holes. Provide casing or other methods of support to prevent caving of holes and loss of ground.
- C. Predrilled holes for soldier piles shall be backfilled with concrete from the pile tip elevation to the elevation of the bottom of the excavation. The remainder of the

predrilled hole shall be backfilled with lean concrete or sand. Concrete strength shall be in accordance with the reviewed shop drawings.

- D. Install lagging to mitigate gap spacing between adjacent boards so that excessive ground loss does not result in exceeding ground movement levels. The Contractor shall anticipate having to make adjustments in height of unlagged face support based on ground and groundwater conditions at each shaft excavation.
- E. As the installation progresses, backfill the voids between the excavation face and the lagging. Pack with materials such as hay, burlap, or geotextile filter fabric as necessary to allow drainage of ground water without loss of ground.

3.04 BRACED SUPPORT SYSTEMS

- A. The internal bracing support system shall include wales, struts, rakers, or tiebacks. Arrange in a manner that will minimize interference with construction of the permanent structures.
- B. Include web stiffeners, plates, or angles as needed to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.
- C. Install and maintain all bracing support members in tight contact with each other and with the surface being supported.
- D. Where passive soil pressure limits permit, internal bracing shall be prestressed to at least 50 percent of maximum design loads.
- E. Coordinate excavation work with installation of bracing. Excavation shall extend no more than two feet below centerline of any brace level prior to installation of the next bracing.
- F. Use procedures that produce uniform loading of bracing member without eccentricities or overstressing and distortion of members of system.

3.05 REMOVAL OF EXCAVATION SUPPORT SYSTEMS

- A. Unless approved by the PM/CM, all soldier piles, shall be left in place. Refer to Section 02465 for removal requirements for other types of excavation support systems.
- B. Soldier piles that are not completely removed shall be cut off at least 5 feet below finished grade and removed or as noted on the Contract Drawings. No wood, except where in contact with waterproofing, shall remain as part of the abandoned portion of the work. Protect waterproofing from damage in anticipation of this activity.
- C. Except where specified elsewhere in the Contract Documents, other support system elements, including wales, struts, lagging, thrust blocks, and working slabs, shall be carefully removed from the bottom of the excavation prior to restoration. Remove the support system in a manner that will not disturb or damage adjacent buildings, structures, waterproofing material, or utilities.
- D. Do not remove vertical support members installed within the zone of influence of new or existing structure or below the mid-diameter of any pipe. The zone of influence is defined as a zone extending down and away from the lowest outer edge of the structure at 1 horizontal to 1 vertical.

END OF SECTION 02260

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SECTION 02261

SUPPORT OF UTILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, power, and equipment for designing, furnishing, installing, and maintaining systems for support of existing utilities.
- B. The Contractor means and methods shall not cause damage to any existing underground utility. Existing underground utilities that are to remain shall be temporarily supported and protected throughout the work.
- C. The PM/CM acceptance of Contractor construction methods and procedures does not relieve the Contractor of his responsibilities to protect and preserve utilities.
- D. The Owner accepts no responsibility and makes no representation or warranty as to the accuracy or completeness of the utility information provided on the Contract Drawings.
- E. The Contractor shall establish direct and continuous contact with the respective utility companies and cooperate with them in all phases of construction. The Contractor shall contact the utility companies in sufficient time so that the construction is not delayed.
- F. The Contractor shall verify by field investigation the locations of existing utilities within and adjacent to the project limits that may be affected by construction operations.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
 - 1. Section 01300 – Submittals
 - 2. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
 - 3. Section 02260 – Support of Excavation
 - 4. Section 02295 – Geotechnical Instrumentation and Monitoring

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
 - 1. U.S. Department of Labor, Occupation Safety and Health Administration (OSHA)

- a. Construction Standards and Interpretations, 29 CFR Part 1926, Subpart S. Section 1926.800, "Underground Construction.

1.04 DEFINITIONS (NOT USED)

1.05 QUALITY ASSURANCE

A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.

B. Qualifications

1. The design of the utility support systems shall be performed by a Professional Engineer licensed in the State of Rhode Island having not less than five successful projects of similar type, size, and complexity. Experience shall include designing utility support systems in similar site and ground conditions.

1.06 SUBMITTALS

A. Submit in accordance with Section 01300.

B. Submit 30 days prior to the work, signed and sealed design calculations and shop drawings by a Professional Engineer licensed in the State of Rhode Island to include, at a minimum, the following:

1. A written summary, applicable code and design standard references, and design criteria used.
2. Plans, elevations, sections, and details that clearly describe the utility support systems to be installed.
3. Show location, arrangement, bracing, and interface details.
4. Include materials, sizes, dimensions, reinforcement, and connections of fabricated items used.
5. Include a description of the method and procedures to be implemented during construction.

C. Submit a Work Plan for temporary utility support in coordination with the requirements of Section 02260 at least thirty (30) days prior to the start of construction. Include, at a minimum, the following:

1. Construction schedule, list of equipment, methods and procedures to be used, and proposed construction sequence.
2. Include contingency plans for excessive movement of utilities in excess of allowable movement indicated in the Contract Documents. Contingency plans shall include positive measures by the Contractor to limit further movement of utilities. Coordinate the contingency plans with Section 02295.

D. Quality Control Submittals

1. Submit qualifications and experience records for personnel as specified herein.
2. Manufacturers' product data, certificates, and manufacturers' test data for any manufactured materials incorporated.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. The utility support systems shall be designed by the Contractor and submitted to the PM/CM for review and acceptance.
- B. The utility support systems shall be designed by the Contractor and submitted to the utility owner as required for review and acceptance.
- C. The utility support systems shall be designed by the Contractor to provide adequate space to meet the requirements of the Contractor's selected means and methods of construction.
- D. The Contractor means and methods shall not result in applied surcharge loadings to existing utilities in excess of H-20 loading. The Contractor shall design the utility support systems to include any additional loads that may be imposed.
- E. The Contractor's design shall include all phases of construction with appropriate factors of safety.
- F. The Contractor shall design the utility support system to limit movements in accordance with the criteria specified in the Contract Documents.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and the Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, and schedule for the support of utilities.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufacturer's recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall be either new or in serviceable condition.
- B. The Contractor shall furnish all installation tools, materials, and miscellaneous components.

2.02 MATERIALS

- A. As determined by the Contractor's designer of the utility support system.

PART 3 EXECUTION

3.01 GENERAL

- A. Coordinate the work of this section with Section 02260.
- B. Commence installation of utility support systems only after design calculations and shop drawings have been reviewed and accepted by the PM/CM and the utility owner as required and applicable permits have been obtained.
- C. Conduct all work within the construction limits established for the project.
- D. At a minimum, place fencing, gates, lights, and signs as necessary around the support of excavation work areas to provide for public safety.
- E. Methods of construction for utility support systems shall be such as to ensure the safety of the Contractor's employees, the Owner's employees and inspectors, the public, and adjacent property owners.
- F. Perform the work to achieve the minimum required clearances and tolerances necessary for the permanent structures.
- G. If the PM/CM is of the opinion that at any point sufficient or proper supports have not been provided, additional supports will be ordered to be placed at no additional cost. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports.
- H. Maintain a sufficient quantity of materials throughout the conduct of the work for installation of utility support systems.
- I. Maintain temporary excavation support systems in place and functioning properly until no longer necessary.

3.02 INSTALLATION

- A. All underground utility lines shall be identified, located, and protected from damage or displacement.
- B. Utility companies and other responsible authorities shall be contacted to locate and mark the locations and, if they so desire, direct or assist the Contractor with protecting existing utilities.
- C. The Contractor shall permit the utility owner and their representatives to have access to inspect the work during construction.
- D. Proceed with caution in the areas of existing utilities and expose them by hand or by other excavation methods acceptable to the utility owner.
- E. Existing utilities shall remain in operation as required until the relocated utilities are completed and made operational.
- F. When required, the Contractor shall obtain an excavation permit from the local authority having jurisdiction prior to the initiation of any utility support system work.

- G. Remove utility support systems in a manner that will not disturb or cause damage to the utilities.

END OF SECTION 02261

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SECTION 02272

GEOTEXTILE MATERIALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for installation of geotextile filter fabric in trenches and under riprap.

B. Related Sections

1. Section 02100 – Mobilization, Site Preparation, and Demobilization
2. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
3. Section 02215 – Aggregate Materials

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method
2. D4355, Test Method for Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
3. D4491, Test Method for Water Permeability of Geotextiles by Permittivity
4. D4533, Test Method for Trapezoid Tearing Strength of Geotextiles
5. D4632, Test Method for Grab Breaking Load and Elongation of Geotextiles
6. D4751, Test Method for Determining Apparent Opening Size of a Geotextile
7. D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
8. D5261, Measuring Mass Per Unit Area of Geotextiles.
9. D6241, Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

1.03 QUALITY ASSURANCE

A. General

1. Producer of fabric to maintain competent laboratory at point of manufacture to insure quality control in accordance with ASTM testing procedures.
2. Laboratory to maintain records of quality control results.

1.04 SUBMITTALS

A. Shop Drawings

1. Submit in accordance with SECTION 01300
2. Include manufacturer's recommended method of joining of adjacent fabric panels.

B. Certificate of Conformance

1. Upon each shipment/delivery of product to the work site, furnish mill certificate(s) from the company manufacturing the fabric attesting that the fabric meets the chemical, physical, manufacturing and performance requirements specified. Fabric will be rejected if it is found to have defects, rips, flaws, deterioration or other damage.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide fabric in rolls wrapped with a heavy-duty protective covering to protect fabric from, mud, dirt, dust, debris and other deleterious sources until it is installed. Label each roll of fabric with number or symbol to identify production run.
- B. Do not expose fabric to ultraviolet radiation (sunlight) for more than 20 days total in period of time following manufacture until fabric is installed and covered.
- C. If Program Manager determines material is damaged in any way or has excessive sunlight exposure, the Contractor shall immediately make all repairs and replacements as directed by the Program Manager, at no additional cost to the Owner.

1.06 SCHEDULING

- A. Schedule Work so that the covering of the fabric with a layer of the cover material is accomplished immediately after inspection and approval of the placed fabric by the Program Manager. Failure to comply with this requirement shall require replacement of the fabric.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER/MATERIAL

- A. The geotextile fabric shall be nonwoven polypropylene designated as MIRAFI 140N as manufactured by US Fabrics, Cincinnati, Ohio; or acceptable equivalent and shall meet the following minimum requirements:

<u>Minimum Property (Unit)</u>	<u>Unit</u>	<u>Test Method</u>	<u>Requirements</u>
Weight	oz/sy	ASTM D5261	4.5
Grab Tensile Strength	lbs	ASTM D4632	120
Grab Tensile Elongation	%	ASTM D4632	50
CBR Puncture Strength	lbs	ASTM D6241	310
Trapezoid Tear Strength	lbs	ASTM D4533	50
Apparent Opening Size (AOS)	US Std. Sieve (mm)	ASTM D4751	70 (0.21)
Permittivity	sec ⁻¹	ASTM D4491	1.7
Permeability	cm/sec	ASTM D4491	0.22
Flow Rate	gal/min/sf	ASTM D4491	135
Ultraviolet Resistance (strength retained at 500 hrs)	%	ASTM D4355	70

- B. To keep the number of overlay joints to a minimum, fabric shall be provided in sections not less than fifteen (15) feet in width unless otherwise approved by the Program Manager prior to delivery to the site.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. For Riprap

1. Prepared areas to receive geotextile in accordance with SECTION 02100 and SECTION 02200
2. Clear subgrade of all sharp objects, large stones, roots, debris, or any other foreign materials that may contribute to puncturing, shearing, rupturing or tearing of the geotextile.
3. Grade area as smooth as possible and compact in accordance with SECTION 02200, with a vibratory roller or other method approved by the Program Manager.
4. Inspect subgrade and repair all unstable areas or soft spots with the installation of gravel and recompact prior to the placement of geotextile.

3.02 FABRIC INSTALLATION

A. For Riprap

1. Place at the locations shown on the Contract Drawings.
2. Unroll directly onto the prepared slope in a continuous manner. Join adjacent sections by overlapping the fabric a minimum of 12-inches. Join end sections by overlapping the fabric a minimum of 2-feet with field-sewn joints or as recommended by the manufacturer.
3. Place fabric on slopes creating a “shingled” effect in the direction of anticipated water flow.
4. Lay fabric smooth, maximizing surface contact with the prepared subbase, free of tension, stress, folds, wrinkles, or creases.
5. Securely anchor fabric sections at the top of the slope as recommended by the manufacturer. Use anchoring pins, nails, staples or other such means to secure fabric to the subbase surface to prevent fabric movement caused by wind uplift, and/or placement of cover material.
6. Maintain sufficient amount of cover material (minimum depth of 6-inches) to protect fabric during placement of riprap. Dozer buckets or blades, or other heavy or damaging equipment shall not be in direct contact with the fabric.
7. Minimize the height from which cover material is dumped and/or dropped directly onto the fabric material in order to avoid fabric damage or movement. Equipment used for spreading and compacting the cover material shall be of the type and size to avoid damage or movement to the underlying geotextile fabric.
8. Spread cover material in the direction of fabric overlap and in a manner that avoids creating undue tension, stress, sagging, buckling and/or other movement of the underlying fabric.

B. Fabric Installation in Trenches

1. In accordance with manufacturers recommendations
2. Place fabric in trench prior to placing crushed stone pipe bedding.
3. Overlap fabric 18-inches minimum for unsewn lap joints.

4. Do not permit equipment to travel directly on fabric.
5. Place fabric in smooth condition to prevent tearing or puncture.
6. Lay fabric loosely, without wrinkles or creases.
7. Leave slack in fabric to allow for adjustment.

END OF SECTION

SECTION 02276

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to perform all operations in connection with the sediment control, as indicated on the Drawings and as herein specified.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 1. D3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven fabrics
 2. D4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
 3. D4491, Test Method for Water Permeability of Geotextiles by Permittivity.
 4. D4533, Test Method for Trapezoid Tearing Strength of Geotextiles.
 5. D4632, Test Method for Grab Breaking Load and Elongation of Geotextiles.
 6. D4751, Test Method for Determining Apparent Opening Size of a Geotextile.

1.03 SUBMITTALS

- A. In accordance with SECTION 01300.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Silt Fence as manufactured by Amoco Fabrics and Fibers, Austell, GA, Propex Operating Co, Chattanooga, TN or acceptable equivalent.

2.02 MATERIALS

- A. Silt Fence
 1. The silt fence shall be comprised of a sediment control fabric and reinforced netting stitched together with heavy duty thread top and bottom, stapled to hardwood posts.
 2. Hardwood posts shall be 1 1/2-inch x 1 1/2-inch nominal, minimum, x 4.0 feet long, spaced a maximum 8.0 feet apart with lower ends tapered to facilitate driving into compacted soil.
 - a. Provide larger posts to facilitate driving if required.
 3. A 6-inch flap at the bottom of the fence shall be used to toe in the sediment control barrier to prevent silt migration under the barrier.
 4. Each section of fence shall be supplied with a coupling to attach adjoining sections.
 5. Silt fence shall conform to the following test requirements:

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
Grab Tensile	ASTM D4632	120 lbs.
Grab Elongation	ASTM D4632	15 %
Trapezoid Tear Strength	ASTM D4533	60 lbs.
Apparent Opening Size (AOS)	ASTM D4751	US Std. Sieve 30
Ultraviolet Resistance	ASTM D4355	70 % @ 500 hrs

6. Roll Width: 3.0 feet.
7. Roll Length: 100.0 feet.

B. Hay Bales/Straw Wattles

1. Machine produced.
2. Straw filled tubes of compacted straw of rice, wheat or barley.
3. Straw wattles to be certified as weed free.
4. Netting for tubes to be seamless, high density polyethylene with ultra violet inhibitors.
5. Roll length to be 10.0 feet to 25.0 feet.
6. Weight per linear foot,
 - a. 12-inch: 2.5 lbs. minimum
 - b. 9-inch: 1.5 lbs. minimum
7. Stakes shall be wooden, 1 1/8-inch x 1 1/8-inch x 2.5 feet long, with lower ends tapered to facilitate driving into compacted soil. Rebar may be substituted for wooden stakes.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Silt fence and hay bales shall be installed prior to any grubbing or earth excavation.
- B. Install silt fence in accordance with manufacturers written recommendations. Excavated soils shall be thoroughly compacted back into trench after installation of erosion control devices.
- C. Install hay bales “tight” against silt fence.
 1. Remove all rocks, vegetation or other obstructions at straw wattle location.
 2. Excavate a trench approximately 2 to 3-inches deep to accept the straw wattle and place straw wattle in trench.
 3. Anchor straw wattle with stakes placed a maximum of 4-feet apart.
 4. The end stakes shall be placed 6-inches from the end of straw wattle and angled toward previously laid straw wattle to force straw wattles together.
- D. Install silt fence and hay bales at locations shown on the Contract Drawings or as directed by the Engineer.

3.02 MAINTENANCE

- A. Maintain fence throughout the duration of the project.

- B. Remove sediments when depths accumulate to 50% of the depth of the fence height, or as necessary.

3.03 REMOVAL AT PROJECT COMPLETION

- A. Remove all sediment collected by the silt fence, remove the silt fence, and restore the area to pre-construction condition to the satisfaction of the Engineer.

END OF SECTION

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SECTION 02295

GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for furnishing, installing, monitoring, reporting data from, maintaining and decommissioning geotechnical instrumentation.
- B. Contractors Responsibilities
 1. Furnish all instrumentation shown on the Contract Drawings. Include the following minimum quantities;
 - a. Deformation Monitoring Points (DMPs)
 - i. Seventeen (17) DMP Type 1 to monitor the ground in the vicinity of the Gate and Screening structures and in the vicinity of Diversion Structure DS-210, and the existing retaining wall along Roosevelt Ave.
 - ii. One hundred and seven (107) DMP Type 2. This includes seventeen (17) to monitor existing buildings along the alignment and bridge abutments and ninety (90) paint mark type points to monitor support of excavation systems along open cut reaches of the alignment.
 - b. One (1) Inclinator (INCL) located in the vicinity of the Gate and Screening structures to monitor the performance of the excavation support system.
 - c. Three (3) groundwater Observation Wells (OW) located at DS-214, MH217-2, and MH217-3.
 - d. Two (2) Seismograph (SEIS). One each located in the vicinity of shafts during construction and one in the vicinity of the existing roadway overpasses. Seismographs can be moved to various locations depending on work progression.
 - e. Nineteen (19) Utility Monitoring Points (UMP) located on the existing electric duckbank along the alignment in close proximity to the work.
 2. Monitor, interpret, and report all data from all instruments shown on the Contract Drawings.
 3. Protecting instrumentation from damage. Replacing damaged, malfunctioning, or worn-out instrumentation equipment and materials.
 4. Implement response actions.
 5. The Contractor shall install instrumentation, in addition to that specified herein, that the Contractor deems necessary to ensure the safety of personnel and the Work, at no additional cost.

6. Decommission geotechnical instrumentation.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
 1. Section 01300 – Submittals
 2. Section 01381 – Audio Video Recording
 3. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
 4. Section 02240 – Construction Water Handling
 5. Section 02260 – Support of Excavation
 6. Section 02315 – Pipe Jacking
 7. Section 02316 – Shield Driven Tunnel Excavation
 8. Section 02465 – Secant Pile Wall

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
 1. American Society for Testing and Materials (ASTM)
 - a. C778 - Standard Specification for Standard Sand
 - b. D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Sch 40, 80, and 120
 2. International Society of Explosive Engineers (ISEE)
 - a. Field Practice Guidelines for Blasting Seismographs 2020
 3. National Geodetic Survey (NGS)
 4. National Institute of Standards and Technology (NIST)

1.04 DEFINITIONS (NOT USED)

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Qualifications
 1. The person in responsible charge of the surveyors shall be a Registered Land Surveyor in the State of Rhode Island with experience in measurements of the types and accuracies specified herein.
 2. The Contractors instrumentation personnel shall include a Superintendent who shall be in responsible charge during the geotechnical instrumentation program.

The Superintendent shall have prior field experience in installation and monitoring of the types of instrumentation specified herein and shall have supervised instrumentation programs of similar magnitude in similar subsurface conditions. The Superintendent shall:

- a. Be on site and supervise all instrument installations and acceptance tests.
 - b. Supervise data collection, reduction, plotting, and reporting, except for survey data.
- C. Factory calibration shall be conducted on instruments prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacture's calibration requirements. Where applicable, calibration shall be traceable to the NIST.
1. Seismographs shall be calibrated annually.
- D. The Contractor shall provide the manufacturer's warranty for each portable readout unit.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submit 30 days prior to installation, and Instrumentation Work Plan. Include, at a minimum, the following:
 1. Detailed step-by-step procedures for installation, together with a sample installation record sheet. The installation procedures shall include:
 - a. Method to be used for cleaning the inside of casing or augers.
 - b. Specifications for proposed grout mixes, including commercial names, proportions of admixtures and water, mixing sequence, mixing methods and duration, pumping methods and tremie pipe type, size and quantity.
 - c. Drill casing or auger type and size.
 - d. Depth increments for backfilling boreholes with sand and granular bentonite.
 - e. Method of sealing joints in pipes to prevent ingress of grout.
 - f. Method of conducting post installation acceptance tests.
 2. Detailed step-by-step procedures for conducting all optical survey measurements to the specified accuracies, including types of surveying instruments and data reduction procedures.
 3. A schedule indicating the proposed time sequence of instrumentation installation.
- C. Quality Control Submittals
 1. Submit qualifications and experience records for personnel as specified herein.
 2. Manufacturers' product data, factory calibration, and manufacturers' test data for all instruments to be installed.

3. Submit location plan with surveyed coordinates, baseline readings, and borehole logs of all installed instruments in advance construction in the area where they are to be installed.
4. Submit Monitoring Instrumentation Reports as specified herein.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS (NOT USED)

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule, operation, monitoring, and removal.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufacturer's recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall be new.
- B. Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. The term "acceptable equivalent" shall be understood to indicate that the "acceptable equivalent" product is the same or better than the product named in the specifications in function, performance, reliability, quality, and general configuration.
- C. The Contractor shall furnish all installation tools, materials, and miscellaneous instrumentation components.
- D. The Contractor shall provide readout units as needed for making acceptance tests and for taking readings during construction.
- E. Surface protection shall be flush with the ground surface in paved or other areas and shall be traffic rated if located in vehicle travel areas. Secure instrumentation to prevent theft and vandalism with a lid cover fixed with hex key headed bolts and protected from damage by construction activity.

2.02 SURVEY INSTRUMENTS

- A. Instruments used for vertical movement monitoring shall have a minimum accuracy of ± 1.5 mm (standard deviation for one kilometer of double run leveling) and a minimum setting accuracy of ± 1.0 arc seconds. Leveling staffs shall be non-telescopic in design (i.e., 'Chicago' style leveling staff). A bull's-eye bubble shall be used to plumb the leveling rod.
- B. Instruments used for horizontal movement monitoring shall have a minimum accuracy of ± 3.0 arc seconds and a minimum display reading less than or equal to the accuracy. Distances greater than 30 feet shall be measured with an Electronic Distance Measuring (EDM) device. Electronic pointing shall be used to minimize error due to possible misalignment of the EDM axis and telescope. Centering shall be accomplished using high precision optical plummets or mechanical centering devices.

2.03 DEFORMATION MONITORING POINTS

- A. DMP Type 1 shall consist of a 2-inch-long masonry nail with an identification tag. The nail shall be manufactured from hardened, zinc plated steel. The nail shall have ribbed thread along its shank and a conical point. It shall also have an indent in the center of its head to receive a surveyor's plumb bob. The identification tag shall be 1 ½ inch diameter and 3/32-inch-thick with a punched number for identification. The masonry nail shall be placed through the central hole of the identification tag and driven into the surface such that the identification tag lies directly between the surface and the head of the masonry nail.
- B. DMP Type 2 shall consist of the following:
 - 1. To monitor an existing structure, use a 3/8-inch diameter x 2-inch long stainless steel socket head cap screw, ASTM A307 UNC thread, screwed into a 2-inch long x 1 ¼ inch diameter tamp-in screw anchor. The anchor and casing shall meet the requirements of GSA Specification FF S 325 Group 1, Type 1, Class 1. These tamp-in screw anchors shall typically be installed into the vertical surface of a structure.
 - 2. To monitor a support of excavation system, use an observable point punchmarked on the top horizontal surface of soldier pile, or other steel surface. The steel surface within 3 inches of the point shall be cleaned by wire brush to permit easy identification of the exact point. The point shall also be clearly identified using fluorescent spray paint adjacent to the point.
- C. DMP Type 3 shall consist of a 5-foot-long, ¾ inch diameter steel rod and a surface roadway box. Top of rod shall be rounded, and punch marked at its center.

2.04 INCLINOMETERS

- A. Inclinator casing shall be 2.75-inch OD ABS plastic casing for installation in the ground, internally grooved to receive the inclinometer.
- B. Provide couplings, locking devices, caps and grout of the sizes and types recommended by the manufacturer.
- C. Provide grout mix conforming to the recommendations of the manufacturer's instrument installation specification.

- D. Provide granular bentonite by Holeplug®, as manufactured by Baroid, or acceptable equivalent for the bentonite seal.

2.05 OBSERVATION WELLS

- A. Provide slotted pipe, 1 ¼ inch Schedule 80 PVC pipe with three rows 0.01-inch-wide slots on 120 degree centers with the slot to leave 0.25 inch between rows. The riser pipe shall be 1 ¼ inch 80 flush-joint PVC pipe.
- B. Provide filter sand conforming to ASTM C778, Standard Specification for Standard Sand, for 20-40 sand.
- C. Provide granular bentonite by Holeplug®, as manufactured by Baroid, or acceptable equivalent for the bentonite seal.

2.06 SEISMOGRAPHS

- A. Seismic range: 0.01 to 4 inches per second with accuracy of ±5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.01 inch per second or less.
- B. Acoustic range: 110 to 140 dB (referenced to 20 micro-Pascals) with an accuracy and resolution of ±1 dB.
- C. Frequency response (±3 dB points): 2 to 200 Hertz.
- D. Three channels for vibration monitoring.
- E. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
- F. Capable of internal dynamic calibration.
- G. Capable to transfer data electronically. Instruments must be capable of producing strip chart recordings of readings on site within 1 hour of obtaining the readings. Provide computer software to perform analysis, produce reports of continuous monitoring, and to perform zero-crossing frequency analyses of waveform data.
- H. Self-triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, peak overpressure, frequencies of peaks.
- I. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of 1 minute or less.

2.07 UTILITY MONITORING POINTS

- A. Provide steel pipe flange, 1-inch-diameter, ASTM A403, machined to fit within 3 ½ inch extra strong steel sleeve.
- B. Provide 3 ½ inch extra strong steel sleeve pipe, threaded and coupled, ASTM A53 Grade B.
- C. Provide 1 inch extra strong steel riser pipe, threaded and coupled, ASTM A53 Grade B.

- D. Provide PVC centralizers. Centralizers shall consist of a Schedule 40 PVC pipe conforming to ASTM D1785, sized to provide a tight fit on the riser pipe, and spring-formed to a larger diameter to provide a loose fit in the sleeve pipe.
- E. Provide 24 inch by 24 inches by ¼ inch steel plate with a central hole.
- F. Provide steel pipe clamp to fit 3 ½ inch extra strong steel pipe. Steel plate and pipe clamp assembly shall be capable of transferring the total weight of the 3 ½ inch extra strong pipe to the soil underlying the steel plate. The assembly shall also be capable of maintaining its position on the 3 ½ inch extra strong steel pipe over time.
- G. Provide oakum.
- H. Provide 1-inch pipe cap with ¼ inch diameter round head stainless steel bolt set securely in cap.

2.08 IDENTIFICATION TAGS

- A. Provide each instrument with a stainless-steel indented name tag designating the instrument number.
- B. For name tags that cannot be attached directly to the associated instrument, mount on the associated structure or enclosure as close as practicable to allow convenient, unambiguous reading. Mount using epoxy or other adhesive as recommended by name tag manufacturer.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

- A. Installation shall be in accordance with the details shown on the Drawings.
- B. When instruments are received at the site, the Contractors instrumentation personnel shall perform pre-installation acceptance tests to ensure that the instruments and readout units are functioning correctly prior to installation.
- C. Installation procedures for instruments in boreholes shall be such that all steps in the procedure can be quality assured. Granular bentonite shall be placed in depth increments not exceeding two (2) feet. Volumes of each increment of backfilling with sand shall be small enough such that no bridging occurs. The depth to the top of each increment of sand or granular bentonite shall be checked after placement.
- D. Prior to installing any instrument through drill casing or augers, all material adhering to the inside of the casing or augers, and all cuttings, shall be removed thoroughly.
- E. After completion of installation, a record sheet shall be prepared, including appropriate items from the following list:
 - 1. Project name.
 - 2. Contract name and number.
 - 3. Instrument type and number, including readout unit.
 - 4. Personnel responsible for installation.

5. Plant and equipment used, including diameter and depth of any drill casing or augers used.
 6. Date and time of start and completion.
 7. A log of subsurface data indicating the elevations of strata changes encountered in the borehole.
 8. Type of backfill used.
 9. Notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior.
- F. After completion of installation of a DMP, the as-built location in horizontal position and elevation shall be determined as follows:
1. For DMPs that require distance monitoring, horizontal deformation monitoring and vertical deformation monitoring, determine distance to an accuracy of ± 0.01 foot, horizontal position to an accuracy of ± 0.01 foot and elevation to an accuracy of ± 0.01 foot (at 95 percent level of confidence).
 2. For DMPs that require both distance monitoring and vertical deformation monitoring, determine distance to an accuracy of ± 0.01 foot, horizontal position to an accuracy of ± 0.1 foot and elevation to an accuracy of ± 0.01 foot (at 95 percent level of confidence).
 3. For DMPs that require vertical deformation monitoring only, determine horizontal position to an accuracy of ± 0.1 foot and the elevation to an accuracy of ± 0.01 foot (at 95 percent level of confidence).
- G. For INCL, one set of grooves, defined as the A-axis, shall be oriented perpendicular to the excavation. Casing groove orientation shall be maintained throughout installation. A post-installation acceptance test shall be performed to verify that there is no grout in the inclinometer casing, that groove orientation and verticality are correct, and that the inclinometer probe tracks correctly in all four orientations.
- H. After completion of INCL installation, the as-built location in horizontal position shall be determined to an accuracy of ± 0.03 foot, and the elevation of the top of the inclinometer casing to an accuracy of ± 0.01 foot. The point selected to determine horizontal position shall be indicated on the installation record sheet.
- I. After completion of OW and UMP installation, the as-built location in horizontal position shall be determined to an accuracy of ± 1 foot and the elevation to an accuracy of ± 0.01 foot.
- J. After completion of installation, establish baseline readings.
1. Baseline readings for a DMPs and UMPs will consist of three (3) readings with 24 hours minimum between readings.
 2. A baseline reading for an INCL will consist of the average of stable readings over a 72-hour period.
 3. The initial reading for a OW will consist of the average of three (3) readings taken an hour apart.

3.02 DATA COLLECTION

A. Monitor instruments using the following schedule when construction activities are within 100 feet of the instruments.

1. DMP – Type 1 Daily
2. DMP – Type 2 Daily
3. DMP – Type 3 Daily
4. Inclinometers Bi -Weekly
5. Observations Wells Weekly
6. Seismographs Monitor during construction activities
7. Utility Monitoring Points Daily

B. The PM/CM may increase the reading frequency of readings at no additional cost.

C. Data shall be recorded on field data records in U.S. Customary Units, such as feet, inches, pounds, and shall include at least the following:

1. Project Name
2. Contract Name and Number
3. Instrument Type
4. Date and Time
5. Observer
6. Readout Unit Number
7. Instrument Number
8. Readings
9. Remarks
10. Visual Observations
11. Other causal data including weather, temperature, and construction activities.

3.03 REPORTING

A. The Contractor shall provide raw field data (daily) and plots (weekly) in electronic format. The weekly data should include a description of work conducted during that week.

B. The Monthly Instrumentation Report shall include the following:

1. A description and location of construction activities.
2. Raw and reduced data shall be on summary tables in printed tabular and electronic format.
3. Data plots shall show the Response Values for each type of instrument.
4. A report of any unusual events that may have affected the instrumentation readings. This report shall include a description of any remedial or precautionary

measures that were implemented during the month in response to geotechnical instrumentation or other data, including when they were implemented and for what reason. The report shall also include a description of any future remedial or precautionary measures that are planned in response to existing geotechnical instrumentation.

- C. The following types of plot types shall apply to the data the Contractor supplies.
1. Plots of OW data shall show water level elevation versus time.
 2. Plots of UMP data shall show absolute vertical deformation versus time.
 3. Plots of DMP shall show deformation versus time.
 4. Plots of inclinometer data shall be “cumulative change” data, showing absolute horizontal deformation versus depth, and “change” data showing incremental deflection versus depth. The top of the inclinometer casing (excluding any extension length added during data collection) shall be used as a datum for depth measurement. Multiple plots shall be on the same sheet to provide a time history, each labeled with the date. Each plot shall include the instrument numbers and coordinate location.
 5. Plots of seismograph data shall be the following types: strip charts and full waveform plots.
 - a. For seismograph data collected in continuous monitoring (strip chart) mode the Contractor shall provide a permanent record of single-component peak particle velocity. The strip chart shall also indicate the time and magnitude of maximum single-component peak particle velocity measured during each 1 hour interval of the monitoring period.
 - b. For seismograph full waveform data, the Contractor shall provide plots consisting of a graphical display of the three component particle velocities and overpressure levels during the entire course of the vibration-producing construction activity.
- D. For any data from an instrument that has been installed to replace a damaged instrument, the formal initial reading for the damaged instrument shall be used as an initial reading for the replacement instrument so that data are plotted continuously, without an offset at the time of damage. The time of damage and replacement shall be noted on the plot.

3.04 INTERPRETATION AND IMPLEMENTATION OF ACTION PLANS

- A. The PM/CM will have the right to perform its own interpretation of the data collected and provided by the Contractor. However, the Contractor will have the primary responsibility for interpretation. Interpretation shall include making correlations between instrumentation data and specific construction activities. Instrumentation data shall be evaluated to determine whether the response to construction activities is reasonable.
- B. The Contract Drawings indicate Response Values (where appropriate) for selected instruments. The actions associated with these Response Values are defined below. Response Values are subject to adjustment by the PM/CM as indicated by prevailing conditions or circumstances.

- C. If a Review Value is reached for an instruments, the Contractor shall:
1. Meet with the PM/CM to discuss the need for response action(s).
 2. If directed by the PM/CM, during the above meeting, that a response action is needed, within 24 hours of receiving instrumentation data from the Contractor indicating that a Review Value has been reached, submit a detailed specific plan of action, based as appropriate on the generalized plan of action submitted previously in accordance with this section.
 3. If directed by the PM/CM, implement response action(s) within 24 hours of submitting a detailed specific plan of action.
 4. Install additional instruments if directed by the PM/CM.
 5. Increase frequency of readings if directed to do so by the PM/CM or as deemed necessary by the Contractor.
- D. If an Alert Value is reached for an instrument, the Contractor shall:
1. Terminate further work activity that will impact the condition measured by the instrument.
 2. Meet with the PM/CM to discuss the need for response action(s).
 3. If directed by the PM/CM, during the above meeting, that a response action is needed, within 24 hours of receiving instrumentation data from the Contractor indicating that an Alert Value has been reached, submit a detailed specific plan of action, based as appropriate on the generalized plan of action submitted previously in accordance with this section.
 4. If directed by the PM/CM, implement response action(s) within 24 hours of submitting a detailed specific plan of action.
 5. Install additional instruments if directed by the PM/CM.
 6. Increase frequency of readings if directed to do so by the PM/CM, or as deemed necessary by the Contractor.
- E. The Contractor shall take all necessary steps so damage to adjacent and newly constructed facilities does not result. The Contractor may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid damage.

3.05 DISCLOSURE

- A. The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent of the Owner.

3.06 DECOMMISSIONING

- A. Remove salvageable instruments only when directed by the PM/CM. All salvaged instruments shall become the property of the Contractor.
- B. Upon completion of the Work, as directed by the PM/CM, the Contractor shall remove and dispose of those portions of instruments constituting an obstruction, including DMPs, INCLs, and UMPs.

1. The upper two (2) feet of the instrument shall be removed, together with the ground surface protection.
2. The remaining open portions of the instrument and casing shall be backfilled with cement grout up to a level two (2) feet below the ground surface, and with lean concrete in the upper two (2) feet.
3. New pavement patches shall be constructed, in paved areas, of the same material and to the same thickness as existing adjacent pavement.
4. Disturbed or damaged surfaces shall be restored to the condition existing before installation of the instrument to the satisfaction of the PM/CM.

3.07 FIELD QUALITY CONTROL

- A. Protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, weather, traffic, and vandalism.
- B. Replace damaged or inoperative instruments within 72 hours. Replacement shall be at Contractors expense. The Contractor shall notify the PM/CM at least 24 hours prior to replacing a damaged or inoperative instrument.

TABLE 1. RESPONSE VALUES

Instrument Type	Instrument Criteria	
	Review	Alert
Deformation Monitoring Points (Type 1)	$\frac{3}{4}$ inch Vertical	1 inch Vertical
Deformation Monitoring Points (Type 1) Retaining Wall	$\frac{3}{4}$ inch Vertical $\frac{3}{8}$ inch Horizontal	1 inch Vertical $\frac{3}{4}$ inch Horizontal
Deformation Monitoring Points (Type 2)	$\frac{3}{4}$ inch Vertical	1 inch Vertical
Deformation Monitoring Points (Type 3)	$\frac{3}{4}$ inch Vertical	1 inch Vertical
Deformation Monitoring Points (Type 3) Gas Lines	$\frac{1}{8}$ inch Vertical	$\frac{1}{4}$ inch Vertical
Inclinometer	1 inches	2 inches
Seismographs	Maximum ppv = 1.0 inch per second	Maximum ppv = 2.0 inch per second
Utility Monitoring Points	$\frac{3}{4}$ inch Vertical	1 $\frac{1}{2}$ inches Vertical

END OF SECTION 02295

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SECTION 02315

PIPE JACKING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies minimum design and performance requirements for the construction of four tunnel drives using pipe jacking methods for a one-pass installation of reinforced concrete pipe (RCP) to the limits indicated on the Contract Drawings. Requirements for the RCP are specified elsewhere.
- B. The pipe jacking drives, and approximate length are as follows:
 - 1. Drive 1 – MH213-1 to Diversion Structure 210, 62 feet.
 - 2. Drive 2 – Diversion Structure 213 to MH213-3, 185 feet
 - 3. Drive 3 – MH217-1 to MH217-2, 19 feet.
 - 4. Drive 4 – MH217-2 to MH217-3, 214 feet.
- C. Coordinate requirements for pipe jacking operations with Section 02240 and Section 02260.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
 - 1. Section 01060 – Permits and Regulatory Requirements
 - 2. Section 01300 – Submittals
 - 3. Section 02240 – Construction Water Handling
 - 4. Section 02260 – Support of Excavation
 - 5. Section 02295 – Geotechnical Instrumentation and Monitoring
 - 6. Section 02317 – Reinforced Concrete Pipe for Pipe Jacking

1.03 REFERENCES

- A. The following Standards apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
 - 1. American Society of Civil Engineers (ASCE)
 - a. Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction, Standards ASCE/CI 27-17
 - 2. American Welding Society (AWS)

- a. D1.1 Structural Welding Code-Steel.
- 3. Occupational Safety and Health Administration (OSHA)
 - a. Regulations and Standards for Underground Construction.

1.04 DEFINITIONS

- A. Annular Space: The void created between the outside of the pipe being installed and the extreme outer limits created by the shield.
- B. Contact Grouting: Grout injected into the theoretical space between the pipe and the ground after the drive is complete.
- A. Guidance System: System that locates the actual position of the pipe jacking shield relative to the laser or other device.
- C. Jacking Frame: A structural component, that houses the hydraulic cylinders used to propel the jacking shield and pipe. The jacking frame cradles the jacking shield and pipe and serves to distribute the thrust load to the pipeline and the reaction load to the shaft wall or thrust block.
- D. Jacking Shield: A shield attached to the leading edge of the pipe.
- E. Launching Shaft: A shaft from which the pipe jacking operations are conducted including launch of the jacking shield, pipe placement, and spoils removal.
- F. Laser: A device commonly incorporated into the guidance system and used to track alignment and grade during the jacking operations.
- G. Lubricant: A substance applied between the pipe and ground to minimize friction and fill annular space.
- H. Receiving Shaft: A shaft used for which the retrieval operations for the jacking shield are conducted.
- I. Thrust Block: Concrete or steel wall at the back of the shaft providing a reaction for jacks pushing the pipe.

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Qualifications
 - 1. The design of the pipe jacking work shall be performed by a Professional Engineer licensed in the State of Rhode Island having not less than five (5) successful projects of similar type, size, and complexity.
 - 2. The pipe jacking work shall be performed by a Specialty Subcontractor having not less than ten (10) successful projects of similar type, size, and complexity. Experience shall include installing pipe in similar site and subsurface conditions.
 - 3. The pipe jacking work shall be under the supervision of a Superintendent(s) having not less than five (5) years of recent experience and have successful projects of similar type, size, and complexity.

4. The pipe jacking machine operator(s) shall be trained in the operation of the proposed equipment by the machine manufacturer and shall have completed at least two (2) similar recent projects of similar type, size, and complexity.
 5. The person in responsible charge of surveying shall be a Registered Land Surveyor in the State of Rhode Island with experience in measurements of the types and accuracies required for the work.
- C. Any welding required shall be performed by certified welders in accordance with AWS D1.1.
- D. The Contractor shall perform the work to limit movements in accordance with Section 02295.
- E. The pipe shall be installed within the line and grade tolerances as indicated on the Contract Drawings.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submittals herein shall be submitted at the same time and in full coordination with the required submittals of Section 02240 and Section 02260.
- C. Submit shop drawings, engineering calculations, and method statement signed and sealed by a Licensed Professional Engineer registered in the State of Rhode Island at least thirty (30) days prior to the start of the work. Include, at a minimum, the following:
1. Calculations that demonstrate that the pipe to be jacked has been designed to support the maximum anticipated loads anticipated during installation. Provide details for pipe wall thickness, grout fittings, and joint details.
 2. Indicate estimated jacking loads for each drive and design for thrust blocks.
 3. Description of method for breaking out of and into shafts.
 4. Description of the pipe jacking equipment.
 5. Description of equipment for line and grade control. Include method for mounting laser or equivalent device used with measures employed to isolate it from excavation supports systems and deflections caused by ground or support wall movement.
 6. Description of equipment, materials, and procedures for the mixing and delivery system for lubricating exterior of the pipe during jacking operations.
 7. Description of equipment, materials, and procedures for injection of cement grout between the installed pipe and the earth. Provide mix design for contact grout.
 8. Layout drawings for each site subject to the limits indicated on the Contract Drawings. Provide details for lighting, ventilation, electrical systems, and ancillary support equipment.
 9. Manufacturers' product data, certificates, and test data for any manufactured materials incorporated.

10. Include contingency plans for excessive movement of ground, alignment adjustments, temporary excavation support system for Launching and Receiving Shafts, or existing structures or utilities in excess of allowable movement. Contingency plans shall include positive measures by the Contractor to limit further movement of ground or existing structures or utilities. Coordinate the contingency plans with Section 02295.

- D. Submit qualifications and experience records for personnel as specified herein.
- E. Submit Daily Activity Logs regardless of progress to include, at a minimum, the following:
 - 1. Crew size, employee classification, and employee work assignment.
 - 2. Tunneling equipment data including stationing, distance along drive, thrust force, bentonite injection locations and amounts, steering adjustments, and other pertinent information. Provide this information for each length of product pipe.
- F. Submit as-built data for the final tunneled alignment(s).

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

A. Tolerances

1. Line and Grade

- a. As indicated on the Contract Drawings.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule, installation, operation, monitoring, and removal.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufactures recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide materials and equipment that are either new or in serviceable condition and free from defects that impair their strength or performance.

2.02 MATERIALS

- A. Refer to Section 02317 for requirements for RCP.
- B. Provide water used for making pipe lubricant that is clean, fresh, and free from oil, acid, alkali, organic matter, or other deleterious substances, and of a neutral pH.
- C. Provide bentonite and polymers used for pipe lubrication that are non-toxic and that do not adversely affect groundwater quality. The use of polymers shall be subject to review and acceptance of the PM/CM.
- D. Cement grout shall be a readily pumpable mixture of Portland cement and bentonite or similar commercial product with a minimum compressive strength of 500 psi.

2.03 EQUIPMENT

A. General

1. Pipe jacking equipment shall be capable of advancing through the geologic conditions described in the Geotechnical Data Report (GDR).
2. Equipment shall have the means for laser-guided operation and monitoring.
3. Provide gaskets to prevent material from flowing through the contact between the jacking shield and the leading edge of the pipe.
4. Limit overcut to no more than 1-inch over the outside diameter of the pipe.
5. Equip pipe jacks with positive locking mechanism in the event of a loss of hydraulics.
6. Provide a bentonite injection system for injection as a pipe lubricant.

B. Jacking Shield

1. The pipe shall be installed with the use of a jacking shield attached to the leading edge of the pipe. The shield shall be of steel construction designed to support the required ground loading and jacking stresses and shall be adequately braced and be provided with the necessary appurtenances for completely bulkheading the face with horizontal or vertical breastboards. The shield shall be capable of being steered by steering jacks located in the shield or other suitable means.

C. Jacking System

1. Provide a jacking frame with suitable hydraulic jacks for developing a uniform distribution of jacking forces around the perimeter of the pipe. Provide a jacking frame that reacts against a thrust block, the face of which shall be perpendicular to the centerline of the jacked pipe alignment.
2. Provide jacks with pressure limiting devices such that the ultimate jacking load capacity of the pipe is not exceeded.

D. Spoil Transport

1. Provide a spoil transportation system that has the capability of matching the excavation rate of the pipe jacking advance to the rate of spoil removal.

2.04 SOURCE QUALITY CONTROL

- A. Only materials meeting the requirements of these specifications shall be used.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence pipe jacking operations only after submittals have been reviewed and accepted by the PM/CM and applicable permits have been obtained.
- B. Conduct all work within the construction limits established for the project.
- C. Provide adequate ventilation, cooling, and dust removal to provide acceptable air quality and environmental conditions in accordance with applicable federal, state, and local regulatory requirements.
- D. Mount laser equipment independently from the thrust block and jacking frame.

3.02 PIPE JACKING

- A. Operate all pipe jacking equipment and systems in accordance with the equipment manufacturer's guidelines and recommendations.
- B. Complete all required set-up procedures and system checks and demonstrate that all required materials are at hand prior to commencing any pipe jack drive.
- C. Jack each pipe section forward as the excavation progresses so as to provide complete and adequate ground support at all times.
- D. Any methods which employ simultaneous boring ahead of the pipe and jacking will not be permitted.
- E. Inject pressurized lubricant around the leading edge of the pipe being jacked and through the ports in the pipe being jacked, as necessary.
- F. Maximize safety and avoid exposure of personnel and equipment to hazardous and potentially hazardous conditions, in accordance with applicable safety standards and Contractor's safety procedures.
- G. Whenever there is an emergency which may potentially endanger the tunnel excavation, existing structures or utilities, operate a full work force for 24 hours a day, including weekends and holidays, without interruption until the emergency no longer jeopardizes the stability and safety of the pipe jacking operations.
- H. Maintain a Daily Activity Log during each drive and make it available for review by the PM/CM at any time.

3.03 GROUTING

- A. After completion of a pipe segment, inject cement grout through the grout ports from the interior of the installed pipe to fill voids and displace lubricating grout outside of the jacked pipe.
- B. Grout pressure shall not exceed one-half of the existing total overburden pressure.
- C. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable device until cement grout has set sufficiently for a minimum of 24 hours. After the grout is set, grout holes shall be completely filled with dense concrete and finished without evidence of voids or projections.

END OF SECTION 02315

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SECTION 02316

SHIELD DRIVEN TUNNEL EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies minimum design and performance requirements for the construction of one tunnel drive using a shield driven tunnel excavation method for a two-pass installation of reinforced concrete pipe (RCP) to the limits indicated on the Contract Drawings. Requirements for the RCP are specified elsewhere.
- B. The tunnel drive and approximate length are as follows:
 - 1. Drive 1 – GSS-1 to the Junction Chamber, 40 feet.
- C. Steel liner plate shall be used as the initial support lining. Other methods may be proposed subject to the review and approval of the PM/CM.
- D. Coordinate requirements for tunneling operations with Section 02240 and Section 02260.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
 - 1. Section 01060 – Permits and Regulatory Requirements
 - 2. Section 01300 – Submittals
 - 3. Section 02240 – Construction Water Handling
 - 4. Section 02260 – Support of Excavation
 - 5. Section 02295 – Geotechnical Instrumentation and Monitoring

1.03 REFERENCES

- A. The following Standards apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
 - 1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. Specification for Highway Bridges, Section 15, Steel Tunnel Liner Plates
 - 2. American Society for Testing and Materials (ASTM) International:
 - a. ASTM A1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

- b. ASTM C31, Practice for Making and Curing Concrete Test Specimens in the Field.
 - c. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - d. ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - e. ASTM C150, Specification for Portland Cement.
3. American Welding Society (AWS)
- a. D1.1 Structural Welding Code-Steel.
4. Occupational Safety and Health Administration (OSHA)
- a. Regulations and Standards for Underground Construction.

1.04 DEFINITIONS

- A. Annular Space: The void created between the outside of the RCP pipe being installed and the inside of the initial support.
- B. Annular Space Grouting: The systematic injection of grout to specified limits of pressures to achieve continuous contact between the RCP installed inside the liner plate to completely fill the tunnel Annular Space surrounding the existing pipe.
- C. Contact Grouting: Grout injected into the theoretical space between the liner plate and the ground after the excavation is complete.
- D. Guidance System: A system that locates the actual position of the shield relative to the laser or other device.
- E. Laser: A device commonly incorporated into the guidance system and used to track alignment and grade during the tunneling operations.
- F. Launching Shaft: A shaft from which the tunneling operations are conducted including launch of the tunneling shield, pipe placement, and spoils removal.
- G. Receiving Shaft: A shaft used for which the retrieval operations for the tunneling shield are conducted.
- A. Refusal: When grout take is below 0.50 cubic feet per minute over a continuous 1-minute period at the maximum specified injection pressure for the RCP.
- H. Two-pass Lining System: A two-pass lining system is one in which an initial support lining is placed as the tunnel is excavated and the final lining is placed later, typically after tunnel excavation is completed.

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Qualifications

1. The design of the shield driven tunneling work shall be performed by a Professional Engineer licensed in the State of Rhode Island having not less than five (5) successful projects of similar type, size, and complexity.
 2. The shield driven tunneling work shall be performed by a Specialty Subcontractor having not less than ten (10) successful projects of similar type, size, and complexity. Experience shall include installing pipe in similar site and subsurface conditions.
 3. The shield driven tunneling work shall be under the supervision of a Superintendent(s) having not less than five (5) years of recent experience and have successful projects of similar type, size, and complexity.
 4. The person in responsible charge of surveying shall be a Registered Land Surveyor in the State of Rhode island with experience in measurements of the types and accuracies required for the work.
- C. Any welding required shall be performed by certified welders in accordance with AWS D1.1.
- D. The Contractor shall perform the work to limit movements in accordance with Section 02295.
- E. The pipe shall be installed within the line and grade tolerances as indicated on the Contract Drawings.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submittals required herein shall be submitted at the same time and in full coordination with the required submittals of Section 02240 and Section 02260.
- C. Submit engineering calculations, shop drawings, and method statement signed and sealed by a Licensed Professional Engineer registered in the State of Rhode Island at least thirty (30) days prior to the start of the work. Include, at a minimum, the following:
1. Calculations that demonstrate that the shield and initial support lining has been designed to support the maximum loads anticipated during installation.
 2. Shop drawings for the equipment. Provide details of the propulsion system and face support provisions.
 3. Shop drawings for initial support system detailing dimensions, thicknesses, and material composition for the system, including appurtenant items as needed for installation.
 4. Method statement to include the following:
 - a. Layout drawings for the site subject to the limits indicated on the Contract Drawings. Provide details for lighting, ventilation, power systems and source, and ancillary support equipment.
 - b. Include information for the guidance and steering control system.
 - c. Details for breaking out of and into shafts.

- d. Method for groundwater control.
 - e. Methods proposed for installation and removal of the tunnel shield.
 - f. Description of equipment, materials, and procedures for injection of cement grout between the initial support lining and the ground. Provide mix design for Contact Grouting.
 - g. Methods for installing the final lining (RCP). Describe the type and use of blocking, wedging, strapping, and other appurtenances required.
 - h. Description of equipment, materials, and procedures for injection of cement grout between the initial support lining and the RCP. Provide mix design for Annular Space Grouting.
 - i. Include contingency plans for excessive movement of ground, alignment adjustments, temporary excavation support system for launching and receiving shafts, or existing structures or utilities in excess of allowable movement. Contingency plans shall include positive measures by the Contractor to limit further movement of ground or existing structures or utilities. Coordinate the contingency plans with Section 02295.
5. Manufacturers' product data, certificates, and test data for any manufactured materials incorporated.
- D. Submit qualifications and experience records for personnel as specified herein.
- E. Submit Daily Activity Logs regardless of progress to include, at a minimum, the following:
- 1. Crew size, employee classification and employee work assignment.
 - 2. Tunneling equipment data including stationing, distance along drive, rate of advance, line and grade deviation, steering adjustments, and other pertinent information.
- F. Submit as-built data for the final tunneled alignment.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Design the initial support lining and shield to accommodate the thrust required to advance the shield while excavating.
- B. Tolerances
- 1. Line and Grade
 - a. As indicated on the Contract Drawings.
- C. Design of Annular Space Grouting and Contact Grouting shall be determined by the Specialty Subcontractor subject to the minimum performance criteria as follows:
- 1. Grout shall be a neat cement mix with a minimum 1:1 water to cement ratio.
 - 2. Grout shall have a minimum one (1) day compressive strength of 100 pounds per square inch (psi), 7-day compressive strength of 300 psi, and a 28-day compressive strength of 500 psi in accordance with ASTM C39 or ASTM C109.

3. The maximum pressure at the point of injection for Annular Space Grouting shall not exceed 30 psi.
4. The maximum pressure for Contact Grouting shall not exceed one-half of the existing total overburden pressure.
5. Grout samples shall be acceptable if all production 28-day samples meet minimum 28-day strength or if the average of all production 28-day samples meet minimum 28-day strength and the weakest strength is within 10 percent of the minimum 28-day strength.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule and anticipated performance for installation, operation, monitoring, and removal.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufactures recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide materials that are either new or in serviceable condition and free from defects that impair their strength or performance.
- B. Materials and equipment used shall adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of the dewatering work.

2.02 MATERIALS

- A. Refer to the Contract Drawings for requirements for RCP.
- B. Provide water that is clean, fresh, and free from oil, acid, alkali, organic matter, or other deleterious substances, and of a neutral pH.
- B. Cementous Materials
 1. Portland cement shall conform to ASTM C150, Type 1/II.

- C. Liner Plate shall be four flange-type plate and:
1. Hot rolled, carbon steel sheets or plates conforming to ASTM A1011 and the following:
 2. Tensile strength: 42,000 psi
 3. Yield strength: 28,000 psi
 4. Elongation in 2 inches: 30 percent
 5. Plate gauge shall be determined by the Contractor; however, minimum plate gauge shall be as indicated. Thickness tolerance shall conform to AASHTO specification for Highway Bridges, Section 15.
 6. Equip no less than one plate in each course with a 2-inch threaded, capped port.
 7. Bolts and nuts shall be coarse threaded, conforming to ASTM A307. Bolt diameter shall be 5/8 inch minimum. Bolt length shall be as recommended by the manufacturer.

2.03 EQUIPMENT

A. General

1. The equipment shall be capable of advancing through the geologic conditions indicated in the Geotechnical Data Report (GDR).
2. Equip pipe jacks with positive locking mechanism in the event of a loss of hydraulics.

B. Jacking Shield

1. The initial support lining shall be installed with the use of a jacking shield that is thrust of the initial support. The shield shall be of steel construction designed to support the required soil and rock loading and jacking stresses and shall be adequately braced and be provided with the necessary appurtenances for completely bulkheading the face with horizontal or vertical breastboards. The shield shall be capable of being steered by steering jacks located in the shield or other suitable means.

C. Jacking System

1. Provide suitable hydraulic jacks for developing a uniform distribution of jacking forces around the perimeter of the shield.
2. Provide jacks with pressure limiting devices such that the ultimate jacking load capacity of the shield is not exceeded.

D. Spoil Transport

1. Provide a spoil transportation system that has the capability of matching the excavation rate of the tunnel advance to the rate of spoil removal.

E. Grouting

1. Annular Space Grouting and Contact Grouting equipment shall be specifically designed for the type of grouting being performed.

2. Grout mixers shall ensure complete and uniform mixing of grout materials and shall be of sufficient capacity to continuously feed the pumping unit at normal pumping rate.
3. Grout pumps shall be capable of controlled pumping rates and shall be equipped with calibrated gauges capable of displaying grout pressure flow rate, and injection volume.
4. Use a pressure gage that displays readings in 1.0 psi increments.

2.04 SOURCE QUALITY CONTROL

- A. Only materials meeting the requirements of these specifications shall be used.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence tunneling operations only after design calculations and shop drawings have been reviewed and accepted by the PM/CM and applicable permits have been obtained.
- B. Conduct all work within the construction limits established for the project.
- C. Provide adequate ventilation, cooling, and dust removal to provide acceptable air quality and environmental conditions in accordance with applicable federal, state and local regulatory requirements.

3.02 EXCAVATION AND INSTALLATION OF INITIAL SUPPORT

- A. Operate all equipment and systems in accordance with the equipment manufacturer's guidelines and recommendations.
- B. Complete all required set-up procedures and system checks and demonstrate that all required materials are at hand prior to commencing the drive.
- C. Maintain stability of the face at all times using positive measures such as breasting and shield breast plates that do not rely on hydraulic pressure, and local dewatering.
- D. Advance initial support system concurrently with the excavation, while maintaining full support of arch, sidewalls, and invert at all locations.
- E. Erect liner plate in accordance with manufacturer's recommendations. Stagger longitudinal joints between courses.
- F. Monitor installed initial support and repair or remove and replace improperly installed or damaged initial support elements.
- G. Maximize safety and avoid exposure of personnel and equipment to hazardous and potentially hazardous conditions, in accordance with applicable safety standards and Contractor's safety procedures.
- H. Whenever there is an emergency which may potentially endanger the tunnel excavation, existing structures or utilities, operate a full work force for 24 hours a day, including weekends and holidays, without interruption until the emergency no longer jeopardizes the stability and safety of the tunneling operations.

- I. Maintain a Daily Activity Log during each drive and make it available for review by the PM/CM at any time.

3.03 CONTACT GROUTING

- A. After completion of a pipe segment, inject cement grout through the grout ports from the interior of the installed liner plate to fill voids between the installed liner plate and the ground.
- B. Measure and record volumes of grout placed, pumping pressures, injection rates, and time and date of injection at each grout hole.
- C. Dispose of grout that cannot be placed or injected prior to initial set or maximum specified time limit as defined by the grout mix design.
- D. Upon discharge into the pump hopper or holding tank, the grout must be continuously agitated. Mixed grout may not be held in the agitator for more than two (2) hours unless a set retarder is used.
- E. After Contact Grouting is complete, pressure shall be maintained by means of stopcocks or other suitable device until cement grout has set sufficiently for a minimum of 24 hours. After the grout is set, grout holes shall be completely filled with suitable plugs as recommended by the manufacture of the grout holes.

3.04 RCP INSTALLATION AND ANNULAR SPACE GROUTING

- A. Install each RCP segment by joining to the preceding pipe segment in its final configuration; the lead end supported to its final alignment and blocked-in place prior to joining the subsequent pipe section.
- B. Leave adjacent grout holes open during Annular Space Grouting operations to facilitate the escape of air and water from pockets in the space surrounding the RCP. Where grout is found to issue forth from an adjacent grout connection at the same rate, and with the same consistency as that being injected, close valves on such adjacent connections.
- C. Start grouting from lower elevation end of the tunnel segment and work upward. At each longitudinal station, grout lower holes first.
- D. Grout all holes, regardless of grout communication with that hole.
- E. Inject grout until refusal occurs.
- F. Measure and record volumes of grout placed, pumping pressures, injection rates, and time and date of injection at each grout hole.
- G. Dispose of grout that cannot be placed or injected prior to initial set or maximum specified time limit as defined by the grout mix design.
- H. Upon discharge into the pump hopper or holding tank, the grout must be continuously agitated. Mixed grout may not be held in the agitator for more than two (2) hours unless a set retarder is used.
- I. Completion of Annular Space Grouting
 1. Grouting at each port is complete when refusal, as defined herein, is met.

2. Upon completion of the grouting at each connection, close the connection valve and leave it in place until the grout has set.
3. Upon removal of the grout port after the Annular Space Grout has set, provide suitable plugs as recommended by the manufacturer for the grout holes. Repair the hole in the pipe with supplier-recommended materials and procedures.

3.05 FIELD QUALITY CONTROL

C. Grout Samples for Testing

1. Prepare and test grout samples according to ASTM C109 for cubes or ASTM C39 for cylinders.
2. Grout for the test samples shall be taken from the nozzle of the grout injection line. Provide at least one set of six (6) samples for each 100 cubic feet of grout injected, but not less than one set for each batch. Test 24-hour, 7-day, and 28-day strengths in accordance with ASTM C109 or ASTM C39. Hold unused samples for 56-day tests if test results do not meet the strength requirements in the time specified herein.

A. Notifications

1. Notify the PM/CM immediately of any permit compliance limit or standard exceedance.

END OF SECTION 02316

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SECTION 02317

REINFORCED CONCRETE PIPE FOR PIPE JACKING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for designing, manufacturing, and furnishing of reinforced concrete pipe (RCP) for pipe jacking t, including all pipe joint components, and all related materials that shall remain as permanent components of the pipeline installed by one pass pipe jacking approach, as specified herein and shown on the Contract Drawings.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
1. Section 01300 – Submittals
 2. Section 02315 – Pipe Jacking
 3. Section 03300 – Cast-in-Place Concrete

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.
1. American Society of Civil Engineers (ASCE)
 - a. 27-17 - Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
 2. American Society for Testing and Materials (ASTM)
 - a. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - b. A185 - Standard Specification for Steel Wire, Fabric, Plain for Concrete Reinforcement Pipe.
 - c. A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - d. A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - e. C33 - Standard Specification for Concrete Aggregate.
 - f. C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - g. C150 - Standard Specification for Portland Cement.

- h. C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
 - i. C497 - Standard Test Methods for Concrete Pipe, Concrete Box Sections, Manhole Sections, or Tile.
 - j. C822 - Standard Terminology Relating to Concrete Pipe and Related Products.
 - k. C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 - l. C1619 - Standard Specification for Elastomeric seals for joining concrete structures.
 - m. C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
3. American Water Works Association (AWWA)
- a. C302 - Standard for Reinforced Concrete Pressure Pipe

1.04 DEFINITIONS

- A. Concrete Jacking Pipe: Precast reinforced concrete pipe with flush bell and spigot joints sealed with rubbers gaskets and specifically designed to handle loads due to jacking installation and shall also serve as a product pipe. Referred to herein as Jacking Pipe.
- B. See Section 02315 for additional definitions.

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Manufacturer's Qualifications:
 - 1. Provide experience record listing projects with references and contact information. List projects for which RCP, 42-inch diameter or larger, was manufactured within the last 5 years.
 - 2. The manufacturer of the RCP for pipe jacking shall have at least five (5) years' experience in the design and manufacture of pipe jacking pipe and have manufactured at least five thousand (5,000) feet of jacking pipe at equivalent dimensions and configuration as required for this project.
- C. RCP Design Engineer
 - 1. The design for the RCP for pipe jacking shall be performed by a Professional Engineer licensed in the State of Rhode Island with at least 5 years of experience in the design of 42-inch diameter or larger RCP with demonstrated experience in designing RCP installed by pipe jacking.
- D. Gasket Manufacturer:
 - 1. Provide project references including project owner, pipe size, project name, and project owner contact with telephone number.
 - 2. The gaskets shall be the product of a manufacturer having prior experience in the manufacture of gaskets for pipe joints to seal joints subjected to conditions similar to:
 - a. Hydrostatic pressures in accordance with the GDR.

- b. Ground and groundwater contamination conditions and constituents in accordance with the project Environmental Data Report (EDR) in the Contract Documents.

E. Acceptance Criteria:

1. Acceptance will be based on the successful results of the following:
 - a. Tests of materials
 - b. D-load bearing tests
 - c. Pressure tests.
 - d. Inspection of the completed installation.
2. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe is subject to inspection by the PM/CM. Inspection may be conducted at the place of manufacture, or at the work site after delivery, or both.
3. The pipe is subject to rejection at any time due to failure to meet any of the requirements specified in the Contract Documents, even though sample units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor.
4. The PM/CM reserves the right to have any or all pipe units inspected or tested, or both, by an independent testing laboratory at either the manufacturer's plant or elsewhere. Such additional inspection and/or tests shall be at the Owner's expense and shall be the test results of record.

F. Pre-Manufacture Meeting:

1. A preconstruction meeting that includes the pipe manufacturer shall be arranged not less than 3 weeks and no more than 6 weeks prior to pipe fabrication to discuss manufacturing procedures, schedule, and QA/QC program.
2. Pipe handling, repair, written notification procedure, and gasket sealing shall be discussed.

G. Warranty

1. The Contractor shall obtain from the manufacturer its warranty that the pipe for pipe jacking conforms to the specified requirements herein and will be free from defects in materials and workmanship for a period of one (1) year from the date of substantial completion of the Contract.
2. The manufacturer's warranty shall be in a form acceptable to and for the benefit of the Owner and shall be submitted by the Contractor.
3. The Contractor shall repair or replace, at the sole option of and at no additional cost, any pipe for pipe jacking found to be defective within the warranty period. Repair or replacement shall include the cost of removal and reinstallation and all other cost required to affect removal and reinstallation.

H. Testing: Shall conform to ASTM C76 Class V, Wall C, and ASTM C1103.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.

B. Product Data:

1. RCP materials: In accordance with ASTM C76

C. Gasket Materials:

1. Dimensioned catalog cuts showing sizes, thicknesses, and type and grade of material to be furnished.
2. Test reports of the physical properties of the gaskets.

D. Submit the following 30 days prior to the work:

1. Design calculations and analysis for determining moments, shears, deflections and, if required, additional reinforcement due to handling, transportation, storage and installation procedures. Perform calculations in accordance with ASCE 27-17 and as specified herein for sanitary and combined sewage service. Include, at a minimum, the following information:
 - a. Design criteria, assumed parameters, and formulas.
 - b. Include factor of safety, maximum allowable jacking force, and maximum allowable contact grout pressure.
 - c. Identify packer material information, including thickness and size, and angle of deflection assumed at each joint.
2. Detailed shop drawings certified by the pipe manufacturer for the RCP and appurtenances for a jacked installation. Shop drawings shall include:
 - a. D-load, cement type, concrete strength, and details of the wall class, and fittings.
 - b. Details of the pipe including weight per foot, length, and lay length.
 - c. Detail drawings for the joint design.
 - d. Details of the lubrication ports, including location, spacing, and orientation.
 - e. Details of interfaces between pipes and the shield and between pipes and the jacking ring.
 - f. Fabrication drawings for reinforcing steel in accordance with ASTM C76.
 - g. Piece mark for each pipe section.
 - h. The gasket details shall include the diameter of the cross-section and the unstretched diameter and volume.
3. Packer design details, including packer dimensions, and materials.
4. Steel end ring design details (if used), including dimensions, and materials.
5. A description of the plans for storage and handling of pipe for pipe jacking.
6. Working Drawings and Methods Statement that includes the following:
 - a. Data on the fabrication plant proposed for use in fabricating the pipe and fittings, including:
 - i. Name of supplier.
 - ii. Plant location.

- iii. Plant volume or output quantity.
 - iv. All other data necessary to show the supplier's capability to produce RCP of the quality and quantity required.
 - b. Proposed procedure for shop hydrostatic testing.
 - c. Proposed method for field testing each joint.
 - 7. Mix designs in accordance with Section 03300 for all concrete irrespective of plant location.
 - 8. A description of the plan for inspection and testing the pipe and joints following installation.
- E. Quality Control Submittals
- 1. Qualifications and experience records for:
 - a. Manufacturer
 - b. RCP design engineer.
 - 2. Certifications: Certified copies in triplicate of test results/reports will be required for the materials and the finished pipe units as described below:
 - a. Certificate from an independent laboratory of compliance for each load of cement.
 - b. Certified copies of mill test reports from an independent laboratory covering the physical and chemical properties of reinforcing steel.
 - c. Test certificates guaranteeing that the pipe furnished hereunder complies with the requirements of the Contract Documents.
 - d. Certified copies of the test reports from an independent laboratory of the compound used in the gaskets.
 - e. Design engineer's certification that pipe has been designed to handle all applicable loading conditions with appropriate factors of safety.
 - f. Manufacturer's warranty for jacked pipe.
 - 3. Lists of all pipe and fittings received in each shipment, including the manufacturing control number or piece mark, weight, class, size, and description.
 - 4. Joint acceptance test results.

1.07 DESIGN CRITERIA

- A. The Contractor is responsible for analysis and final design for the RCP jacking pipe for pipe jacking and pipe joint design in accordance with design criteria specified herein.
- B. The Contractor is responsible for verifying that all aspects of pipe for pipe jacking and pipe joint design are compatible with the Contractor's equipment and pipe jacking methodology.
- C. The Contractor is responsible for verifying that the jacking pipe and joints shall have been designed for the anticipated service conditions and all loads due to handling, storage, transportation, and installation to withstand jacking over the full length of the pipe jacking drives shown on the Contract Documents without incurring damage.

D. Pipe for pipe jacking shall meet the following criteria:

1. Concrete used in pipe for pipe jacking shall have a minimum 28-day unconfined compressive strength of 6,000 pounds per square inch (psi) for the following pipe class:
 - a. Class V, Wall C in accordance with ASTM C-76.
2. The ultimate jacking load capacity of the pipe shall be at least three (3) times the maximum anticipated jacking load.
3. Anticipated jacking load evaluations shall consider the Contractors proposed pipe jacking equipment and methods, drive lengths, and anticipated ground conditions.
4. The pipe and pipe joint designs shall consider the range of potential eccentric loading during jacking.
5. Joints shall be watertight in conformance with the requirements specified herein.

E. Design the pipe to:

1. Withstand long-term operational hydrostatic pressures of 20 psi, and short-term interior hydrostatic pressures of 25 psi without leakage.
2. Withstand long-term external hydrostatic pressures resulting from a water column measured from pipe invert to ground surface, or to the 100-year flood elevation, whichever results in the greatest hydrostatic pressures.
3. Withstand long-term ground loads based on the height of soil or rock cover and surcharge loads.
4. Withstand long-term durability considering interior and exterior exposure conditions based on corrosivity evaluation of known ground and groundwater contaminants.

F. Performance Requirements:

1. Acceptability of pipe will be based upon conformance with this Specification and ASTM C76.
2. Manufacturing Tolerances: In conformance with ASCE 36-15 or ASTM C76, to whichever is applicable and more stringent.
3. Joints:
 - a. The spigot ring shall have grooves to receive, hold and protect the gaskets. A special tube at each joint shall be cased in the joint for hydrostatic field-testing. Where hydrostatic field testing can be performed, spigot ends with reinforced thermosetting resin coupling or with steel coupling are acceptable. Steel coupling shall be coated with minimum 16 mils coal tar epoxy.
 - b. Gaskets shall be self-centering and designed so that when the pipe is installed, the gasket will not support the weight of the pipe and will function solely to seal the joint.
 - c. Joint shall not be installed deflected more than 50 percent of its maximum allowable deflection.
 - d. Joints shall be watertight when tested to the design pressure. Joint shall be watertight under all service conditions including expansion, contraction, and settlement.

1.08 SEQUENCING AND SCHEDULING

- A. Schedule manufacturing so that pipe is available and meets the minimum specified concrete compressive strength before installation.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with accepted submittals and manufacturer's written recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.
- C. Deliveries shall be scheduled so that the progress of the work is not delayed.
- D. Delivery and Handling of Pipe:
 - 1. Trucks, trailers, or rail cars used for transporting pipe shall be provided with bolsters between each layer of pipe curved to fit the outside of the pipe.
 - 2. Care shall be exercised in handling, transporting, and placing pipe to prevent damage. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with exterior slings or with a suitable forklift. Heavy canvas or nylon slings of suitable strength shall be used for lifting and supporting materials; do not use chains or cables.
 - 3. Pipe may be placed for jacking using one sling near the center of the pipe, provided the pipe is guided to prevent uncontrolled swinging and no damage will result to the pipe or harm to the workers.
 - 4. Pipe shall be stored in an orderly manner, so that there will be a minimum of rehandling to the final position. Pipe can be stored at the tunnel site, at the Contractor's corporation yard or other offsite location approved by the PM/CM.
 - 5. The Contractor shall limit the number of pipe segments at each work zone to the number necessary for continuous installation within one work shift. The Contractor shall obtain additional off-site storage area as necessary to store pipe prior to installation at no additional cost.
 - 6. Store pipe materials in a manner that will not be a hazard to traffic or to the public in general, will not obstruct access to adjacent property, or will not obstruct other Contractor's working in the area.
 - 7. When not being handled, the pipe shall be supported on timber cradles, on sandbags that keep the pipe off the ground and prevent roll, or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. Do not store pipe and fittings on rocks or gravel or other uneven hard surfaces.
 - 8. Each pipe segment shall be marked on both ends to identify the manufacturer, factory location, date of manufacture, shift, lot number, and nominal diameter. A production lot shall consist of all pipes having the same lot marking.
 - 9. Pipe gaskets shall be stored in a cool, well-ventilated place and do not expose to the direct rays of the sun prior to use. Do not allow contact with oils, fuels, petroleum, or solvents.
- E. Pipe Acceptance at Project Site

1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and acceptance by the PM/CM. Such inspection may be made at the place of manufacture, or on the site after delivery, or at both places. The pipe shall be subject to rejection at any time if it fails to meet the specified requirements; even if previously accepted.
2. Sections rejected after delivery to the project site shall be immediately marked with "Remove" for identification and shall be removed from the project within 24-hours.
3. Any installed pipe sections rejected after installation shall be acceptably repaired, if permitted by the PM/CM, or removed and replaced, at no additional cost.
4. All sections shall be inspected for general appearance, dimension, blisters, cracks, roughness, and soundness. The surface shall be dense and close-textured.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall be new.

2.02 PIPE FOR PIPE JACKING

A. Manufacturers

1. Pipe for pipe jacking shall be manufactured and supplied by one of the following manufacturers or approved equal.
 - a. Hanson Pipe and Precast, Danielson, CT 06239
 - b. Vianini Pipe Inc, Whitehouse, NJ 08876

- B. Pipe diameter shall be as shown on the Contract Documents.

- C. Outside diameter, exterior roundness, end squareness, straightness, and joint length in accordance with ASTM36-15 or ASTM C76, whichever is most restrictive.

- D. The Contractor shall select the standard length furnished based on their means and methods, and all standard pipe shall be uniformly of that length within manufacturing tolerances, however, standard pipe length shall be 8 feet minimum to 10 foot maximum.

- E. Pipe for pipe jacking shall be tested in accordance with ASTM C497 as required to ensure compliance with the requirements specified herein.

F. Concrete Materials:

1. Cement shall comply with ASTM C150-Type II.
2. Aggregates shall comply with ASTM C33.
3. Minimum steel cover: 1-1/2 inches on both faces.

G. Reinforcement

1. Shall consist of hot-rolled steel bars conforming to ASTM A615 placed in accordance with ASTM C76.

2. Double circular steel reinforcements shall be provided. The area of the outer cage steel reinforcement shall not be less than 75 percent of the inner cage. Not less than 12 longitudinal bars at approximately equal spacing shall be provided for each cage. Longitudinal bars shall be #3 or greater.
3. Only full circular cage reinforcement shall be used. No quadrant mat or elliptical cage will be accepted.
4. The spigot end of each pipe shall have additional external hoop reinforcement placed along the length of any reduced wall section.

H. Joints and Gaskets

1. Pipe joints shall be designed, tested, and manufactured in accordance with ASTM C361.
2. Pipe joints shall be gasket joints of the configuration shown on the Contract Drawings and shall be designed for the internal and external pressures as specified herein.
3. Pipe joints shall be flush or slightly recessed in relation to the pipe outside diameter.
4. Steel end rings, if used, shall be hot-dipped galvanized in accordance with ASTM A123 or zinc metalized with two (2) coats of 4 mils (one thousandth of an inch) minimum thickness each coat as per AWWA C302.
5. Gasket specimens shall be heated in a dry oven to 150 degrees Fahrenheit (F) for a 6-hour duration. Five (5) specimens shall be tested by immersion, one each as follows:
 - a. 2-hour immersion in petroleum ether
 - b. 72-hour immersion in saturated Hydrogen Sulfide solution
 - c. 72-hour immersion in 1 percent Sodium Hydroxide solution
 - d. 72-hour immersion in standard soap solution (80 percent alcohol)
 - e. 72-hour immersion in 10 percent Sodium Chloride solution
 - f. The specimens shall show no detrimental change in color, texture, or feeling upon completion of the above tests.
 - g. The specimens shall be tested in accordance with ASTM C1619 Part 8 and the test results shall be within 10 percent of the values listed in Table 1 of ASTM C1619 for Class A gasket.
 - h. The manufacturer shall supply test data and affidavits showing compliance with these requirements. Tests shall have been conducted within six (6) months of the start of the manufacture of the pipe.
6. Use only manufacturer-recommended lubricants.

I. Packers

1. The contact surfaces of all pipe joints that transmit axial (longitudinal) jacking forces shall be separated by a custom-designed cut plywood or fiberboard packer, that can transmit axial jacking forces uniformly and without producing transverse splitting forces, with a minimum thickness of $\frac{3}{4}$ inch.
2. Packers shall be designed and cut in consultation with the pipe designer such that the cushioning material does not adversely affect joint sealing and/or load-carrying capacity.

3. Packers shall be cut to adequate dimensions to ensure the full bearing width of the joint is protected.
4. Packers shall not extend over the outermost ¼ inch of the joint bearing area.

J. Pipe Lubricant Injection Ports

1. Pipe for pipe jacking shall be supplied with factory-installed pipe lubricant injection ports of diameter, quantity, and orientation compatible with the Contractor's pipe jacking methods. At a minimum, each pipe for pipe jacking shall be supplied with at least one (1) 2-inch diameter lubrication port and the ports shall alternate at 10, 12 and 2 o'clock for every 3 pipe sections.
2. Pipe lubricant injection ports shall be designed to withstand the design conditions for the pipe, and for lubricant fluid pressures anticipated by the Contractor during pipe jacking.
3. Pipe lubricant injection ports shall be sealed with corrosion-resistant plugs or similar material complying with the pipe manufacturer's recommendations.
4. Install one-way valves to prevent infiltration during contact grouting.

K. Pipe Inspection and Testing during Manufacturing

1. The Contractor shall facilitate all requests by the PM/CM to inspect pipes or to witness pipe manufacture and testing at the manufacturing plant.

2.03 PIPE FABRICATION

A. General: RCP shall be manufactured in accordance with ASTM C76.

B. Fabrication of Joints:

1. The contact surfaces of the bell and spigot shall be smooth to prevent damage to the gaskets.
2. Joints shall be designed specifically for jacking and shall be designed to withstand the jacking force before applying a factor of safety.

C. Repair of Imperfections and Damage to Pipe:

1. In accordance with the approved submittals.
2. Repairs made to pipe during fabrication shall be made immediately prior to curing period with a minimum delay in the start of the curing.
3. Surface imperfections of 3/8 inch or greater on the interior of the pipe shall be filled and finished. If 6 or more imperfections, 1/4 inch or greater in maximum dimension, occur in 1 square foot, they shall be filled and finished. Repairs made to the interior pipe surfaces shall not have a roughness exceeding the adjacent formed surface and shall be flush with the adjacent surfaces.
4. Surface imperfections of the exterior pipe surfaces, 1/2 inch or greater shall be filled and finished. If 6 or more imperfections, 3/8 inch or greater in maximum dimension, occur in 1 square foot, they shall be filled and finished.

D. Marking:

1. Each pipe section shall be marked with the following information:
 - a. Name of manufacturer.

- b. Date of manufacture.
 - c. Diameter of pipe, in inches.
 - d. Wall thickness, in inches.
 - e. Length of pipe, in feet.
 - f. Class of pipe or D-loading, in pounds.
 - g. Top of pipe if elliptical reinforcing is used.
 - h. Sequential numbering of each piece of pipe.
- E. All markings shall be on the inside and outside of each section of pipe and affixed thereto as soon as practicable after the forms are removed.
- F. Markings shall be acceptable to the PM/CM.

2.04 SOURCE QUALITY CONTROL

A. Inspection:

1. The Contractor shall require the manufacturer to provide the PM/CM with reasonable facilities and space for inspection and testing.
2. The PM/CM shall be notified a minimum of 2 weeks prior to start of fabrication. The PM/CM shall have access to all phases of fabrication for inspection.
3. If the PM/CM determines that the specified method of nondestructive testing cannot be used under conditions encountered in the work, an alternative method of inspection will be determined by the PM/CM.

B. Cement and Aggregates Testing: In accordance with the requirements of Section 03300.

C. Concrete Testing:

1. General: Conform to the requirements of Section 03300.
2. Any pipe that does not meet the compressive strength requirement shall be rejected.

D. Fit-Up Tests:

1. Following completion of fabrication, ends intended for field connection shall be checked in the fabricator's shop to ensure that a proper fit can be achieved during field erection. Shop fit-up shall be done without the use of jacks or other objects.
2. Fit-up for standard sections of pipe shall be checked in the shop by stabbing a minimum of two joints. Pipe sections for test fit of joints will be selected by the PM/CM.

PART 3 EXECUTION

3.01 GENERAL

- A. Pipe for pipe jacking shall be installed in accordance with Section 02314 and in accordance with the manufacturer's recommendations.
- B. Contractor shall assure that the pipe jacking forces are within the manufacturer's jacking limits.

- C. The Contractor's pipe manufacturer shall furnish the services of a competent factory representative to inspect the storage, handling, and installation of the pipe for a minimum of five (5) days during initial pipe installation. The factory representative shall be provided at no additional cost.
- D. On completion of jacking and before contact grouting, the pipeline shall be thoroughly cleaned prior to final inspection.
- E. Any pipe which has been damaged during installation shall be replaced by the Contractor. The cost of replacement of a new pipe shall be at no additional cost.
- F. Any part of the pipeline, joints, or lining which fails inspection or testing shall be replaced at no additional cost.

3.02 FIELD QUALITY CONTROL

- A. The Contractor shall perform infiltration acceptance tests of the installed pipe for pipe jacking in accordance with ASTM C969 in the presence of the PM/CM.
- B. All pipe shall be tested for leakage and thoroughly cleaned of any obstructions or debris. Pipes shall be tested and retested, at the Contractor's cost, as specified herein until acceptance by the PM/CM. All pipe shall be joint-tested prior to contact grouting.
- C. Joints which show leakage shall be repaired subject to the approval of the PM/CM, and the joint retested. All joints shall have been tested and shall comply with the leakage requirement specified herein prior to acceptance of the work.
- D. The Contractor shall maintain a current log of all pipe testing, including, but not limited to, the following information:
 - 1. Type of test: i.e., hydrostatic, initial test, or retest number.
 - 2. Time, beginning, and end.
 - 3. Maximum pressure and pressure drop over test time.
 - 4. All special precautions, considerations, or remarks concerning the particular test.
- E. Hydrostatic Test for Double Gasket Joint, if used.
 - 1. Test the annular space between double gaskets using two integral testing ports. Water shall be used as a testing medium. To test, remove the caps from both testing ports. Inject water into the lower testing port. When all the air has been displaced and water is coming out of the testing port located on the soffit of the pipe, place the pressure gage on the upper testing port.
 - 2. Prior to backfill operations, the isolated joint shall be pressurized to 25 psi. If the pressure holds, or drops less than 1 psi in 30 seconds, the joint is acceptable.
 - 3. If the pressure test at 25 psi fails, the pipe joint shall be pressurized to 25 psi and maintained for 2 minutes, the pressure bled off and again tested.
 - 4. When individual joints have been tested and accepted, the testing tubes shall be capped securely with plugs at each testing port.
- F. Hydrostatic Test for Single Gasket Joint
 - 1. Joints shall be tested in accordance with ASTM Standards C1103.

END OF SECTION 02317

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SECTION 02370

STORMWATER POLLUTION PREVENTION

PART 1 GENERAL

1.01 SCOPE.

A. The work specified in this section includes the installation, maintenance, and removal of perimeter erosion controls, check dams, temporary dewatering basins, storm drain protection, stilling basins for water pollution control, and construction accesses. Soil erosion and sediment controls shown on the Plans shall be installed by the Contractor. Some soil erosion and sediment controls specified herein may or may not be shown or detailed on the Drawings, but may be utilized by the Contractor. Soil erosion and sediment controls not detailed on the Plans shall be in accordance with this specification and the Rhode Island Department of Environmental Management Soil Erosion and Sediment Control Handbook, 1998, and all addendums. The methods described in this section are approved means for soil erosion and sediment control, the actual means and methods shall be determined by the Contractor. The Contractor shall be responsible for preparing and establishing a stormwater pollution prevention plan at each work site for approval by the Program Manager/Construction Manager.

B. Related Work Described Elsewhere:

1. Section 02200 – Earth Excavation, Backfill, Fill, and Grading

1.02 GENERAL REQUIREMENTS.

A. Perimeter Erosion Controls: Work shall consist of the provision of perimeter erosion controls in reasonably close conformity with the dimensions and details indicated on the Drawings, all in accordance with these Specifications. Perimeter erosion controls consist of the following two types:

1. Baled Hay Erosion Checks. Baled hay erosion checks shall consist of straw wattles, or baled or straw, each bale of which is embedded and attached to the ground with wood stakes, and are constructed as indicated on the Drawings.
2. Silt Fence. Silt fencing shall consist of oak fence posts to which are attached industrial support netting and sediment control filter fabric, and are constructed as indicated on the Drawings.

B. Check Dams: Work shall consist of the provision of check dams and dikes in reasonably close conformity with the RIDEM Soil Erosion and Sediment Control Handbook. Check dams consist of the following three types:

1. Baled Hay Ditch and Swale Erosion Checks. Baled hay ditch and swale erosion checks shall consist of baled hay or straw, each bale of which is embedded and attached to the ground with wood stakes.

2. Sand Bag Erosion Dikes. This work shall consist of the placement of sand bags across either riprap or earth ditches, thereby forming a dike, to create temporary stilling basins for pollution control.
 3. Stone Check Dams. This work shall consist of the placement of stone in ditches or drainage swales to reduce flow velocities, to prevent soil erosion.
- C. Temporary Dewatering Basins: Work shall consist of the provision of temporary dewatering basins for the purpose of controlling water pollution caused by sediment-laden discharge from excavation sites. The basins shall be constructed in reasonably close conformity to means and methods of the RIDEM Soil Erosion and Sediment Control Handbook. Temporary dewatering basins consist of the following two types:
1. Dewatering Basin. The basin consists of a rectangular concrete barrier enclosure, the bottom and sides of which are lined with filter fabric. The bottom fabric is stabilized with filter stone. The basin is divided into the required number of 12-foot sections by stone berms approximately 18-inches high.
 2. Filter Fabric Retention Basin. The basin consists of a rectangular enclosure formed by a 2-foot high chain link fence. Both the fence and the bottom of the enclosure are lined with filter fabric which is stabilized by a layer of rock riprap.
- D. Storm Drain Protection: Work shall consist of the provision of temporary storm drain protection facilities. Storm drain protection facilities shall consist of the following three types:
1. Sandbag Gutter Inlet Sediment Barrier. This work consists of placing a sandbag barrier upstream of a gutter inlet prior to the placement of roadway pavement.
 2. Silt Fence Catch Basin Inlet Protection. This work consists placing a temporary filter fabric fence around inlet grates.
 3. Baled Hay Catch Basin Inlet Protection. This work consists of placing baled hay around catch basin inlets. Baled hay inlet protection shall be constructed as indicated on the Drawings.
- E. Stilling Basins for Water Pollution Control: Work shall consist of the provision of temporary and/or permanent stilling basins in accordance with the RIDEM Soil Erosion and Sediment Control Handbook.

1.03 QUALITY CONTROL.

- A. Provide Quality Assurance / Quality Control services in accordance with Section 01400.

1.04 SUBMITTALS.

- A. In accordance with Section 01300, submit a Stormwater Pollution Prevention Plan (SWPPP) in conformance with the requirements specified in the General Permit for Storm Water Discharges Associated with Construction Activities (Section 01060).
- B. SWPPP to be stamped by a professional engineer registered in the State of Rhode Island in accordance with RIDEM requirements.

1.05 REFERENCE STANDARDS.

- A. Rhode Island Department of Environmental Management (RIDEM). 1988. Recommendations of the Stormwater Management and Erosion Control Committee Regarding the Development and Implementation of Technical Guidelines for Stormwater Management. RIDEM, Office of Environmental Coordination, Providence, RI.
- B. Rhode Island Department of Environmental Management and USDA Soil Conservation Service (SCS). 1989. Rhode Island Soil Erosion And Sediment Control Handbook. RIDEM, Providence, RI.
- C. Rhode Island Pollutant Discharge Elimination System. General Permit for Discharges Associated with Construction Activities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Perimeter Erosion Controls:

- 1. Straw Wattles: Machine produced straw filled tubes of compacted straw of rice, wheat or barley. Straw wattles to be certified as weed free, and netting for tubes to be seamless, high density polyethylene with ultra violet inhibitors. Roll length to be 10.0 feet to 25.0 feet, and weight per linear foot, shall be: 12-inch: 2.5 lbs. minimum, 9-inch: 1.5 lbs. minimum. Stakes shall be wooden, 1 1/8-inch x 1 1/8-inch x 2.5 feet long, with lower ends tapered to facilitate driving into compacted soil. Rebar may be substituted for wooden stakes.
- 2. Baled Hay Erosion Checks. Baled hay or straw shall be baled within twelve months of use. Bindings shall be sufficiently strong to act as handles when placing bales in position by hand. The minimum dimension of any bale shall be 18-inches. Wood stakes shall be oak, 1-inch by 1-inch in section, and at least 3.0 feet in length.
- 3. Silt Fence. The filter fabric shall be a material suitable for erosion control applications. Wood posts shall be oak, 2-inch by 2-inch in section, and at least 4.5 feet in length. Support netting shall be heavy-duty plastic mesh. For prefabricated silt fence, 1-inch by 1-inch wood posts will be permitted.

B. Check Dams:

- 1. Baled Hay Ditch and Swale Erosion Checks. Baled hay or straw shall be baled within twelve months of use. Bindings shall be sufficiently strong to act as handles when placing bales in position by hand. The minimum dimension of any bale shall be 18-inches. Wood stakes shall be oak, 1-inch by 1-inch in section, and at least 3.0 feet in length.
- 2. Sand Bag Erosion Dikes. The sand bags and the sand material shall be of a quality acceptable to the Program Manager/Construction Manager. Dumped stone, when required, shall meet the requirements for Modified NSA Class R-4 riprap in Table II. The filled sand bags will weigh a minimum of 60 pounds.

3. Stone Check Dams. The stone shall meet the requirements for Filter Stone under RIDOT FS-2.
- C. Temporary Dewatering Basins:
1. Dewatering Basins. Precast concrete barrier units shall conform to the RIDEM Soil Erosion and Sediment Control Handbook. Filter fabric shall conform to the applicable requirements of Article 2.01, Item A, Para. 2; Silt Fence, of these Specifications. Filter stone shall conform to the requirements of RIDOT FS-2. Sand bags shall be of a quality acceptable to the Engineer. Hay bales and wood stakes shall conform to the requirements of Article 2.01, Item A, Para. 1 of these Specifications.
- D. Storm Drain Protection:
1. Sandbag Gutter Inlet Sediment Barrier. The sandbags and the sand material shall be of a quality acceptable to the Program Manager/Construction Manager.
 2. Silt Fence Catch Basin Inlet Protection. The filter fabric shall be a material suitable for erosion control applications utilized. Wood posts shall be oak, 2-inch by 2-inch in section, and at least 4.5 feet in length. Support netting shall be heavy-duty plastic mesh. For prefabricated silt fence, 1-inch by 1-inch wood posts will be permitted.
 3. Baled Hay Catch Basin Inlet Protection. Baled hay or straw and wood stakes shall conform to the requirements of Article 2.01, Item A, Para. 1 of these Specifications.
- E. Stilling Basins for Water Pollution Control: The various materials required for the construction of stilling basins will be determined by the Contractor and provided in the Soil Erosion and Sediment Control Plan for approval by the Program Manager/Construction Manager.

PART 3 EXECUTION

3.01 GENERAL.

- A. Construction Methods: Those erosion and pollution controls indicated on the Drawings shall be installed to the satisfaction of the Program Manager/Construction Manager before the commencement of any construction.

3.02 INSTALLATION.

A. Perimeter Erosion Controls:

1. Straw Wattles shall be constructed at the locations, and in accordance with the details indicated on the Drawings to the satisfaction of the Program Manager/Construction Manager. The following stipulations also apply:
 - a. Wattles shall be placed in a single row, lengthwise on the contour, with ends of adjacent wattles tightly abutting one another. Remove all rocks, vegetation or other obstructions at straw wattle location.
 - b. Excavate a trench approximately 2 to 3-inches deep to accept the straw wattle and place straw wattle in trench.

- c. Anchor straw wattle with stakes placed a maximum of 4-feet apart.
 - d. The end stakes shall be placed 6-inches from the end of straw wattle and angled toward previously laid straw wattle to force straw wattles together.
 - e. Refer to detail on Drawings for additional installation requirements.
2. Silt Fence. Silt fence shall be constructed at the locations, and in accordance with the details indicated on the Drawings, to the satisfaction of the Program Manager/Construction Manager. The following stipulations also apply:
- a. A 6-inch x 6-inch minimum trench shall be dug where the fence is to be installed.
 - b. The fence shall be positioned in the trench with the fence posts set at 8-feet on center (maximum).
 - c. The sedimentation control fabric and the industrial netting shall be stapled to each post. When joints are necessary, filter fabric shall be spliced together only at support posts. Splices shall consist of a 6-inch overlap, and shall be securely sealed.
 - d. Each wood post with industrial support netting and filter fabric attached shall be driven into the undisturbed soil in the trench as indicated on the Drawings.
 - e. The trench shall be backfilled and the soil compacted over the filter fabric.
 - f. The installed height of the fence shall be 2.5 feet (minimum). However, height shall not exceed 36-inches since higher barriers impound volumes of water sufficient to cause failure of the fence structure.
- B. Check Dams:
1. Baled Hay Ditch and Swale Erosion Checks. Erosion checks shall consist of two or more bales placed and staked perpendicular to the flow line of a ditch formed by the intersection of its slopes. The following stipulations also apply:
 - a. A pair of erosion checks shall be placed a minimum of 12 feet apart at each location.
 - b. The ditch erosion checks shall be entrenched and backfilled. The trench shall be excavated the width of the bale(s) and the length of the check to a minimum depth of 3-inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the check. Backfill shall conform to the ground level on the downhill side and shall be built up to 4-inches against the uphill side.
 - c. The bales are to be installed so that the bindings are oriented around the sides of the bales rather than their tops and bottoms.
 - d. The edges of overlapped bales shall overlap in such a manner that there will be no opening between the bales. Where bales butt together the gap between bales shall be chinked with loose straw to prevent water from escaping.
 - e. Each bale shall be securely anchored by a least two stakes driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together.
 - f. All earth ditch areas are required to have the protection of baled hay ditch erosion checks prior to their outfall onto existing ground, or natural or man-made water courses.
 - g. The haybale barrier shall be extended such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale. This configuration will insure that the sediment-laden runoff will flow either through or over the barrier, but not around it.
 2. Sand Bag Erosion Dikes. Sand bags will be placed a minimum of four layers high. Over the center of the ditch the top layer of sand bags will have a weir opening equal to one

half the bottom ditch width. The sand bags shall be extended such a length that the bottom of the end sand bags are higher in elevation than the top of the lowest middle sand bag. When the sand bag dike is constructed across an earth ditch, the down stream side of the dike at the weir opening is to be protected with Modified NSA Class R-4 dumped riprap.

3. Stone Check Dams. Stone shall be placed across the ditch or swale to achieve complete coverage and shaped to the required configuration by the use of hand tools. The stone shall be sloped from the sides of the ditch/swale towards the center such that the center is 6-inches lower than the stone at the sides of the ditch/swale. The check dam shall have 2-horizontal to 1-vertical side slopes and shall not exceed 2-feet in height.

C. Temporary Dewatering Basins:

1. Dewatering Basin. The following stipulations shall apply:

- a. The precast concrete barrier units shall be placed on level, or nearly level, ground.
- b. Filter fabric shall be placed on the bottom of the entire area enclosed by the concrete barrier units. If more than one sheet of fabric is required, the adjacent section shall be overlapped a minimum of 12-inches to insure full coverage. Filter fabric shall be turned up along the inside face of the concrete barriers to the top of same, there to be folded across the top of the barriers. The fabric will be maintained in position by the placement of sand bags, end-to-end, along the top of the concrete barrier enclosure.
- c. A minimum layer of 6-inches of filter stone shall be spread over the bottom of the basin. Stone berms shall be constructed at 12-foot intervals along the length of the basin.

2. Filter Fabric Retention Basin. The following stipulations shall apply:

- a. The filter fabric retention basin will be placed on stabilized and level, or nearly level, ground to prevent erosion by water exiting the basin.
- b. A 6-inch by 6-inch minimum trench shall be dug where the basin is to be constructed.
- c. The filter fabric and wire backing shall be 3-feet wide (minimum) positioned in the trench and secured to metal posts positioned 4-feet on center (maximum).
- d. The metal posts shall be driven into undisturbed soil next to the trench to a minimum depth of 12-inches.
- e. Fill material shall be placed in the trench and compacted.
- f. The installed height of the fence shall be 2-feet (minimum).
- g. A minimum layer of 6-inches of filter stone (Modified NSA Class R-4 riprap) shall be spread evenly over the bottom of the basin.

D. Storm Drain Protection:

1. Sandbag Gutter Inlet Sediment Barrier. The following stipulations shall apply:

- a. The sandbags shall be placed in a curved row extending from the curb or berm. The row shall be at least 6-feet upstream of the inlet and should overlap the curb or berm.
- b. Several layers of sandbags shall be placed over the first layer to a minimum height of 1-foot. The bags shall be overlaid and packed tightly together.
- c. A gap of one sandbag should be left in the middle of the top row to serve as a spillway. The spillway shall be a least 8-inches high.
- d. Additional sediment storage capacity can be obtained by constructing a series of these barriers along the gutter upstream of the inlet.

2. Silt Fence Catch Basin Inlet Protection. The following stipulations shall apply:
 - a. Posts shall extend at least 1 foot below grade.
 - b. The filter fabric shall extend to a height at least 12-inches above the top of the inlet grate, but shall not exceed 3 feet in height.
 - c. The support netting shall extend to the full height of the filter fabric.
 - d. A trench shall be excavated approximately 6-inches wide and 6-inches deep around the outside perimeter of the stakes. The filter fabric and support netting shall extend at least 6-inches into the trench. After the fabric and support netting are fastened to the stakes the trench should be backfilled and compacted to original grade.
 - e. The filter fabric and support netting fence shall be securely fastened to the stakes using heavy duty wire staples at least 1-inch long. Ends of the filter fabric must meet at a stake, be overlapped, folded and stapled to the stake.

 3. Baled Hay Catch Basin Inlet Protection. The baled hay inlet protection shall be constructed as indicated on the Drawings. The following stipulations shall also apply:
 - a. The bales shall be entrenched and backfilled. The trench shall be excavated the width of the bale and the length of the check to a minimum depth of 3-inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the check. Backfill shall conform to the ground level on the inside and shall be built up to 4-inches around the outside.
 - b. The bales are to be installed so that the bindings are oriented around the sides of the bales rather than along their tops and bottoms.
 - c. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together.
 - d. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between bales.
- E. Stilling Basins for Water Pollution Control:
1. The stilling basins will be constructed in such a manner to allow any material which may cause a natural water course or the surrounding environment to be damaged to be retained in the basin. During the life of the Contract, the Contractor will be required to periodically clean the pool and to maintain the basin to the satisfaction of the Program Manager/Construction Manager. If the basin is temporary, the Contractor will be required to fill the basin with suitable material and to restore the area in which the basin was located to either its original condition or to the requirements of the Contract.
 2. In all cases the stilling basins are to be constructed immediately after the clearing and grubbing operation and before commencement of any excavation and/or embankment. The single exception to this requirement is the construction of a leveling course to create a work platform. Excavation for stilling basins is to take place from the downstream end of the basin and to proceed upstream. Prior to the start of excavation, temporary baled hay ditch erosion checks are to be constructed immediately beyond the downstream end of the basin. When the basin is complete the above temporary erosion control measures are to be removed.

3.03 MAINTENANCE AND CLEANING.

A. Definitions:

1. Cleaning consists of removing debris and accumulated sediment-laden deposits from the upstream side of perimeter controls, check dams and temporary drainage protection and from the bottom of temporary dewatering basins and stilling basins. All material so-removed shall be legally disposed of in accordance with Federal, State, and local regulations.
2. Maintenance consists of the repair and restoration to original configuration of damage sustained by erosion and pollution controls caused by "normal" rainfall events. (Abnormal weather events are defined in Article 3.03, Item I)

B. Methods:

1. Erosion and pollution controls shall be maintained by the Contractor to the satisfaction of the Program Manager/Construction Manager. Erosion and pollution controls must be able to prevent, under normal weather conditions, both the movement of soil materials and the intrusion of sediment-laden discharges into environmentally sensitive areas.
2. Construction shall not commence or continue until all specified erosion and pollution controls are in place, properly installed and accepted by the Program Manager/Construction Manager.
3. Erosion and pollution controls shall be routinely inspected by the Program Manager/Construction Manager. The Program Manager/Construction Manager shall notify the Contractor immediately if problems develop. The Contractor shall commence cleaning and maintenance measures no later than the next consecutive calendar day after receiving a directive from the Program Manager/Construction Manager to perform such measures. The Contractor shall aggressively and expeditiously perform such cleaning and maintenance work until the original problem is remedied to the complete satisfaction of the Program Manager/Construction Manager. In the event of a weekend storm, the Contractor must have resources available to restore, and, if necessary, to replace any damaged controls.

C. Applicable Controls:

1. The specific erosion and pollution control facilities to be cleaned and maintained under this Section are outlined in Article 1.02 and consist of the following:
 - a. Perimeter Controls:
 - 1) Straw Wattles
 - 2) Baled Hay Erosion Checks
 - 3) Silt Fence
 - b. Check Dams:
 - 1) Baled Hay Ditch and Swale Erosion Checks
 - 2) Sand Bag Erosion Dikes
 - 3) Stone Check Dams
 - c. Temporary Dewatering Basins:
 - 1) Dewatering Basins
 - 2) Filter Fabric Retention Basins
 - d. Storm Drain Protection:
 - 1) Sandbag Gutter Inlet Sediment Barrier
 - 2) Silt Fence Catch Basin Inlet Protection
 - 3) Baled Hay Catch Basin Inlet Protection
 - e. Stilling Basins

D. Materials:

1. Materials required to repair and restore damaged erosion and pollution controls shall meet the applicable requirements of Article 2.01, Items A thru E; for Perimeter Erosion Controls, Check Dams, Temporary Dewatering Basins, Storm Drain Protection, and Stilling Basins, respectively, of these Specifications.

E. Threshold for Cleaning Erosion Controls:

1. Erosion and pollution controls will be cleaned when directed by the Program Manager/Construction Manager, after a rainstorm, and when sediment deposits reach the heights indicated in the following table:

	<u>Height</u>	
a. Perimeter Controls		
1) Straw Wattels / Baled Hay Erosion Checks		1/2 Bale Height
2) Silt Fence	6-inches	
b. Check Dams		
1) Baled Hay Erosion Checks	1/2 Bale Height	
2) Sand Bag Erosion Dike	1/2 Dike Height	
3) Stone Check Dam	1/2 Dam Height	
c. Temporary Dewatering Basins		
1) Dewatering Basins	1/2 Original Basin Height	
2) Filter Fabric Retention Basin	1/2 Original Basin Height	
d. Storm Drain Protection		
1) Sandbag Gutter Inlet Sediment Barrier	1/2 Dike Height	
2) Silt Fence Catch Basin Inlet Protection	6-inches	
3) Baled Hay Catch Basin Inlet Protection	1/2 Bale Height	
e. Stilling Basins	1/2 Depth Below Outlet Elevation	

F. Other Requirements:

1. Perimeter Controls, Check Dams and Storm Drain Protection. The following requirements apply:
 - a. Damaged controls will be repaired or replaced after each storm events.
 - b. Before controls are removed all accumulated sediment on the upstream side shall be removed and legally disposed of.
 - c. Erosion controls shall not be removed until the adjacent exposed areas are relatively free from future uncontrolled discharges.
 - d. The Program Manager/Construction Manager has the authority to verify, enforce, and to specify maintenance activities and to ensure that erosion and pollution controls have been properly maintained.
2. Temporary Dewatering Basins and Stilling Basins. The following requirements apply:
 - a. The basins will be periodically inspected for signs of erosion around the basin and downslope area.
 - b. Repairs will be promptly carried.
 - c. The Program Manager/Construction Manager has the authority to verify, enforce, and to specify maintenance activities and to ensure that controls have been properly maintained.

G. Failure of Erosion and Pollution Controls:

1. This Article 3.03; Maintenance and Cleaning, is based on the concept that erosion and pollution controls will essentially remain intact under normal rainfall events and that any damage sustained by said controls under normal rainfall may be repaired under the maintenance provisions set forth herein.
2. However, under abnormal weather events it is possible that erosion and pollution controls may be damaged to the extent that the Program Manager/Construction Manager may direct that they be replaced in their entirety. Under such abnormal conditions the Contractor will replace the particular facilities, and be compensated for same, under the applicable provisions set forth in regarding PERIMETER CONTROLS, CHECK DAMS, TEMPORARY DEWATERING BASINS, STORM DRAIN PROTECTION, and STILLING BASINS, respectively, of these Specifications.

H. Definition of Abnormal Weather Conditions:

1. For the purposes of Article 3.03, Item G, abnormal weather events are defined as follows:
 - a. For a duration of 1-hour; rainfall equal to or greater than 1/2-inch.
 - b. For a duration of 12-hours; rainfall equal to or greater than 2-inches.
 - c. For a duration of 24-hours; rainfall equal to or greater than 3-inches.
 - d. Extreme weather conditions such as hurricanes, tornadoes, floods, blizzards, etc. Daily rainfall records may be obtained from the National Weather Service.

3.04 REMOVAL.

A. Perimeter Erosion Controls:

1. Baled Hay Erosion Checks. All stakes must be removed from the haybales at a time designated by the Program Manager/Construction Manager. In general, the bales will be allowed to rot in place. If the Contract requires the haybales to be removed, they may be removed only when the adjacent exposed area has been stabilized, i.e., the area has an established grass or stone cover or has been paved, and is free from future uncontrolled discharges. Prior to such removal, however, all silt, mud, and debris entrapped by the haybales shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications. Immediately upon removal of the bales the remaining exposed areas (under the bales) will be backfilled, raked, and graded as necessary to match the surrounding grade and then seeded.
2. Silt Fence. This work will include the removal of the silt fence erosion checks and posts. Silt fence will not be left to rot in place. The silt fence may be removed only when the adjacent exposed area is stabilized, i.e., the area has an established grass or stone cover or has been paved, and is free from future uncontrolled discharges. Prior to such removal, however, all silt, mud, and debris entrapped by the silt fence shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications. Immediately upon removal of the bales the remaining exposed areas (under the bales) will be backfilled, raked, and graded as necessary to match the surrounding grade and then seeded.

B. Check Dams:

1. Baled Hay Ditch and Swale Erosion Checks. Bales of hay used in this work will not normally be left to rot in place. The bales may be removed only when the adjacent

exposed area is stabilized, i.e., the area has an established grass or stone cover or has been paved, and is free from future uncontrolled discharges. Prior to such removal, however, all silt, mud, and debris entrapped by the respective erosion checks shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications. Immediately upon removal of the bales, the remaining exposed areas (under the bales) will be backfilled, raked, and graded as necessary to match the surrounding grade and then seeded.

2. Sand Bag Erosion Dikes. Sand bag erosion dikes will be removed prior to the completion of the project at a time designated by the Program Manager/Construction Manager. Prior to such removal, however, all silt, mud, and debris entrapped by the erosion dike shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications.
3. Stone Check Dams. Stone check dams will be removed prior to the completion of the project at a time designated by the Program Manager/Construction Manager. Prior to such removal, however, all silt, mud and debris entrapped by the check dam shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications.

C. Temporary Dewatering Basins:

1. Dewatering Basin. The dewatering basin will not be removed until all dewatering operations are complete. Prior to such removal, however, all accumulated sediment within the basin shall be removed and legally disposed of in accordance with the applicable requirements of Article 3.03 of these Specifications. The area covered by the basin shall be seeded and mulched immediately after the basin is removed.
2. Filter Fabric Retention Basin. Removal requirements for the filter fabric retention basin are the same as set forth above for the dewatering basin.

D. Storm Drain Protection:

1. Sandbag Gutter Inlet Sediment Barrier. The sandbag sediment barrier will be removed prior to the completion of the project at a time designated by the Program Manager/Construction Manager. Prior to such removal, however, all silt, mud, and debris entrapped by the sediment barrier shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications.
2. Silt Fence Catch Basin Inlet Protection. The silt fence inlet protection shall be removed and the area prepared for pavement construction once the contributing drainage area is free from future uncontrolled discharges. Prior to such removal, however, all silt, mud, and debris entrapped by the silt fence shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications.
3. Baled Hay Catch Basin Inlet Protection. The baled hay inlet protection shall be removed and the area prepared for pavement construction the contributing drainage area is free from future uncontrolled discharges. Prior to such removal, however, all silt, mud, and debris entrapped by the baled hay shall be removed and the area cleaned up in accordance with the applicable provisions of Article 3.03 of these Specifications.

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SECTION 02465

SECANT PILE WALL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, power, and equipment for designing, furnishing, installing, and maintaining a secant pile wall support of excavation system.
- B. This specification is to be used as a guidance document for the Contractor and demonstrates the level of detail which the Contractor's final design must contain.
- C. The Contractor shall coordinate the design of the secant pile wall with the support of excavation system requirements in Section 02260.
- D. The Contractor shall coordinate the design and submittals of the secant pile wall with the dewatering systems and the water handling systems specified in Section 02240.
- E. The Contractor shall be responsible for sizing the secant pile wall system.
 - 1. The secant pile wall shall be adequately sized for construction of the permanent structures and pipelines indicated on the Contract Drawings and to provide adequate space to meet the requirements of the Contractor's selected means and methods of construction.
 - 2. Shaft excavation sizes larger than those indicated on the Contract Drawings shall be subject to review and acceptance of the PM/CM.
 - 3. Modifications to approved traffic control measures and utility relocations shall be subject to review and acceptance of the PM/CM and completed at no additional cost.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
 - 1. Section 01300 – Submittals
 - 2. Section 02200 – Earth Excavation, Backfill, Fill, and Grading
 - 3. Section 02240 – Construction Water Handling
 - 4. Section 02260 – Support of Excavation
 - 5. Section 02295 – Geotechnical Instrumentation and Monitoring
 - 6. Section 02316 – Shield Driven Tunnel Excavation
 - 7. Section 03300 – Cast-in-Place Concrete

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern. The latest editions of the Codes and Standards shall be used.
1. American Concrete Institute (ACI) Standards
 - a. 301-16 Specification for Structural Concrete
 - b. 318-11 Building Code Requirements for Structural Concrete and Commentary
 - c. 336.1 Specification for the Construction of Drilled Piers
 - d. 336.3R Report on Design and Construction of Drilled Piers
 2. ASTM International Standards
 - a. A36 Specification for Carbon Structural Steel
 - b. A615 Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - c. C31 Practice for Making and Curing Test Specimens in the Field
 - d. C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - e. C138 Test Method for Unit Weight, Yield, and Air Content of Concrete
 - f. C143 Test Method for Slump of Hydraulic Cement Concrete
 - g. C172 Practice for Sampling Freshly Mixed Concrete
 - h. C1064 Test Method for Temperature of Freshly Mixed Portland Cement Concrete
 - i. C1077 Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
 - j. D7205 Test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars
 - k. D7957 Specification for Solid Round Glass Fiber Reinforced Polymer Bars for Concrete Reinforcement
 3. International Society of Rock Mechanics and Rock Engineering (ISRM)
 - a. The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring:1974-2006", Edited by R. Ulusay and J.A. Hudson.
 4. U.S. Department of Labor, Occupation Safety and Health Administration (OSHA)
 - a. Construction Standards and Interpretations, 29 CFR Part 1926, Subpart S. Section 1926.800, "Underground Construction.

1.04 DEFINITIONS

- A. Groundwater Seepage: The act or process involving the movement of groundwater through the secant pile wall.
- B. Secant Pile Wall: A continuous wall system constructed using rotary drilling techniques to excavate circular boreholes that are backfilled with concrete and reinforced with vertical steel reinforcement.

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Qualifications
 - 1. The design of the secant pile wall system shall be performed by a Professional Engineer licensed in the State of Rhode Island having not less than five successful projects of similar type, size, and complexity. Experience shall include designing excavation support systems in similar site and ground conditions.
 - 2. Installation of a secant pile wall system shall be under the supervision of a Superintendent(s) having not less than five (5) years of recent experience and having successfully completed projects of similar type, size, and complexity. Experience shall include installation of secant pile wall systems in similar ground conditions.
 - 3. The Contractor shall employ a Testing Agency using trained and experienced personnel in accordance with ASTM C1077 to perform the required tests as specified.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submittals for design, working drawings, and work plans required herein shall be submitted at the same time and in full coordination with the required submittals of Section 02240.
- C. Submit 30 days prior to the work, signed and sealed design calculations and shop drawings by a Professional Engineer licensed in the State of Rhode Island to include, at a minimum, the following:
 - 1. A written summary, applicable code and design standard references, and design loading criteria for all stages of installation and excavation.
 - 2. Working Drawings
 - a. Plans, elevations, sections, and details that clearly describe the secant pile wall to be installed, including tolerances, typical spacing, and minimum overlap for the secant piles.
 - b. Reinforcement placement drawings and details.
 - 3. Proposed mix design.
- D. Submit a Secant Pile Work Plan at least thirty (30) days prior to the start of construction. Include, at a minimum, the following:

1. Construction schedule, list of equipment and materials, and proposed construction sequence.
2. Methods and procedures of installation and bottom inspection, obstruction removal procedures, procedures for maintaining and measuring tolerances, and seam repairs/sealing procedures.
3. Methods and procedures of concrete and reinforcement placement, and casing withdrawal.
4. The method of groundwater control.
5. The method for the collection, placement in containers if used, and offsite disposal of all drilling and secant pile construction wastes.
6. Include contingency plans for excessive movement of ground, support wall system, or existing structures or utilities in excess of allowable movement indicated on the Contract Drawings. Contingency plans shall include positive measures by the Contractor to limit further movement of ground, support wall system, or existing structures or utilities. Coordinate the contingency plans with Section 02295.

E. Quality Control Submittals

1. Submit qualifications and experience records for personnel as specified herein.
2. Manufacturers' product data, certificates, and manufacturers' test data for any manufactured materials incorporated.
3. Quality Control Field Reports daily during construction to include where applicable, date and time, soils encountered, obstructions or excavation problems, tests performed, verification of verticality, and deviations from planned locations.
4. Submit as-built record data within one week of secant pile wall completion.
5. Submit mitigation designs for review by the PM/CM for secant piles that do not meet the performance criteria specified.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. The Contractor shall design the secant pile wall to include, at a minimum, the minimum loading criteria indicated on the Contract Drawings and any other loads that may be imposed.
- B. The bottom of the secant pile walls shall be installed a minimum of five (5) feet below the bottom of the excavation or embedded five (5) feet into moderately weathered to fresh bedrock as defined by ISRM weathering classification system, whichever is deeper.
- C. The Contractors design shall include all phases of construction with appropriate factors of safety.
- D. The Contractors design shall consider conditions that may occur during the various stages of construction including, but not limited to following:
 1. Temporary or permanent alteration of the soils' in-situ properties caused by the selected methods of construction.

2. Installation, relocation, and removal of temporary bracing.
 3. Excavation below bracing.
 4. Dewatering of excavation.
 5. Time related effects.
 6. Load transfer to permanent structures.
- E. The Contractor is solely responsible for design of each shaft bottom to provide a stable support for guide rails, thrust block, and other construction operations. Include, at a minimum, a working slab (mudmat), a drainage layer, and geotextile fabric.
- F. The Contractor shall design the excavation support system to limit movements in accordance with Section 02295.
- G. Excavations below the level of the base of any adjacent foundation or retaining wall shall not be permitted unless the design of the excavation system includes an analysis of the stability of the adjacent structure and includes, as necessary, any required bracing/underpinning of the adjacent structure.
- H. Cased holes advanced with rotary or other techniques shall be used to install the secant piles. Open hole slurry or water support of drill holes without cased holes is not allowed.
- I. The Contractor's secant pile wall Subcontractor shall be prepared to make modifications to construction methods if the interface between the overburden and bedrock is not sufficiently sealed to prevent migration of materials into the secant pile or if groundwater inflows prevent the required verification of bottom depth.
- J. Design the work to achieve the minimum required clearances and tolerances necessary for the tunneling work and for the permanent structures.
- K. Minimum concrete compressive strength shall be 4000 pounds per square inch (psi) and tested in accordance with ASTM C39 at 28 days.
- L. Welding of steel reinforcement is not allowed unless accepted in writing by the PM/CM.
- M. Installation Tolerances
1. Secant pile shaft shall be designed considering a maximum in-plan installation tolerance of 1 inch from pile design locations.
 2. Secant pile shaft shall be designed considering a maximum out-of-verticality tolerance of 1% applied such that two adjacent piles are diverging away from each other in the radial direction from shaft center.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, schedule, operation, monitoring, and removal.

- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufactures recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall either new or in serviceable condition.
- B. The Contractor shall furnish all installation tools, materials, and miscellaneous components.

2.02 MATERIALS

- A. Steel
 - 1. Steel casing shall conform to the requirements of ASTM A36. Steel casing shall be of sufficient strength to withstand the stress imposed on it.
 - 2. Reinforcing steel shall be Grade 60 kips per square inch (ksi) and conform to ASTM A615.
- B. Concrete
 - 1. Concrete materials as specified in Section 03300.
 - 2. Concrete for secant piles shall have a slump of six (6) to eight (8) inches.

2.03 EQUIPMENT

- A. Use only equipment that has the necessary power and torque to excavate a hole and construct the secant piles to the required diameter and depth required.

2.04 SOURCE QUALITY CONTROL

- A. Only materials meeting the requirements of these specifications shall be used.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence installation of support of excavations systems only after design calculations and shop drawings have been reviewed and accepted by the PM/CM and applicable permits have been obtained.
- B. Seal the inside face of the secant pile wall system at joints and penetrations as necessary to provide a watertight wall. The term “watertight” means that the allowable leakage rate shall not exceed:
 - 1. One quarter (0.25) gallon per minute (gpm) per 250 square feet (sf) of wall and base.
 - 2. One half (0.5) gpm from any single leak.
 - 3. Maximum total inflow for the entire shaft shall not exceed five (5) gpm.
 - 4. Moist patches are acceptable.
- C. Any borehole that will remain open overnight shall be covered and protected to prevent foreign material and surface water from entering the borehole.
- D. Conduct all work within the construction limits established for the project.
- E. At a minimum, place fencing, gates, lights, and signs as necessary around the support of excavation work areas to provide for public safety.
- F. Methods of construction for support using secant pile walls shall be such as to ensure the safety of the Contractor's employees, the PM/CM employees and inspectors, the public, and adjacent property owners.
- G. Perform the work to achieve the minimum required clearances and tolerances necessary for the permanent structures.
- H. If the PM/CM is of the opinion that at any point sufficient or proper supports have not been provided, additional supports may be ordered to be placed at no additional cost. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports.
- I. If unstable material is encountered during excavation, all necessary measures shall be taken immediately to prevent ground displacement.
- J. Maintain a sufficient quantity of materials throughout the conduct of the work for installation of temporary excavation support systems, protection of the work, or in cases of accident or emergency.
- K. Care shall be taken to prevent voids outside of the excavation support system. If voids are formed, they shall be immediately filled with sand or stone. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete or other material as accepted by the PM/CM.
- L. All underground utility lines shall be identified, located, and protected from damage or displacement. Refer to the Contract Documents for geotechnical instrumentation requirements.
- M. Maintain temporary excavation support systems in place and functioning properly until no longer necessary.

3.02 SECANT PILE INSTALLATION

A. Sequencing

1. After installation of primary piles, allow concrete fill to set sufficiently to prevent hole stability issues. Do not drill within ten feet or three shaft diameters, whichever is less, from an adjacent secant pile until a minimum of three (3) days has past.
2. Drill secondary piles as soon as concrete has achieved ample strength to resist damage and deformation but has not achieved full strength.
3. Install steel casing as the excavation is advanced. Secant piles shall be cased to the top of bedrock.
4. Excavate through materials encountered to the dimensions and depths shown on the accepted submittals.
5. Clean the bottom of the secant pile excavation of loose material and free water.
6. Verify the depth, dimension, and alignment of each secant pile excavation. Measure the excavation depth with a suitable weighted tape or other acceptable reviewed methods.
7. Place reinforcement after verification of depth, dimension, and alignment is demonstrated.
8. Remove temporary casing while the concrete is workable. Maintain the casing at least five feet below the top of the concrete during withdrawal.
9. After concrete placement, extract temporary casing without disturbing setting concrete or installed reinforcing.

B. Placement of Reinforcement

1. Place and maintain steel reinforcement members in the center of the secant pile using centering devices.
2. Replace steel reinforcement damaged during transport, storage, or installation at no additional cost.

C. Concrete Placement

1. Concrete work shall conform to ACI 301-16.
2. Place concrete within 24 hours of reaching the excavation depth.
3. Prevent damage to steel reinforcement during concrete placement.
4. Place concrete by tremie methods from the bottom of the excavation. Do not start concrete placement until a concrete supply adequate to fill the secant pile is assured. Place concrete within a time limit during which the excavation remains clean and stable and the concrete maintains the required slump.

D. Records

1. Maintain a record of each secant pile installed on a form. Include, as a minimum, the following:

- a. Secant pile number, location including deviation from plan design location, vertical, diameter, and top and bottom elevation, rotation of any reinforcing members.
- b. Time and date of the start and finish of each secant pile, including times and dates of excavation and concrete placement.
- c. Casing dimensions, concrete strength, concrete volume, and size and location of splices in reinforcement.
- d. Subsurface conditions description and observations of water, and documentation of problems encountered or delays.
- e. Remediation and unacceptable secant piles.

E. Secant Pile Demolition

1. When backfilling, remove secant pile shaft wall to a depth of 5-feet below finished grade. Protect waterproofing from damage in anticipation of this activity.

3.03 FIELD QUALITY CONTROL

- A. The Contractors Testing Agency shall obtain samples of fresh concrete in accordance with ASTM C172 at the point of concrete discharge. At least one composite sample shall be obtained at a minimum rate of one (1) set of four (4) cylinders per shift that concrete is placed.
- B. Sampled concrete used to mold strength test specimens shall be in accordance with ASTM C31 and include the following additional tests:
 1. Compressive Strength: ASTM C39 for 28-day strength
 2. Air Content: ASTM C138
 3. Slump: ASTM C143
 4. Temperature: ASTM C1064
 5. Density: ASTM C138
- C. Evaluation and Acceptance Tests of concrete shall conform to ACI 318-11.
- D. Monitor placement and chart actual volume of concrete placed versus theoretical volume required.
- E. Perform secant pile excavation inspection as the excavation progresses. Immediately inform the PM/CM of overexcavation, obstructions, or excavations out of tolerance. Correct secant piles that exceed permissible tolerances.
- F. Provide a mitigation designs for review by the PM/CM for secant piles and the secant pile system that does not meet the performance criteria specified.
- G. Inspect vertical seams between adjacent secant piles during excavation for incomplete bonding, separation, soil inclusion, seepage, and other defects. Seal seams as necessary to meet the allowable leakage criteria.

END OF SECTION 02465

SECTION 02500

PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for construction of all temporary and permanent pavement on paved areas affected or damaged by the Contractors operations, whether inside or outside the normal trench limits, as indicated on the Drawings and as herein specified.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading

1.02 REFERENCES

A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification prior to preparation and installation of any pavements.

1. Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, including all addenda, issued by the State of Rhode Island Department of Transportation, (referred to as the Standard Specification).

1.03. PAVEMENT SCHEDULE

A. The Contractor's attention is directed to the various pavements required under this contract as outlined on the Drawings.

B. All pavement thicknesses identified identified on the Drawings shall be of the thickness required after compaction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Tack

1. Tack coat shall consist of either emulsified asphalt, grade RS-1 or cutback asphalt grade RC-70 conforming to the requirements of the Rhode Island Standard Specification Section 403 and M.03.04.

B. Bituminous Base

1. Bituminous Base shall conform to the requirements of the Rhode Island Standard Specification Section 401 and and Class 12.5 HMA for Base Course.

C. Bituminous Leveling Course

1. Bituminous Leveling Course shall conform to the requirements of the Rhode Island Standard Specification Section 401 and Class 12.5 HMA for Leveling Course.

D. Bituminous Surface, (Curb to Curb)

1. Bituminous Surface Course shall conform to the requirements of the Rhode Island Standard Specification Section 401 and Class 9.5 HMA for Surface Course.

E. Temporary Pavement

1. Temporary Pavement shall be Base Course conforming to the requirements of the State of Rhode Island Standard Specification, Subsection 402 and M.03.01.1. for Binder Course.

H. Gravel Base Course

1. Gravel base course in accordance with State of Rhode Island Standard Specification, Subsection M.01.09, Meeting the gradation requirements of Table 1, Column 1, with 100% Passing 3-inch Square Mesh Sieves.

2.02 SOURCE QUALITY CONTROL

- A. The paving plant used by the Contractor for preparation of bituminous paving materials shall be acceptable to the Program Manager/Construction Manager who shall have the right to inspect the plant and the making of the material.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to placing pavement, all backfill shall have been properly compacted as specified under SECTION 02200 to eliminate settling of backfill. No pavement shall be placed over poorly compacted backfill. Backfill and gravel base course shall be compacted, brought to the proper elevation, and dressed so that new pavement construction shall be at the required grade. The Contractor shall maintain the surfaces of all excavated and disturbed areas until the pavement is placed. If there is a time lapse of more than 24 hours between completion of preparation of subgrade or placing of gravel base course and placing of paving, or if subgrade or gravel base course has been eroded or disturbed by traffic, the subgrade or gravel base course shall be restored before placing pavement.
- B. When installing permanent pavement on bituminous concrete roadway the edges of existing pavement shall be cut back 12-inches, or more as required, from the trench excavation wall or damaged area to sound undamaged material, straightened, cleaned, and painted with an accepted asphalt emulsion to ensure a satisfactory bond between it and the newly placed surface courses. Existing surface courses shall be stripped from the bituminous concrete base course for at least a 6-inch width and trimmed square and straight so that new permanent surfacing shall be placed on undisturbed bituminous concrete base course. Existing pavement shall be swept clean prior to placing any asphalt emulsion over it. Existing pavement that will be under new pavement shall be painted with asphalt emulsion to ensure a satisfactory bond.

- C. Before permanent pavement is installed, the base shall be brought to the proper grade, and temporary pavement and excess gravel base shall be removed.
- D. All manhole covers, catch basin grates, valve and meter boxes, curbs, walks, walls and fences shall be adequately protected and left in a clean condition. Where required, the grades of manhole covers, catch basin grates, valve boxes, and other similar items shall be adjusted to conform to the finished pavement grade.
- E. The Contractor shall remove and acceptably dispose of all surplus and unsuitable material.

3.02 INSTALLATION

A. General

- 1. All construction methods and materials shall be satisfactory to the Program Manager/Construction Manager.
- 2. Unless indicated otherwise, all permanent bituminous pavement shall be installed in two courses or more. Bituminous base courses shall be carefully spread and raked to a uniform surface and thoroughly rolled before application of the top course.
- 3. All to courses of permanent paving shall be applied with acceptable mechanical spreaders in widths of at least 9 feet.
- 4. The rolling for all bituminous and gravel base courses shall conform to the standards listed in the appropriate Subsection of the Standard Specification.
- 5. Pavement shall be placed so that the entire roadway or paved area shall have a true and uniform surface, and the pavement shall conform to the proper grade and cross section with a smooth transition to existing pavement.

B. Gravel Base Course

- 1. The gravel base shall be placed to such depth that the furnished compacted gravel base course is the depth as indicated on the drawings and specified herein.
- 2. The top of the compacted gravel base shall be below the furnish grade a distance required to accommodate the compacted pavement material as indicated on the drawings and specified herein.
- 3. The gravel base as herein specified shall be 18-inches thick for flexible pavements and 6-inches thick for rigid pavements.

C. Temporary Pavement

- 1. Temporary pavement shall be placed over all trenches in paved areas where directed by the Program Manager/Construction Manager.
- 2. The Contractor, upon completing the backfilling and compaction of the trenches in the streets and the placing of the gravel base course, shall be required to construct temporary pavement unless otherwise directed by the Program Manager/Construction Manager.
- 3. Temporary Pavement in city roads shall be placed in one course and shall consist of 2-inch compacted thickness of hot bituminous mix, on a 18-inch compacted thickness gravel base as directed by the Program Manager/Construction Manager.
- 4. Temporary Pavement in state roads shall be placed in one course and shall consist of 3-inch compacted thickness of hot bituminous mix, on a 18-inch compacted thickness gravel base as directed by the Program Manager/Construction Manager.

5. The Contractor shall maintain temporary pavement in good repair and flush with the existing pavement at all times until the permanent pavement is placed.
6. The temporary pavement shall not be removed until such time that the Program Manager/Construction Manager authorizes the placement of permanent pavement.

D. Bituminous Base

1. Bituminous Base shall be used in city streets and parking areas as listed in Article 1.03 of this specification.
2. Bituminous Base shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.
3. Prior to placing bituminous base, all temporary pavement and sufficient gravel base course shall be removed, to proper depths as detailed in the Contract Drawings.

G. Bituminous Surface

1. Bituminous Surface shall be used in the streets as listed in Article 1.03 of this specification.
2. Bituminous Surface shall be placed to the thickness as indicated in Article 1.03 of this Specification and installed in accordance with the requirements of the Standard Specification and as detailed in the Contract Drawings.

H. Sidewalks, Driveways, Parking Lots And Curbing

1. Sidewalks, driveways, parking lots and curbing that are removed or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they are found immediately prior to the start of operations. Materials and methods used for such restoration shall be in conformance with the requirements of the State of Rhode Island Standard Specification.
2. Where the trench location is in a sidewalk, the entire width of the sidewalk shall be replaced with new material. Side forms shall be set so as to obtain and preserve a straight edge along both sides of the walk.
3. Where trench location is in a driveway, the driveway shall be repaved across its entire width with even edges.
4. Parking lots shall be repaved in accordance with Article 3.01 of this section.
5. Gravel base course under sidewalks and driveways shall not be less than 12" inch thick.

I. Surface Maintenance

1. During the guarantee period, the Contractor shall maintain the bituminous surface and shall promptly make good all defects such as cracks, depressions, and holes that may occur. At all times, the surfacing shall be kept in a safe and satisfactory condition for traffic. If defects occur in surfacing constructed by the Contractor, the Contractor shall remove all bituminous concrete and base course as is necessary to properly correct the defect. After removing bituminous concrete and base course, the Contractor shall correct the cause of the defect and replace the base course and bituminous concrete in accordance with these specifications.

END OF SECTION

SECTION 02501

RECLAIMED BASE COURSE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This work consists of the rehabilitation of an existing pavement structure into a processed asphalt stabilized base (recycled) course. The existing pavement is to be mixed with a specified depth of the existing gravel base. This mixture of pavement and gravel is to be processed, reshaped, rolled, compacted and fine graded to the cross sections and/or grades indicated on the Contract Drawings, all in accordance with these Specifications.

1.02 RELATED SECTIONS

- A. Section 02200 - Earth Excavation, Backfill and Grading.

1.03 REFERENCES

- A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification prior to any reclamation.
1. The Rhode Island Department of Transportation Standard Specification for Road and Bridge Construction, 2004 Edition, together with all errata, addenda, additional revisions and supplemental specifications, all of which are hereinafter referred to as the Rhode Island Standard Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The processed asphalt stabilized base material shall conform to the gradation requirements of either Gradation "A" or Gradation "B," whichever is specified in the Contract.

<u>Sieve Designation</u>	<u>Gradation "A"</u> <u>% Passing by Weight</u>	<u>Gradation "B"</u> <u>% Passing by Weight</u>
3"	100	100
2½"	80-100	100
1½"	70-100	70-100
¾"	50-85	50-95
NO. 4	30-55	30-75
NO. 50	8-24	8-30
NO. 200	2-12	3-12

If additional aggregate is needed, the Contractor may be directed to add material from an outside source. However, scarified pavement and gravel fines must be mixed together and thoroughly worked and/or reworked as described herein.

Additional gravel shall conform to the requirements for Gravel Borrow as set forth in Subsection M.01.09, Table I, Column I, of the Rhode Island Standard Specifications.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

- A. The Contractor has the option to utilize whatever equipment can effectively pulverize, crush, mix and/or blend the recyclable materials to specification. Furthermore, the Contractor can choose to process in-place or load and haul the recyclable materials to an off-site location, process them into the proper recycled material and return it to the job site.
- B. Procedure. Prior to the start of Pavement "Rehabilitation/Recycling" all water and gas gates are to be lowered to a minimum depth of one foot from proposed finish grade. All manholes and catch basin frames, grates and covers are to be removed. The structures are to be covered with a temporary cover which shall overhang the pavement opening by a minimum of one foot on all sides of adequate strength to accommodate truck and construction equipment loadings. The voids remaining after utility gates or drainage structures are lowered are to be filled with gravel borrow material conforming to the requirements of Table I, Column I of Subsection M.01.09 of the Rhode Island Standard Specifications. The existing pavement is to be scarified and mixed with gravel from the roadway structure.
- C. The minimum depth of existing gravel to be incorporated in the rehabilitation process will be shown on the Plans. This quantity will be taken from the uppermost portion of the base layer unless otherwise specified.
- D. Water and calcium shall be added to insure optimum moisture content at the time of compaction. They shall be applied at the rate of 0.25 pounds of calcium chloride per gallon of water per square yard of recycled pavement area. The mixing formula may be modified by the Engineer to compensate for temperature, humidity, weather and/or density determinations.
- E. Any required modifications to the remaining gravel base and/or subgrade such as but not limited to cuts, fills, grade realignment and the removal of unsuitable materials will be made before spreading the asphalt stabilized base material. Existing utility gates, manholes and catch basins are to be adjusted to finish grade.
- F. The thickness of the processed asphalt stabilized (recycled) base course will be shown on the Plans, graded to the specified cross section, plan grades or as directed by the Engineer and compacted to a uniform density of not less than 95 percent of maximum density as determined by AASHTO T180, Method D.
- G. The restored cross section shall be thoroughly compacted to a dense consolidated mass by rolling with an approved roller capable of producing the specified density. The required density will be measured by a Nuclear Density Gauge.
- H. The processed asphalt stabilized base shall be tested for smoothness and accuracy of grade and if any portions are found to lack required smoothness or accuracy such portions shall be re-scarified, reshaped, re-compacted, and otherwise manipulated as the Engineer may direct

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until the required smoothness and accuracy are obtained. The finished surface shall have a tolerance of ½ inch plus or minus to the grades shown on the Plans or as directed.

- I. It is the responsibility of the Contractor to insure that the equipment/construction methods he intends to use are capable of complying with project specifications.

- J. Gate boxes and castings shall not be adjusted upward until after placement of the binder course, but before placement of the wearing course. Lowering and raising of gate boxes and castings shall be considered incidental to this item with no additional compensation allowed. Any new gate boxes or castings required shall be supplied by the Owner. Installation of new gate boxes and castings to replace broken ones shall also be considered incidental to this item with no additional compensation allowed.

END OF SECTION

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SECTION 02502

BITUMINOUS CONCRETE EXCAVATION BY MICROMILLING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for removing bituminous pavement by Micromilling in designated areas.

1.02 REFERENCES

- A. This specification includes by reference, requirements of additional specifications as listed. The Contractor shall perform the Work in accordance with requirements of the referenced specification in addition to the requirements of this Specification Section 02502.
- B. The Contractor shall obtain and familiarize himself with all requirements of these specifications prior to any milling.
1. Materials and construction methods shall conform, insofar as applicable, to the requirements of the or Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, together with all errata addenda additional revisions, and supplemental specifications.

1.03 PERFORMANCE REQUIREMENTS

- A. The milling equipment must be equipped with an elevating device capable of loading milled material directly into dump trucks while operating. The milling equipment shall have necessary safety devices such as reflectors, headlights, taillights, flashing lights and back up signals so as to operate safely in traffic day and/or night.
- B. The milling equipment shall be designed and built for milling pavements and possess the ability to mill cement concrete patches when encountered in bituminous pavement. It shall be self propelled and have the means for milling without tearing or gouging the underlying surface. Variable lacing patterns shall be provided to permit a rough grooved or smooth surface as directed by the Program Manager/Construction Manager.
- C. A 1 ½ inch cut to predetermined grade or any specified lesser depth may be required in one pass. The minimum width of pavement milled in one pass shall be 6 feet, except in areas to be trimmed and edged. The Contractor will be permitted to augment the large milling equipment with other more maneuverable machines for those areas inaccessible to the 6 foot machine such as curb or casting cuts.
- D. The machine shall be adjustable as to crown and depth and meet the standards set by the Air Quality Act for noise and air pollution.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

- A. The milled surface shall conform generally to the grade and cross section required. The surface shall not be torn, gouged, shoved, broken or excessively grooved. It shall be free of imperfections in workmanship that prevent resurfacing after the milling operation. Surface texture shall be as required by the Program Manager/Construction Manager and excess material shall be removed so that the surface is acceptable to traffic if required.
- B. Asphalt cuttings shall be removed and legally disposed of by the Contractor.
- C. The milled surface shall be swept clean and its condition accepted by the Program Manager/Construction Manager prior to installation of bituminous surface course.

END OF SECTION

SECTION 02503

FIBER REINFORCED JOINT AND CRACK SEALING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing all plant, labor, equipment and materials necessary to clean and seal construction joints and random cracks in bituminous concrete pavements.

1.02 SUBMITTALS

- A. Shop Drawings
 - 1. Submit in accordance with Section 01300.

1.03 QUALITY ASSURANCE

- A. Certifications
 - 1. If requested, a manufacturer's certificate of material compliance shall be furnished to the Owner certifying conformance to the above material specification.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Crack Sealer
 - 1. Asphalt fiber compound designed especially for improving strength and performance of the parent asphalt sealant.
 - 2. Asphalt sealant to be Grade PG 58-28 (formerly AC-10), PG 64-22 or 64-28 (formerly AC-20) with a penetration of 75-100.
 - 3. Fiber reinforcing materials shall be short-length polyester fibers having the following properties,
 - a. Length .25 inches
 - b. Diameter 0.008 inch plus or minus 0.0001 inch
 - c. Specific Gravity 1.32 to 1.40
 - d. Melt Temperature 480 degrees F. minimum
 - e. Ignition Temperature 1000 degrees F. minimum
 - f. Tensile Strength 75,000 PSI plus or minus 5,000 PSI
 - g. Break Elongation 33% plus or minus 9% when they are fully drawn.
- B. Asphalt Fiber compound mixing rate to be 6-8% fiber weight of asphalt cement.

- C. This compound having the same chemical base provides compatibility and exhibits excellent bond strengths.
- D. Fiber functions to re-distribute high stress and strain concentrations that are imposed on the sealant by thermal sources, traffic loading, etc.

2.02 EQUIPMENT

A. General

- 1. Equipment used in the performance of the Work required by this section of the specification shall be subject to the approval of the Engineer and maintained in a satisfactory working condition at all times.

B. Air Compressor

- 1. Portable and capable of furnishing not less than 100 cubic feet of air per minute at not less than 90 PSI pressure at the nozzle.
- 2. Equipped with traps that will maintain the compressed air free of oil and water.

C. Sweeper

- 1. Manually operated, gas powered air-broom or self propelled sweeper designed especially for use in cleaning highway and airfield pavements shall be used to remove debris, dirt, and dust from the cracks.

D. Hand Tools

- 1. Utilize brooms, shovels, metal bars with chisel shaped ends, and any other tools which may be satisfactorily used to accomplish this Work.

E. Melting Kettle

- 1. Unit used to melt the joint sealing compound shall be double boiler, indirect fired type.
- 2. Annular space between the inner and outer shells shall be filled with suitable heat transfer oil or substitute having a flash point of not less than 600 degrees F.
- 3. Equipped with a satisfactory means of agitating the joint sealer at all times with either or both of the following,
 - a. Continuous stirring with mechanically operated paddles,
 - b. Continuous circulating gear pump attached to the heating unit.
- 4. Equipped with a thermostatic control calibrated between 200 degrees F. and 550 degrees F.

PART 3 EXECUTION

3.01 PREPARATION

A. General

1. No crack sealing material shall be applied in wet cracks or where frost, snow, or ice is present or when ambient temperature is below 25 degrees F.

B. Debris Removal

1. Cracks shall be blown clean by high pressure air.
2. Old material and other debris removed from the cracks shall be removed from pavement surface immediately by means of power sweepers, air brooms or hand brooms.

C. Vegetation

1. Remove vegetation from cracks then sterilize by the use of propane torch unit generating 2000 degrees F. and 3000 foot/second velocity to eliminate all vegetation, dirt, moisture and seeds.

3.02 INSTALLATION

A. Sealer

1. Heated and applied at a temperature specified by the manufacturer and approved by the Engineer.
2. Minimum application temperature to be 320 degrees F.
3. Delivered to the pavement surface through a pressure hose line and applicator shoe.

B. Boiler slag aggregate

1. Broadcast over cracks to prevent sealer pickup when traffic requires immediate use of the roadway.

3.03 WORKMANSHIP

A. General

1. All workmanship to be of the highest quality
2. Excess of spilled sealer shall be removed from the pavement by approved methods and discarded.
3. Workmanship determined to be below the high standards of the particular craft involved will not be accepted, and will be corrected and/or replaced as required by the Engineer.

3.04 PROTECTION

- A. Supply and maintain traffic cones and barricades for the protection of workers and the Work.

3.05 PERFORMANCE

A. General

1. Properly formulated and mixed asphalt compound over-banding shall not expand beyond 4-inches in width due to temperature or traffic compression after placement.
2. Penalties may be imposed upon the contractor for expansion of over-banding beyond 4-inches.

END OF SECTION

SECTION 02530

RESTORATION OF CURB, SIDEWALKS AND VEGETATED AREAS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for removal and replacement of granite curb, concrete and bituminous sidewalks including sidewalks at driveways and wheelchair ramps.
2. Requirements for restoration of vegetated areas, plantings and tree beds.
3. Restoration to include those areas designated by the Contract Drawings and those affected or damaged by the construction operations, outside the limits of Work.

B. Related Sections

1. Section 02200 - Earth Excavation, Backfill, Fill and Grading

1.02 REFERENCES

- A. This specification makes reference to the requirements of additional specifications as listed. The Contractor shall obtain and familiarize himself with all requirements referenced by this specification.
1. Rhode Island Department of Transportation, Standard Specifications for Road and Bridge Construction, , including all addenda, issued by the State of Rhode Island Department of Transportation, (referred to as the Standard Specification).

1.03 SUBMITTALS

A. Submit in accordance with Section 01300,

1. Sieve analysis for aggregates and loams.
2. Mix designs for batched materials.
3. Certifications for landscape material.
4. Samples when requested by the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel Borrow

1. In accordance with State of Rhode Island Standard Specification, Subsection M.01.02, Meeting the gradation requirements of Table 1, Column 1, with 100% Passing 3-inch Square Mesh Sieves.

B. Granite Curb

1. In accordance with the requirements of the State of Rhode Island Standard Specification, Section M.09.

C. Cement Concrete

1. In accordance with the requirements of the State of Rhode Island Standard Specification, Section M 02.

D. Bituminous Concrete

1. In accordance with the requirements of the Rhode Island Standard Specification Section 401 for Surface Course, Class I-2 and the gradation requirements for Class I-2 or sidewalk in section M.03.01.

E. Loam, Seed, Lime, Fertilizer, Mulch and Water

1. In accordance with Section M.18 of the Rhode Island Standard Specification.

2.02 SOURCE QUALITY CONTROL

- A. The plants used by the Contractor for preparation of bituminous paving materials and cement concrete shall be acceptable to the Engineer who shall have the right to inspect the plant and the making of the material.

PART 3 EXECUTION

3.01 INSTALLATION/RESTORATION

- A. Excavation to be in accordance with Section 02200 unless noted otherwise by the referenced specifications below.

B. Granite Curb

1. Installing or Remove, Salvage and Reset granite curb at the locations indicated on the Drawings or as directed by the Engineer shall be in accordance with Section 906 of the State of Rhode Island Standard Specification.

C. Sidewalks

1. Installation of new or replacing existing sidewalks, driveways and wheelchair ramps at the locations shown on the Drawings or as directed by the Engineer to be in accordance with Section 905 of the State of Rhode Island Standard Specification.

D. Vegetated Areas, Plantings and Tree Beds

1. Restore all disturbed areas in accordance with the following Sections of the State of Rhode Island Standard Specification.
 - a. Loam in accordance with L.01
 - b. Seeding in accordance with L.02
 - c. Plantings and Tree Beds in accordance with L.08

E. Stonedust Sidewalk

1. The work shall include the construction of stone dust sidewalk on an existing gravel borrow sub-base. This specification shall govern work performed near the trunk base of trees designated by the City's Representative as "Sensitive Tree Areas" and is intended to minimize damage to the root system of the trees which lie within the sidewalk area.
2. Installation of stone dust shall be done after the excavation of the existing sidewalk in the Sensitive Tree Area is complete.
3. Remove protective loam before the stone dust is installed. The remaining gravel sub-base will be left in place. The stone dust shall be applied to a four (4) inch depth on the existing gravel sub-base within the designated "Sensitive Tree Area" The stone dust will be fine graded smooth and level.
4. The stone dust will be tamped in place by using hand tools only, the use of vibrating compactors will not be allowed. All roots will be left in place unless they are above the finish grade of the sidewalk. If root trimming is necessary, it will be done in accordance with Section L.10, Tree Root Pruning of the State of Rhode Island Standard Specifications.
5. Roots are not to be left exposed for more than one (1) hour. Stone dust will be installed immediately after the loam has been removed. Heavy equipment will be excluded from the "Sensitive Tree Areas" at all times.

F. Restoration Limits

1. Where the trench location is in a sidewalk, the entire width of the sidewalk shall be replaced with new material. Side forms shall be set so as to obtain and preserve a straight edge along both sides of the walk.
2. Sidewalks shall be cut at existing joints or as directed otherwise by the Engineer.
3. Where trench is in a driveway, the driveway shall be repaved across its entire width with even edges.

G. Restoration outside Limits of Work

1. Sidewalks, driveways, parking lots and curbing that are or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they are found immediately prior to the start of operations. Materials and methods used for such restoration shall be in conformance with the requirements of the Standard Specification.
2. There shall be no cost to the Owner for this work.

END OF SECTION

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SECTION 02607

PRECAST CONCRETE MANHOLES AND STRUCTURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for modular precast concrete manhole sections and structures with tongue- and-groove joints, cast iron covers or aluminum hatches, accessories and appurtenances.

B. Related Sections

1. Section 02200 – Earth Excavation, Backfill, Fill and Grading
2. Section 02240 – Construction Water Handling
3. Section 02260 – Support of Excavation
4. Section 03300 - Cast-In-Place Concrete
5. Section 07100 – Waterproofing

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A48, Standard Specification for Gray Iron Castings.
2. A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. C32, Standard Specification of Sewer and Manhole Brick (Made from Clay or Shale), AASHTO Designation M91-42, Red Sewer Brick Only Grade SS.
4. C144, Standard Specification for Aggregate for Masonry Mortar.
5. C150, Standard Specification for Portland Cement.
6. C207, Standard Specification for Hydrated Lime for Masonry Purposes.
7. C443, Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
8. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
9. C890, Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
10. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
11. C990, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

12. C1244, Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure.
13. D4101, Standard Specification for Propylene Plastic Injection and Extrusion Materials.

B. American Concrete Institute

1. ACI 318, Building Code Requirements for Structural Concrete
2. ACI 350, Environmental Engineering Concrete Structures

1.03 SYSTEM DESCRIPTION

A. Design Requirements

1. Manholes and structures shall conform in shape, size, dimensions, materials, and other respects to the details indicated in the Contract drawings.
2. All manholes and structures shall have concrete bases. Invert channels may be formed in the concrete of the base or brickwork upon the base.
3. Manhole and structure walls, barrels and cones shall be precast concrete sections. The top of the cone (not to be more than 12-in.) shall be built of brickwork to permit adjustment of the frame to meet the finished surface.
4. The inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius, which is tangent, within the manhole, to the centerlines of adjoining pipelines.
5. For Structures, the thickness of the bottom slab of the pre-cast bases shall not be less than the top slab.
6. When the depth of the manhole exceeds twenty-four (24) feet, the following shall be included in the design of the manhole:
 - a. Check the manhole for flotation (buoyancy).
 - b. Verify the exterior water pressure on the precast concrete manhole section joints from the ground water conditions will not exceed the requirements of the ASTM C443 for rubber gaskets, ASTM C990 for preformed flexible joint sealants, and the specifications.
 - c. Verify that the water pressure on the pipe to manhole connections from the groundwater conditions will not exceed the requirements of ASTM C923 and the Specifications.
 - d. Pressure on walls of all buried structures should be calculated using the equations provided in ASTM C890. Structures must be designed for all possible loading including conditions including lateral earth, hydrostatic and surcharge loads.

B. Design Responsibility

1. The Contractor shall be fully responsible for providing a complete and adequately designed sanitary sewer structure as required and/or directed by the Program Manager/Construction Manager in accordance with the provisions set forth herein.

2. The Contractor shall engage, at his own expense, the services of a fully competent and qualified Professional Engineer, hereinafter referred to as the “Contractor’s Engineer”, registered in the State of Rhode Island, for the design of all reinforced concrete, and for completing flotation calculations, as necessary to accomplish the Work specified.
3. The Contractor’s Engineer shall be acceptable to the Program Manager/Construction Manager and demonstrate a minimum of five (5) years documented experience in the field of structural design.

C. Design Criteria

1. Design load requirements shall be determined by local conditions, applicable codes, structure end use, and shall be in accordance with the Building Code of the State in which the structure is being constructed.
2. The structure shall be designed to adequately and safely support all live and dead loads to which the structure will be subjected, and to withstand all conditions that may be encountered, including burial depth, and the dead and live loads anticipated for the structure. The structures shall have adequate wall, base and top slab thickness and steel reinforcement sufficient for the depth of burial shown on the Drawings.
3. Design precast reinforced concrete structures to withstand earth and groundwater loads. Groundwater elevation shall be assumed to be at the top of the structure. An at-rest lateral soil pressure coefficient of 0.5 shall be used.
4. Design precast reinforced concrete structure to withstand an AASHTO HS-20 vehicle loading with an impact factor of 1.3. Design shall account for vehicle positions both above and alongside the structure, including directly on manhole covers and hatches.
5. Design and install the structures to withstand hydrostatic uplift caused by a groundwater elevation at grade level or equal to the top of the structure, whichever produces the most severe condition. Use only the weight of the empty structure (no fill) and submerged soil directly over any base perimeter to resist hydrostatic uplift with a minimum safety factor of 1.10. The weight of submerged soil may be 60 pounds per cubic foot maximum. Do not include side friction of soil on walls.
6. Design, as a minimum, shall be in accordance with the requirements and recommendations of ACI 350 and ASTM C890 as referenced in Section 1.02 herein.

1.04 SUBMITTALS

A. Shop Drawings

1. In accordance with Specification Section 01300.

B. Samples

1. Provide representative samples of materials if requested by the Program Manager/Construction Manager.

C. Design Calculations

1. For documentation ONLY, submit design calculations bearing the Professional Seal and signature of the Contractor's Engineer. Design calculations shall include reinforced concrete design and buoyancy calculations for the sanitary sewer structure, and address design load requirements of Section 1.03C.
2. Included as part of this submission, the Contractor's Engineer must provide a complete listing of all references, codes and specifications that are used by the Contractor's Engineer.

PART 2 – PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

- A. Reinforced precast concrete shall be produced in the United States in accordance with the American Iron and Steel requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014
- B. Conform to the ASTM C478 with the following exceptions and additional requirements:
 1. All cast in place concrete shall be Class A and shall conform to the requirements specified under SECTION 03300.
 2. Wall sections to be 5-inch thick minimum.
 3. Type II cement in accordance with ASTM C150.
 4. 4.0 feet and 5.0 feet diameter manholes minimum of 4,000 psi - 28 days compressive strength.
 5. 6.0 feet, 8.0 feet, and 10 feet diameter manholes and structures minimum of 5,000 psi. - 28 days compressive strength except as otherwise permitted.
 6. No more than two lift holes may be cast or drilled in each section.
 7. The date of manufacture and the name of trademark of the manufacturer shall be clearly marked on the inside of the structure.
 8. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
 9. All sections shall have tongue and groove gasketed, leak proof joints.
 10. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 5,000 psi and not before 5 days after fabrication and/or repair, whichever is longer.
 11. The thickness of the bottom slab of the pre-cast bases shall not be less than the top slab.
- C. Manhole Flat Slab Tops
 1. Thickness and reinforcement as indicated on the drawings and in accordance with ASTM C478.
- D. Manhole Cones
 1. Cones shall be precast sections of construction similar to above.

E. Manhole Bases

1. The tops of the bases shall be suitably shaped by means of accurate bell-ring forms to receive the barrel sections.
2. All holes for pipes shall be cast in the base sections so that there is a clear distance of four inches minimum between the inside bottom of the base section and the pipe invert.
3. Base pad shall be pre-cast with extended base as indicated on drawings and herein specified.
4. Openings for pipe and materials to be embedded in the wall of the base for these joints

2.02 COMPONENTS

A. Pipe Seals

1. Premolded elastomeric-sealed joints fitted or cast integrally into the pipe opening of the manhole base and/or wall section.
2. Provide a watertight joint.
3. Maximum 10-degree omni-directional deflection.
4. Conform to ASTM C923.
5. Seals to be:
 - a. Lock Joint Flexible Manhole Sleeve made by Interpace Corp., Parsippany, NJ;
 - b. Kor-N-Seal made by National Pollution Control Systems, Inc., Nashua, NH;
 - c. A-LOK manhole pipe seal made by A-LOK Corp., Trenton, NJ;
 - d. or an acceptable equivalent product.
6. All materials, accessories and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint. Furnish manufacturer's written instructions to the Program Manager/Construction Manager.

B. Aluminum Manhole Steps

1. Cast into walls of the precast sections to form a continuous ladder with a distance of twelve inches (12) between steps.
2. Aluminum drop-front type.
3. Stock No. 12653B made by Aluminum Company of America, Pittsburgh, PA.
4. Stock No. F-14-2-B made by New Jersey Aluminum Co., New Brunswick, N.J.,
5. Or an acceptable equivalent product.
6. Before the steps are built into the masonry and after thorough cleaning, those parts of aluminum steps which will be embedded shall be given a protective coating of an acceptable, heavy-bodied, bituminous material. The cleaning shall be done by suitable means and with suitable cleaning agents to ensure that the surfaces to be

coated are free from all foreign matter such as dirt, oil, and grease. The steps shall be thoroughly rinsed and dried before the coating is applied and the coating shall have become thoroughly dry before the steps are built into the masonry.

C. Plastic Manhole Steps

1. Install in walls of the precast sections to form a continuous ladder with a distance of twelve inches (12) between steps.
2. Copolymer Polypropylene plastic manhole step Model PS2-PFSL as manufactured by M.
3. A. Industries, Inc., Peachtree City, Georgia.
4. Plastic steps to be in conformance with ASTM D-4101 for type II propylene copolymers.
5. Plastic to encase 1/2-inch grade 60 steel reinforcing rod conforming to ASTM A-615.

D. Exterior Coating

1. Refer to Section 07100.

E. Interior Coating

1. The material shall be:
 - a. Sikagard 7600 made by Sika Corporation, Lynhurst, NJ or
 - b. GacoFlex LM-60 AR by Gaco Western, Seattle, WA.

F. Rubber Gaskets (between manhole sections)

1. In accordance with ASTM C443.
2. Gasket configuration per manufacturers recommendation.

G. Butyl Resin Gaskets (between manhole sections)

1. In accordance with ASTM C990.
2. Gasket configuration per manufacturers recommendation.

H. ACCESSORIES

1. Manhole Frames and Covers

- a. Manhole frames and covers shall be produced in the United States in accordance with the American Iron and Steel requirements of P.L. 113-76, the Consolidated Appropriations Act of 2014
- b. Furnish all cast-iron manhole frames and covers conforming to the details shown on the drawings, or as hereinbefore specified.
- c. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.

- d. Casting shall be thoroughly cleaned and subject to a careful hammer inspection.
- e. Castings shall be at least Class 25 conforming to the ASTM A48.
- f. Standard sewer manhole frames and covers to have 30 inch opening, and be East Jordan Iron Works Cover Model 00149577B02, Frame Model 00148012, or approved equal. Pattern of cover and lettering shall comply with the Owner's standards.
- g. For locations where the proposed rim elevation is below elevation 15, provide watertight sewer manhole frames having 32 inch diameter covers with 4 bolts, and gasket, and be East Jordan Iron Works, or approved equal. Pattern of cover and lettering shall comply with the Owner's standards.

I. Structure Entrance Hatches:

1. Manufacturers:

- a. Bilco Company, New Haven, CT.
- b. Halliday Products, Orlando, FL.
- c. Equivalent

2. Provide aluminum hatches of the type and size indicated on the drawings and as follows:

- a. Fabricate hatch and frame with ¼ inch (6 mm) extruded aluminum frame and ¼ inch (6mm) diamond checkered aluminum plate covers.
- b. Reinforce cover, with aluminum bars and angles welded to underside of covers, to withstand AASHTO H-20 wheel loading.
- c. Provide hatch with hinges, hold-open safety lock bars and flush lift handles, factory assembled, and shipped complete ready for installation.
- d. Provide stainless steel hardware throughout. Hinge covers to frames with heavy duty stainless steel concealed hinges and stainless steel pins. Attach hinges to covers and frames with countersunk/flathead stainless steel machine screws. Covers shall fit flush to frame.
- e. Provide slam latch, flush-mounted grip handle, and removable plug and key wrench.
- f. Fabricate gutter-type hatches with 1-½ inch (38mm) drainage coupling in one corner of the channel frame
- g. Provide frost proof inner hatch.
- h. Provide ladder-up safety post.
- i. Provide safety grating under the hatch door(s). Grating shall be hinged and locked separately from the hatch door(s). Grating shall be designed to withstand 300 psf and be painted safety orange by the hatch manufacturer.
- j. Provide a forged brass case padlock with hardened steel shackle. The padlock shall be furnished with two (2) keys that are compatible with the Owner's Master Locking System.

- k. Install hatch in accordance with manufacturer's instructions.
- l. The hatch shall be cast into the structural slabs. Coordination of the hatch installation is the responsibility of the Contractor.
- m. All hatch operating equipment shall be manufactured to be flush or below the hatch surface.

J. Brick

1. Sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Program Manager/Construction Manager.
2. In accordance with ASTM C32, Red Sewer Brick Only Grade SS.
3. In accordance with AASHTO M91-42, Red Sewer Brick Only Grade SS.
4. Reject brick shall be immediately removed from the work.

K. Mortar for Brickwork

1. Composed of Portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volume of cement and lime.
2. The proportions of cement and lime shall be 1:1/4.
3. Cement shall be Type II Portland cement in accordance with Specification SECTION 03300.
4. Hydrated lime shall be Type S conforming to the ASTM C207.
5. Hydrated lime shall be "Mortaseal" manufactured by U.S. Gypsum or
6. "4X Hydrate" manufactured by the New England Lime Company or
7. An acceptable equivalent product.
8. The sand shall conform to ASTM C144.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Manhole and Structure Sections

1. Set so as to be vertical and with sections and steps in true alignment.
2. Rubber gaskets shall be installed in all joints in accordance with the manufacturer's recommendations.
3. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces

B. Rubber and/or Butyl Resin Gaskets (between manhole sections)

1. In accordance with manufacturers recommendation.

2. Install in all joints between precast sections.
- C. Brickwork
1. Only clean bricks shall be used.
 2. Bricks shall be moistened by suitable means, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
 3. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded.
- D. Plastering And Curing Brick Masonry
1. Outside faces of brick masonry adjustment courses shall be plastered with mortar to a thickness of 1/2-inch.
 2. If required, the masonry shall be properly moistened prior to application of the mortar.
 3. The plaster shall be carefully spread and troweled. After hardening, the plaster shall be carefully checked by being tapped for bond and soundness.
 4. Unbonded or unsound plaster shall be removed and replaced.
 5. Brick masonry and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other suitable means, and shall be protected from the weather and frost, to insure maximum strength.
- E. Exterior Coating
1. The exterior surfaces of all manholes shall be given two coats of waterproofing material.
 2. The waterproofing material shall be applied in accordance with Section 07100.
 3. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.
- F. Interior Coating
1. Where required in the Contract Documents, the interior surfaces of identified manholes and structures shall be coated with an approved interior lining system. See Specification Section 09907.

3.02 SETTING MANHOLE FRAMES AND COVERS

- A. Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings or directed. Frames shall be set concentric with the top of the masonry and in full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
- B. Manhole covers shall be left in place in the frames on completion of work at the manholes.

3.03 CLEANING

- A. Manholes to be free of construction debris prior to final inspection.

END OF SECTION 02607

SECTION 02614

REINFORCED CONCRETE PIPE FOR OPEN CUT INSTALLATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for furnishing and installing the reinforced-concrete pipe as indicated on the drawings.

B. Related Sections

1. Section 02200 – Earthwork
2. Section 03300 – Cast-In-Place Concrete

1.02 QUALITY ASSURANCE

- A. Reinforced-concrete pipe shall be made by a manufacturer of established good reputation in the industry and in a plant adapted to meet the design requirements of the pipe.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. C76, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
2. C361, Specification for Reinforced Concrete Low-Head Pressure Pipe.
3. C443, Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets.

1.04 SUBMITTALS

- A. In accordance with SECTION 01300 submit for review drawings showing the pipe dimensions reinforcement, joint, and other details for each type and class of pipe to be furnished for the project. All pipe furnished under the contract shall be manufactured only in accordance with the specifications and the reviewed drawings.

PART 2 PRODUCTS

2.01 PIPE

- A. Each unit of pipe shall have an interior surface, which is free from roughness, projections, indentations, offsets, or irregularities of any kind. The pipe units shall be of the classes

indicated on the drawings and shall conform to ASTM C76 with the following exceptions and additions:

1. Type II cement shall be used unless otherwise permitted by the Program Manager/Construction Manager. Admixtures shall not be used except with the prior permission of the Program Manager/Construction Manager.
 2. Aggregates shall conform to the requirements set forth hereinafter.
 3. Elliptical reinforcement will not be permitted. Longitudinal reinforcement shall be continuous. Reinforcement shall have a minimum cover of 3/4 in.
 4. Absorption shall be as specified under "inspection, Tests and Acceptance."
 5. Pipe units have a minimum laying length of 8 ft., except as otherwise indicated or permitted by the Program Manager/Construction Manager.
 6. Pipe units shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees. F for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the pipe units to meet the strength requirements.
 7. Pipe units shall not be shipped until they have aged for at least 450 day-degrees which includes the steam curing period. Day-degrees are the total number of days times the average daily air temperature at the surface of the pipe units. (Example: Five days at a daily average temperature of 60 degrees. F equals 300 day-degrees.) Wherever the average daily temperatures are below 60 degrees. F the Contractor shall submit to the Program Manager/Construction Manager records of average daily temperatures and number of days the pipe units have been cured.
 8. There shall be no lift holes in the pipe.
 9. Mortar used for repairs shall have a minimum compressive strength of 4,000 psi. at the end of 7 days and 5,000 psi. at the end of 28 days, when tested in 3-in. by 6 in. cylinders stored in the standard manner. Only those repairs permitted by the above-mentioned ASTM C76 will be allowed.
 10. The date of manufacture, class of pipe unit, size of pipe unit, and trademark of the manufacturer shall be clearly and permanently marked on the inside and the outside at one end of each pipe unit.
 11. Certified copies of tests on materials and the pipe units will be required.
- B. Specials, if required, shall conform to the specifications for straight pipe insofar as applicable. Special design or construction necessary for specials shall be subject to acceptance by the Program Manager/Construction Manager.

2.02 JOINTS

- A. Pipe joints shall be of the rubber gasket type in which the gaskets are in compression and which will permit both longitudinal and angular movement. Each unit of pipe shall be provided with proper ends made of concrete formed true to size and formed on machined rings to ensure accurate joint surface. Joints and gaskets shall be O-ring or ribbed gasket type and shall conform to the requirements of ASTM C443 or C361 and to the additional requirements specified.

2.03 INSPECTION, TESTS AND ACCEPTANCE

- A. Acceptance will be on the basis of tests of materials, absorption tests, plant load-bearing tests, pressure tests, and inspection of the complete product. The required tests are enumerated hereinafter. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe shall be subject to inspection by the Program Manager/Construction Manager. Inspection may be made at the place of manufacture, or on the work site after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet any of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor.
- B. Tests and certified copies in triplicate of test results will be required for the materials and the finished pipe units as described herein. If less than 100 units of a given size and class of pipe are required, the Contractor may submit certified copies of tests made on identical pipe units made by the same manufacturer within the past year. If more than 100 units of a given size and class of pipe are required, the Contractor shall, at his own expense, engage the services of an acceptable independent testing laboratory to perform or witness all tests, other than mill tests on reinforcing steel and cement, and certify the results. In addition, the Owner reserves the right to have any or all pipe units inspected or tested, or both, by an independent testing laboratory at either the manufacturer's plant or elsewhere. Such additional inspection and/or tests shall be at the Owner's expense and shall be the test results of record.
- C. All pipe units to be tested shall be selected at random by the Program Manager/Construction Manager. Unless otherwise permitted, all load-bearing tests on pipe units shall be made in the presence of the Program Manager/Construction Manager.
- D. All tests shall be made in accordance with the latest applicable ASTM specifications.
1. Reinforcing Steel--Mill test reports, or reports on samples taken from each shipment to the pipe manufacturer, shall be submitted for reinforcing steel to be used on this project stating that the reinforcing meets the specified requirements.
 2. Cement--Mill test reports shall be submitted for each shipment to the pipe manufacturer of cement to be used on this project stating that the cement meets the specified requirements. All cement accepted for this project shall be kept segregated from other cement.
 3. Aggregates--Tests reports shall be submitted stating that the aggregates to be used on this project meet the requirements for concrete aggregates as specified "Fine Aggregate" and "Coarse Aggregate" under SECTION 03300. The first report shall be submitted prior to the manufacturer of any pipe for this project. Additional tests and reports shall be made monthly thereafter during the production of the pipe.
 4. Absorption Tests--Three cores shall be taken from each pipe unit that is to be load tested. The cores shall be taken before the load-bearing tests are performed. All cores shall be tested for absorption by the boiling absorption test. Average absorption shall not exceed 8 percent of the dry weight and no single test shall exceed 9 percent.
 5. Pipe Unit Load-Bearing Tests--A load-bearing test shall be made on one pipe unit of each size and class and the report of the test submitted before delivery to the project of that size and class of pipe unit. An additional test will be required for each 200 units of each

size and class of pipe. The load-bearing test shall be performed after the cores for the absorption tests have been taken. Each load-bearing test shall be carried to the specified load to produce the 0.01 in. crack. If the 0.01 in. crack is not formed, the pipe unit may be used in the project. Cored holes shall be plugged with the mortar specified above for repairs.

6. Pressure Test--A pressure test shall be made on two pipe units of each size and class to be used. Each pipe unit shall be bulkheaded independently and then joined together in a normal manner with the joint to be used in the work. The pipe units shall be held in place in such manner that no external compression force is exerted on the joint during the test. The test pressure shall be an average internal hydrostatic pressure of 10 psi and shall be maintained for at least 10 minutes without visible leakage from the joint. A description of the bulk-heading and pipe holding arrangement shall be submitted to the Program Manager/Construction Manager for review prior to performing the test. All pressure tests shall be made in the presence of the Program Manager/Construction Manager.
7. Concrete Cylinders--Compression tests shall be made on standard concrete cylinders for the first or test pipe unit and then for every 100 cubic yards of concrete used in pipe manufacture, or for each additional 200 units of pipe, whichever represents the lesser amount of concrete. Four cylinders shall be made for each test and they shall be broken at 7, 14, and 28 days with one cylinder as a spare to be used in the event of an unsatisfactory break. The reports shall be submitted within three days after each of the compression tests.

PART 3 EXECUTION

3.01 HANDLING PIPE

- A. Each pipe unit shall be handled into its position in the trench only in such manner and by such means as is acceptable to the Program Manager/Construction Manager.
- B. The Contractor will be required to furnish suitable devices to permit satisfactory support of all parts of the pipe unit when it is lifted.

3.02 INSTALLATION

- A. Each pipe unit shall be inspected before being installed. Any pipe discovered to be defective either before or after installation shall be removed and replaced with a sound pipe.
- B. Except as otherwise indicated on the drawings, the pipe shall be supported by compacted crushed stone. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone shall be as specified under SECTION 02200.
- C. Suitable bell holes shall be provided, so that after placement only the barrel of the pipe receives bearing pressure from the supporting material.
- D. All pipe units shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.

- E. Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Program Manager/Construction Manager. Care shall be taken to ensure true alignments.
- F. Before any joint is made, the unit shall be checked to assure that a close joint with the next adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be given down to the required grade by striking it with a shovel handle, timber, or other unyielding object.
- G. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe unit together so that they will fit with a minimum open recess inside and outside and have tightly seated joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends. Joints shall not be pulled or cramped without the permission of the Program Manager/Construction Manager.
- H. Immediately after the pipe joint is completed, the position of the gasket in the joint shall be inspected using a suitable feeler gage furnished by the Contractor, to be sure it is properly put together and is tight. Joints in which the gasket is damaged or not properly positioned shall be pulled apart and remade using a new gasket.
- I. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.
- J. Details of gasket installation and joint assembly shall follow the directions of the manufacturer of the joint materials and of the pipe, all subject to acceptance by the Program Manager/Construction Manager. The resulting joints shall be watertight and flexible.
- K. After each pipe to be supported on screened gravel has been properly bedded, enough gravel shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes provided for jointing shall be filled with screened gravel and compacted, and then screened gravel shall be placed and compacted to complete the pipe bedding, as indicated on the drawings.
- L. The Contractor shall take all necessary precautions to prevent floatation of the pipe in the trench.
- M. At all times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs or by other suitable means. If water is in the trench when work is to be resumed, the plug shall not be removed until all conditions are suitable to prevent water, earth, or other material from entering the pipe.
- N. Pipelines shall not be used as conductors for trench drainage during construction.

3.03 CLEANING

- A. Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out pipelines and manholes, being careful to prevent soil, water, and debris from entering any existing pipe.

END OF SECTION

SECTION 02618

DUCTILE-IRON PIPE AND FITTINGS
FOR BURIED SERVICE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish, lay, joint, and test ductile-iron pressure pipe, fittings (including special castings), and appurtenant materials and equipment indicated on the Drawings and specified in this Section.

1.02 REFERENCES

A. American Water Works Association (AWWA)/American National Standards Institute (ANSI)

1. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems
3. C110/A21.10, Ductile-Iron and Gray-Iron Fittings, 3-inch. through 48-inch., for Water and Other Liquids.
4. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings.
5. C150/A21.50, Thickness Design of Ductile-Iron Pipe.
6. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast for Water.
7. C153/A21.53, Ductile-Iron Compact Fittings, 3 inches through 64 inches for Water Service
8. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe
9. C600, Installation of Ductile-Iron Water Mains and Their Appurtenances
10. C651, Disinfecting Water Mains

B. American Society of Testing and Materials (ASTM)

1. A536, Standard Specification for Ductile Iron Castings

1.03 SUBMITTALS

A. In accordance with SECTION 01300 submit the following:

B. Shop Drawings

1. Piping layouts in full detail.
2. Location and type of backup block or device to prevent separation.
3. Schedules of all pipe, fittings, special castings, couplings, expansion joints, restrained joints and other appurtenances.
4. Detailed disinfection plan consistent with AWWA C651.

C. Certificates

1. Sworn certificates of shop tests showing compliance with appropriate standard.

D. Manufacturer's Literature

1. Catalog cuts of joints, couplings, harnesses, expansion joints, restrained joints gaskets, fasteners and other accessories.
2. Brochures and technical data of coatings and lining's and proposed method of application.

1.04 QUALITY ASSURANCE

- A. Pipe and fittings to be inspected and tested at the foundry as required according to ANSI Standards.
- B. Owner reserves right to inspect and/or test by independent service at manufacturer's plant or elsewhere at his own expense.
- C. Owner reserves right to perform visual and hammer test prior to installation.

PART 2 PRODUCTS

2.01 PIPE

- A. Ductile-Iron Pipe
 1. Designed in accordance with AWWA/ANSI C150/ A21.50.
 - a. Ductile iron pipe used for water mains shall be cement lined Pressure Class 350 push-on or mechanical joint, size as indicated on the Drawings.
 - b. For sewer pipeline use class as indicated on the Drawings.
 2. Manufactured in accordance with AWWA/ANSI C151/A21.51.
 - a. Unless otherwise indicated or specified, ductile-iron pipe shall be at least thickness Class 52
- B. Pipe For Use With Couplings
 1. As specified above except that the ends shall be plain (without bells or beads) cast or machined at right angles to the axis.

2.02 FITTINGS

- A. General
 1. Push-on or mechanical-joint fittings shall be all-bell fittings unless otherwise indicated or specified.
 2. In accordance with AWWA/ANSI C110/A21.10.
 - a. Fittings 24-inches in diameter and less shall be pressure Class 350.
 - b. Fittings 30-inches to 48-inches in diameter shall be at least pressure Class 250.
- B. Nuts and Bolts
 1. Ductile Iron or Kor-10 steel T bolts and nuts or approved equal.
- C. Nonstandard Fittings
 1. Fittings having nonstandard dimensions and cast especially for this project shall be of acceptable design.
 2. Manufactured to meet the requirements of these specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends

shall be determined by their positions in the pipelines and by the particular piping to which they connect.

2.03 ADAPTERS

- A. Where it is necessary to joint pipes of different type, furnish and install the necessary adapters unless solid sleeves are indicated on the drawings or permitted. Adapters shall have ends, conforming to the above specifications for the appropriate type of joint, to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell-and-spigot type joints will be sufficient for proper jointing.

2.04 JOINTS

- A. Push-On and Mechanical
 1. In accordance with AWWA/ANSI C111/A21.11.
 2. The plain end of push-on pipe shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
 3. Push-on and mechanical-joint pipe and fittings shall be provided with sufficient quantities of accessories conforming to AWWA/ANSI C111/A21.11.
- B. Restrained
 1. Location of restrained joints shall be based on Thrust Restraint Design for Ductile Iron Pipe (Second Edition), published by Ductile Iron Pipe Research Association.
 2. Restraining glands will be required on all fittings.
 3. Pipe, fittings and appurtenances for restrained joints shall be in accordance with AWWA/ANSI C110/A21.10. Only restraining glands which impart multiple wedging action against the pipe increasing its pressure as the pipe pressure increases will be allowed. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Twist off nuts shall be used to insure proper actuating of the restraining device.
 4. Mechanical joint restraint shall have a working pressure rating of at least 250 psi.
 5. Manufactured by EBAA Iron, Inc., Eastland, Texas, or equal.
- C. Gaskets
 1. Gaskets shall be of a composition suitable for exposure to the product which the pipe is intended.

2.05 COUPLINGS

- A. Flexible Connections
 1. Where flexible connections in the piping are specified or indicated on the drawings, they shall be obtained by the use of sleeve-type couplings, split couplings, or mechanical-joint pipe and/or fittings as herein specified.
- B. Sleeve Type Couplings
 1. Pressure rating at least equal to that of the pipeline in which they are to be installed.
 2. For sizes 2 1/2 to 16-inch diameter, up to 250 psi working pressure:
 - a. Provide style 442 Long Sleeve, Cast Coupling by Smith Blair, Inc., Texarkana, Texas, or be acceptable equivalent products.

3. For sizes greater than 16-inch diameter, up to 150 psi working pressure:
 - a. Provide style 411, with 10-inch long sleeve minimum, Steel Coupling by Smith Blair, Inc., Texarkana, Texas, or be acceptable equivalent products.
4. Nuts and Bolts to be high strength, low alloy steel unless noted otherwise.
5. Provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
6. Provide with fusion bonded epoxy finish.
7. Conform to requirements of AWWA C219.

C. Solid Sleeve Couplings

1. Solid sleeve couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
2. Couplings shall be ductile iron with gaskets of a composition suitable for exposure to the liquid within the pipe.

2.06 ACCESSORIES

A. Tapped Connections

1. Tapped connections in pipe and fittings shall be made in such manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses shall not exceed the listed size in the appropriate table of the Appendix to the above-mentioned ANS A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
2. Where the size of the connections exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of a tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or permitted by the Engineer.
3. All drilling and tapping of cast-iron pipe shall be done normal to the longitudinal axis of the pipe; fitting shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

2.07 POLYETHYLENE ENCASEMENT

- A. In accordance with AWWA C105.

2.08 INSULATION

- A. As depicted on the Drawings

2.09 FINISHES

A. Lining

1. Inside of pipe and fittings shall be coated with double thickness cement lining and bituminous seal coat conforming to AWWA/ANSI C104/A21.4.

B. Coating

1. Outside of pipe and fittings shall be coated with the standard bituminous coating conforming to AWWA/ANSI C151/A21.51

PART 3 EXECUTION

3.01 HANDLING

A. Pipe and Fittings

1. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coatings.
2. Any fitting showing a crack and any pipe or fitting which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work.
3. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

3.02 CUTTING

A. Pipe

1. Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters, knives, or saws adapted to the purpose. Hammer and chisel or so-called wheel span cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.
2. Cut ends to be used with push-on joints shall be carefully chamfered to prevent cutting the gasket when the pipe is laid or installed.

3.03 INSTALLATION

A. Pipe and Fittings

1. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
2. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
3. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.
4. Pipe shall have a firm bearing along its entire length. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
5. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the tabulation titled PIPE DEFLECTION ALLOWANCES.

PIPE DEFLECTION ALLOWANCES

Maximum permissible deflection, in.*

<u>Size of pipe, in.</u>	<u>push-on joint</u>	<u>Mechanical joint</u>
4	19	31
6	19	27
8	19	20
10	19	20
12	19	20
14	11	13-1/2
16	11	13-1/2
18	11	11
20	11	11
24	11	9
30	11	9
36	11	8
42	7-1/2	7-1/2
48	7-1/2	7-1/2
54	5-1/2	--

*Maximum permissible deflection for 18-ft. lengths; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18 ft.

6. When mechanical joint, push-on joint or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstructions and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

B. Castings

1. Castings to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned.
2. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.

C. Temporary Plugs

1. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

D. Appurtenances

1. Valves, fittings and appurtenances shall be set and jointed as indicated on the drawings.

3.04 ASSEMBLING

A. Push-On Joints

1. Make up by inserting the gasket into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe.
2. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

B. Bolted Joints

1. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces.
2. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

C. Mechanical Joints

1. Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell, and spigot shall be lubricated by being washed with soapy water.
2. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated.
3. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket.
4. After all bolts have been inserted and the nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.
5. The correct range of torque as indicated by a torque wrench and the length wrench (if not a torque wrench) used by an average man to produce such range of torque, shall not exceed the values specified in the tabulation titled TORQUE RANGE VALUES.

TORQUE RANGE VALUES

Nominal pipe size, <u>in.in.</u>	Bolt diameter, <u>ft.-lb.</u>	Range of torque, <u>in.</u>	Length of wrench,
3	5/8	40-60	8
4 thru 24	3/4	60-90	10
30, 36	1	70-100	12
42, 48	1-1/4	90-120	14

If the effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

D. Restrained Joints

1. Install in accordance with manufacturers written instructions.
2. Do not exceed manufacturer's permissible pipe deflection allowance.

E. Sleeve-Type Couplings

1. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8-inches
2. Soapy water may be used as a gasket lubricant.
3. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint.
4. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid.
5. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.

6. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed the manufacturers recommended values
7. After assembly and inspection and before being backfilled, all exterior surfaces of buried sleeve-type couplings, including the middle and follower rings, bolts, and nuts, shall be thoroughly coated with an approved heavy-bodied bituminous mastic. Care shall be taken and appropriate devices used to ensure that the undersides, as well as the more readily accessible parts, are well coated.

3.05 POLYETHYLENE ENCASEMENT

- A. When required, install in accordance with AWWA C105.

3.06 INSULATION

- A. Factory applied insulation to be in accordance with Specification Section 15260.
- B. Field applied insulation,
 1. Prior to the field installation, the pipe shall be thoroughly cleaned to allow for the installation of the insulation around the full diameter of the pipe.
 2. Pipe insulation shall be installed in the dry.
 3. Install in accordance with manufacturers written instructions.

3.07 SOCKET PIPE CLAMPS, TIE RODS AND BRIDLES

- A. Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, suitable pipe clamps, tie rods or bridles shall be provided. Bridles and tie rods shall be at least 3/4 in. diameter except where they replace flange bolts of smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The socket clamps, tie rods or bridles shall be coated with an approved bituminous paint after assembly or if necessary, prior to assembly.

3.08 PIPING SUPPORT (THRUST BLOCK)

- A. Where necessary, bends, tees, and other fittings in pipelines buried in the ground may be backed up with 3000 psi concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then restraining devices shall be provided.

3.09 CLEANING

- A. Prior to the pressure and leakage tests, thoroughly clean piping of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

3.10 TESTING

- A. Except as otherwise directed, pipelines shall be given combined pressure and leakage tests in sections of approved length.
 - 1. Provide 24 hour notice to Engineer for all testing
 - 2. The Contractor shall make arrangements for procuring water for testing and be responsible for all associated fees.
- B. Furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gages, relief valves, other necessary equipment; and all labor required.
- C. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.
- D. However, pipelines to be embedded in concrete shall be tested prior to placing of the concrete and exposed piping shall be tested prior to field painting.
- E. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow offs are not available at high points for releasing air the Contractor shall make the necessary excavations and do the necessary backfilling and make the necessary taps. After completion of the tests, if directed by the Engineer, remove corporations and plug said holes.
- F. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- G. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe but not to exceed 200 psi. Do not apply this pressure to items of equipment known to be incapable of withstanding such pressure.
- H. If the Contractor cannot achieve the specified pressure and maintain it for a period of **[one]** **[two]** hour with no additional pumping, the section shall be considered as having failed to pass the test. Allowable leakage over the two hour period shall be calculated per AWWA C-600 as summarized in the following table.

Hydrostatic Testing Allowance per 1,000 ft. of Pipe
(Loss in U.S. Gallons Following a 2 Hour Test)

Avg. Pipe Press. (psi)	Nominal Pipe Diameter					
	6 in.	8 in.	12 in.	16 in.	24 in.	36 in.
150	1.10	1.48	2.20	2.94	4.42	6.61
175	1.18	1.60	1.38	3.18	4.76	7.16
200	1.28	1.70	2.56	3.40	5.10	7.64

- I. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test and is considered acceptable by the Engineer.
- J. If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure may be made as required and approved by the Engineer, but in any event the Contractor shall be fully responsible for the ultimate tightness of the line within the above leakage and pressure requirement.
- K. All testing to be witnessed by the Engineer.

3.11 DISINFECTING AND FLUSHING

- A. The Contractor shall disinfect the lines carrying potable water. Refer to PWSB requirements appended to this section.
- B. Furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in the AWWA Standard C651 except as otherwise specified herein.
- C. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.
- D. The dosage shall be such as to produce a chlorine concentration of not less than 10 PPM (mg/l) after a contact time of not less than 24 hours.
- E. After treatment, the main shall be flushed with clean water until the residual chlorine content does not exceed 0.2 PPM (mg/l).
- F. Before disposing of the water used in disinfecting and flushing water mains thoroughly neutralize it through the application of a reducing agent, as referenced in AWWA C651.
- G. Dispose of the water used in disinfecting and flushing in an approved manner.
- H. Connection at cut ins shall be swabbed with 50 PPM solution of chlorine at locations when above methods are not possible.
- I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch. Sampling shall be accomplished with sterile bottles treated

with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.

- J. Testing shall be done by a laboratory approved by the Engineer, in accordance with Standard Methods, and shall show the absence of coliform organisms. A standard plate count may be required at the option of the Engineer.

3.12 CONNECTION TO EXISTING WATER MAINS

- A. In general, connection to existing water mains will not be allowed prior to the new water main successfully passing pressure and bacteria tests that can be verified with written confirmation. Any exception to this requirement will be at the sole discretion of the Engineer and/or Owner.

END OF SECTION

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APPENDIX A



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WATER MAIN DISINFECTION PROCEDURE

The following procedures shall be strictly adhered to after the installation of new water mains, the cleaning and lining of existing water mains, or as directed by the Pawtucket Water Supply Board.

DISINFECTION PREPARATIONS

- a. The contractor shall utilize a by-pass piping system for flushing, filling, testing and chlorination of various sized water mains. The by-pass piping shall consist of corporation stops or valves on the supply line and the main to be filled. A reduced pressure zone device (relief valve between two check valves) shall be installed in the temporary piping system to insure that no water is allowed to return to the supply line. Fire hydrants may be utilized for feed points only if properly flushed and the above by-pass piping is installed. Fire hydrants SHALL NOT be used as sample points. Line valves SHALL NOT be used under any circumstances to fill, flush, test or chlorinate water mains. Newly installed water main SHALL NOT be physically connected to an existing distribution system water main until all flushing, disinfection and testing has been completed.
- b. During construction or cleaning water main sections, joints and valves must be kept CLEAN and DRY as possible.
- c. A corporation stop shall be provided within 5 feet of the beginning of the new main for feeding of the liquid chlorine, and at sampling locations designated by the Pawtucket Water Supply Board Chemist or a member of the Engineering staff. These sampling locations shall be within 10 feet of the end of the section of main to be chlorinated. This will be to provide for sampling points along the main. Hydrants shall not be used for sampling points but may be used as a feed point for chlorination. Copper tubing shall be used for all chlorination and sampling pipe.
- d. Chlorination of valves, fittings, and less than one pipe length (generally 20 feet long), of main shall be disinfected by contact swabbing and/or brushing with a 4-percent NSF-61 approved sodium or calcium hypochlorite solution.
- e. Mains shall be pressure tested to 1.5 times the system working pressure, and shall be required to hold pressure for at least two hours. This shall be verified by a member of the Water Supply Engineering Department.

DISINFECTION OF WATER MAINS, TEMPORARY MAINS, AND SERVICES

All mains and appurtenances shall be disinfected with NSF-61 approved chlorine in accordance with provisions of the American Water Works Association Standard C651, latest revision thereof, AND as follows:

- a. Water mains and services shall be thoroughly flushed. Flushing shall be at a rate sufficient to create a water velocity of at least 3.0 feet per second through the pipe. A turbidity reading of less than 5.00 NTU and a

color of less than 15 Hazen units must be verified by the Water Supply Representative prior to introduction of chlorine.

- b. NSF-61 approved liquid chlorine in the form of sodium hypochlorite with a concentration of 5-15% shall be introduced into the main(s) to be tested. The chlorine solution must come into contact with ALL sections of the main that is to be disinfected. The whole main must be filled with chlorinated water (no air), and the concentration of such water must not be less than 25 milligrams per liter as verified by a Water Supply Representative.
- c. The super chlorinated water must stand isolated in the main for at least twenty four (24) hours. After this MINIMUM retention time, the Water Supply Representative will re-test the concentration of chlorine in the main at all the sampling points. The concentration must be a least 10 mg/L. If concentration is below this level, step (b) must be repeated.
- d. Once the concentration is verified, the super chlorinated water must be flushed from the main through the various sampling points until the concentration of residual chlorine at each sampling point reaches a level of no higher than 1.5 mg/L (or system level) and turbidity of less than 1.00 NTU (or system level) as verified by the Water Supply Representative.
- e. Microbiological testing will be done a minimum of 16 hours after step (d) has been completed, but BEFORE the main is put into service. A Water Supply Representative will obtain samples at all sampling points along the main for analysis to determine if coliform bacteria is present. These samples are tested in accordance with the Enzyme Substrate Coliform Test (SM-9223B) and, if required, the Standard Heterotrophic Plate Count Procedure (SM-9215B). Within 24 hours the results will be made available by the Water Supply Chemist. If results indicate the presence of coliform bacteria, further flushing will be required, and new samples must be obtained. Once the main has been certified by the Water Supply Chemist, the main may be place into service with permission of the Chief Engineer.
- f. Under certain conditions, an emergency type chlorination may be conducted with the written approval of the Chief Engineer.

DISPOSING OF HEAVILY CHLORINATED WATER

FINAL FLUSHING - Disposal of heavily chlorinated water shall be in in accordance with provisions of the American Water Works Association Standard C651, latest revision thereof, AND as follows:

Heavily chlorinated water that possibly may discharge as runoff to any body of water, river or stream shall be neutralized by treating with sulfur dioxide. Such locations shall be determined by the Water Supply Representative. The primary choice of neutralizing agent is sulfur dioxide but the contractor may use, if requested, an approved substitute as listed in AWWA Std. C655, latest revision. The chlorine residual of the discharge flow shall be continuously monitored to allow the adjustment of the sulfur dioxide feed to thoroughly neutralize the water discharge. Otherwise, all other heavily chlorinated water will be discharged as runoff to the roadway surface or to the sewer system which shall be in accordance with the current rules and regulations governed by the local sewer authority. The following list is of the streets in Pawtucket that have drains that empty directly into a river and therefore any discharge must be de-chlorinated before entering into the drainage system.

List of Streets in Pawtucket with Storm Drains Emptying into River
All Heavily Chlorinated Water Must Be Dechlorinated Prior to Discharge

<u>Street</u>	<u>Section of Street</u>
Archer St.	Clews to Maplecrest
Arland Ave. (North not South)	Rice to Pinecrest
Armistice Blvd.	All of the Street
Central Ave.	Arland to Diana
Daggett Ave.	Huthinson to Central
Daggett Ave.	Winsor to Stafford
Daggett Ave.	Lindesta to Eddington
Eddington St.	All of the Street
Fenwood Ave.	All of the Street
Grosvenor Ave.	All of the Street
Grotto Ave.	Power to Legion Dr.
Huthinson Ave.	All of the Street
Leather Ave.	All of the Street
Liverpool St.	Bristol to London
London Ave.	All of the Street
Manton St.	All of the Street
Maplecrest Dr.	Archer to Karen
Maryland Ave.	All of the Street
Nathael Ave.	All of the Street
Parkside Ave.	All of the Street
Pearson Ave.	All of the Street
Piave St.	All of the Street
Rice St.	Kirk to Arland
Riverview Ave	All of the Street
Roosevelt Ave.	Exchange to Leather
School St.	Exeter to Beverage Hill
Service Rd.	All of the Street
Smithfield Ave.	Piave to Grotto
Stafford St.	All of the Street
Talcott Ave.	All of the Street
Terrace Ave.	All of the Street
Varnum Ave	All of the Street



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PAWTUCKET WATER SUPPLY BOARD

WATER MAIN DISINFECTION PROCEDURE SUMMARY

A. PRESSURE TEST:

NOTIFY PWSB LABORATORY THAT MAIN IS READY FOR TESTING & DISINFECTION. 1.5 TIMES THE SYSTEM WORKING PRESSURE FOR 2 HOURS. COMPLIANCE CHECKED BY THE WATER SUPPLY BOARD ENGINEERING DEPT.

B. FLUSHING:

FLUSH AT VELOCITY OF AT LEAST 3.0 FEET PER SECOND. TURBIDITY AND COLOR WILL BE VERIFIED BY WATER SUPPLY REPRESENTATIVE. TURBIDITY MUST BE LESS THAN 5.00 NTU AND COLOR LESS THAN 15 UNITS BEFORE CHLORINE CAN BE ADDED.

C. CHLORINATION:

ADD NSF-61 APPROVED LIQUID CHLORINE TO OBTAIN A MINIMUM CONCENTRATION OF 25 mg/L. WATER SUPPLY REPRESENTATIVE WILL TEST FOR COMPLIANCE. ALLOW TO STAND FOR 24 HOURS. RESIDUAL MUST BE NOT LESS THAN 10 mg/L. WATER SUPPLY REPRESENTATIVE WILL TEST FOR COMPLIANCE.

D. MICROBIOLOGICAL SAMPLING:

FLUSH HEAVILY CHLORINATED WATER FROM MAIN, UNTIL CHLORINE IS NO HIGHER THAN 1.50 mg/L (or system level) AND TURBIDITY IS LESS THAN 1.00 NTU (or system level). ONCE MAIN HAS BEEN ALLOWED TO STAND FOR A MINIMUM OF 16 HOURS, THE WATER SUPPLY REPRESENTATIVE WILL TAKE SAMPLE(S) FOR COLIFORM BACTERIA (AND HPC, IF REQUIRED) TESTS. WATER SUPPLY CHEMIST WILL ADVISE OF COMPLIANCE WITHIN 24 HOURS.

E. COMPLIANCE AND CERTIFICATION:

WATER SUPPLY CHEMIST WILL SEND DISINFECTION CERTIFICATE TO WATER SUPPLY ENGINEERING.

WATER SUPPLY ENGINEERING WILL ADVISE WATER SUPPLY T&D SUPERVISOR OR CONTRACTOR TO TIE IN AND PLACE MAIN IN SERVICE.

NO MAIN SHALL BE TURNED ON WITHOUT WATER SUPPLY CHEMIST CERTIFICATE OF COMPLIANCE.

NOTE: IF COLIFORM TESTING IS POSITIVE, STEPS C. AND D. MUST BE REPEATED.

SECTION 02629

UNDERGROUND UTILITY MARKING TAPE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing and installing metallic (detectable) and non-metallic (non-detectable) marking tape over buried pipelines and conduits.

1.02 REFERENCES

- A. A.P.W.A. - American Public Works Association

1.03 SUBMITTALS

- A. Shop Drawings
 - 1. Submit in accordance with SECTION 01300 - SUBMITTALS
- B. Samples
 - 1. Provide samples of submitted products.

1.04 DESCRIPTION

- A. General
 - 1. Marking tape to be installed over all pipe lines and conduits installed under this Contract.
 - 2. Marking tape for non-ferrous pipe or conduits to be Detectable, magnetic type.
 - 3. Marking tape for ferrous pipe or conduits to be Non-detectable, non-magnetic type.
 - 4. Tape to be 6-inches wide.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Underground utility marking tape to be:
 - 1. Detectable: Magnatec by THOR Enterprises, Inc., Sun Prairie, WI.
 - 2. Non-detectable: Shieldtec by THOR Enterprises, Inc., Sun Prairie, WI.
 - 3. Or product deemed equal by the Engineer.

2.02 MATERIALS

- A. Detectable Underground Utility Marking Tape
 - 1. Minimum overall thickness: 5.0 mil (0.005”).
 - 2. Aluminum foil core: 35 gauge (0.00035”) minimum.
 - 3. Foil visible from both sides of tape.

4. Protective plastic jacket applied to both sides of foil.
 5. Jacket adhesive applied directly to the film and foil.
 6. No printing to extend to the edges of the tape.
 7. No Dilutants, pigments or contaminants in the adhesive.
 8. Adhesive formulated to resist degradation by elements normally found in soil.
- B. Non-detectable Underground Utility marking Tape
1. Minimum overall thickness: 4.0 mil (0.004”).
 2. Polyethylene plastic film: 100% virgin, low density acid and alkali-resistant.
 3. Printing: Permanent, black, environmentally safe.
 4. Coloring: color-fast, lead free, organic pigments suitable for direct burial and prolonged exposure to the elements normally found in soil.
- C. Marking
1. Tape to printed with “BURIED *UTILITY* LINE BELOW”, replacing the word “*UTILITY*” with the word “WATER”, “SEWER”, “DRAIN”, “ELECTRIC”, “GAS”, or otherwise appropriate, repeating continuously every 30-inches max.
- D. Color Code in accordance with A.P.W.A. Standards as follows:
- | | |
|----------------------------------|--|
| 1. Safety Red | Electric power and high voltage lines |
| 2. High Visibility Safety Yellow | Gas and oil distribution/Transmission
Dangerous materials/Steam |
| 3. Safety Alert Orange | Fiber optic/telephone/CATV |
| 4. Safety Precaution Blue | Water and irrigation lines |
| 5. Safety Green | Sewer/storm/sanitary systems, non-potable
water |
| 6. Safety Brown | Force mains and effluent lines |
| 7. Alert Purple | Reclaimed and effluent re-use lines |

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install marking tape directly above the pipe line or conduit approximately 18-inches below the proposed finished grade.
- B. Install marking tape in accordance with manufacturers recommendations.
- C. Install marking tape over existing utilities disturbed by the Contractors operation.

END OF SECTION

SECTION 02642

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing and installing potable water service connections.

1.02 SUBMITTALS

A. Shop Drawings

- 1. In accordance with Section 01300, submit manufacturer's specifications, catalog data, descriptive literature, illustrations, diagrams, etc.

1.03 REFERENCES

A. American National Standards Institute

- 1. NSF/ANSI 61 – Drinking Water System Components - Health effects

B. American Society for Testing and Materials (ASTM)

- 1. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings
- 2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- 3. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
- 4. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

C. American Water Works Association (ANSI/AWWA)

- 1. ANSI/AWWA C800, Underground Service Line Valves and Fittings.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fittings and accessories shall conform to the requirements of ANSI/AWWA C800 unless noted otherwise.
 - 1. Corporation Stops shall be CC thread by compression connection.
 - 2. Curb Stops shall be compression connection.

3. Other connection styles as approved by the Engineer.
- B. Fittings shall be manufactured by Clow Corporation, Chicago, IL; Mueller Co., Decatur, IL; Red Head Mfg. Co., Boston, MA; or an acceptable equivalent.
1. Brass goods furnished under this specification shall be new and unused.
 2. Any metal part of the fitting in contact with the water must be made of Sebiloy II per ASTM B584 (UNS Alloy C89520). Brass alloys not assigned an ASTM/UNS alloy designation are not acceptable. Plated components in contact with the water not made of Sebiloy II are not approved.
 3. Metal components that do not contact the water shall comply with the requirements of ASTM B62 or ASTM B584 copper alloy number C83600.
 4. All seats/seals must be of an elastomeric material that has verifiable experience in water systems using chloramines for disinfection. Fluoroelastomers such as unfilled Teflon that exhibit poor tear and cut growth characteristics are not approved.
 5. All service fitting shall be certified as suitable for contact with drinking water by an ANSI accredited organization in accordance with NSF/ANSI 61.
 6. All fittings shall be stamped or embossed with a mark or name indicating that the product is manufactured from the low-lead alloy as specified.
- C. Stops shall be ball valve style and have ends as required to suit type of pipe or tubing to be connected, and a combined cap and tee handle.
- C. Curb Boxes
1. Buffalo style, 2 ½-inch, cast iron, heavy duty top section, sliding type with flare top and recess cover marked "WATER" and sliding type arched bottom section.
 2. Overall length to suit specified depth of cover requirements as approved by the Engineer.
- D. Service Piping
1. 4-inch and larger to be Cement Lined Ductile Iron, Class 52.
 2. 2-inch or less to be Type "K" Copper in accordance with ASTM B88.
- E. Service Saddle
1. Model 317, manufactured by Smith Blair, Inc., Texarkana, TX.

PART 3 EXECUTION

- A. Water service and fire service connections shall be installed or replaced as required from the new water main corporation stop to the new curb stop and connected to the existing service. Remove and replace existing curb stop, remove service pipe from old main, tap new main, install new corporation stop, install **[copper]** **[PE]** water service and fire service connection between new main and new installed curb stop.
- B. Service shall be maintained as continuously as possible, coordinate shut down with property owner.

- C. The tapping machine shall be rigidly fastened to the pipe as near the horizontal diameter as possible. The length of travel of the tap should be so established that when the stop is inserted and tightened with a 14-inch wrench, not more than one to three threads will be exposed on the outside. When a wet tapping machine is used, the corporation cock shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to be watertight. Care must be exercised not to overtighten.
- D. Service tubing shall be installed with care to avoid kinks or sharp bends. Do not allow tubing to contact ledge, rock or sharp stones which could cause damage.
- E. Provide at least 6-inches of coarse grained sand or gravel with a maximum particle size of ½-inch adjacent to and above the service pipe. Backfill remainder of trench with approved backfill material.
- F. Services shall be flushed before activating to avoid meter clogging.
- G. The Engineer must observe all service connections under normal water main pressure prior to backfilling of the service trench to check for leakage.
- H. Service connections shall be free from leaks and may be pressure tested through the water main as directed by the Engineer.
- I. The curb service boxes shall be set in a true vertical position and if the boxes are within the limits of the roadway or within areas where the plowing of snow will take place, the tops of the boxes shall be set about ½-inch below the top of the finished grade. In locations where these boxes are not likely to be disturbed, the tops shall be set flush with the adjoining ground.

END OF SECTION

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SECTION 02665

DOMESTIC WATER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to furnish, lay, joint, and test ductile-iron pressure pipe, fittings (including special castings), and appurtenant materials and equipment indicated on the Drawings and specified herein.

1.02 REFERENCES

- A. American Water Works Association (AWWA)/American National Standards Institute (ANSI)
 - 1. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems
 - 3. C110/A21.10, Ductile-Iron and Gray-Iron Fittings, 3-inch. through 48-inch., for Water and Other Liquids.
 - 4. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings.
 - 5. C115/A21.15, Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 6. C150/A21.50, Thickness Design of Ductile-Iron Pipe.
 - 7. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast for Water.
 - 8. C153/A21.53, Ductile-Iron Compact Fittings, 3 inches through 24 inches, and 54 inches through 64 inches for Water Service
 - 9. C600, Installation of Ductile-Iron Water Mains and Their Appurtenances
 - 10. C651, Disinfecting Water Mains

- B. American Society of Testing and Materials (ASTM)

- 1. A536, Standard Specification for Ductile Iron Castings

1.03 REQUIREMENTS

- A. This Specification makes reference to the requirements of additional specifications as listed. The Contractor shall familiarize himself with all requirements referenced by this specification prior to the installation of any water works.
 - 1. The Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013, as attached to this Specification.
- B. Location of restrained joints shall be based on Thrust Restraint Design for Ductile Iron Pipe (Second Edition), published by Ductile Iron Pipe Research Association.

1.04 SUBMITTALS

A. In accordance with SECTION 01300 submit the following:

B. Shop Drawings

1. Piping layouts in full detail.
2. Location and type of backup block or device to prevent separation.
3. Schedules of all pipe, fittings, special castings, couplings, expansion joints, restrained joints and other appurtenances.

C. Certificates

1. Sworn certificates of shop tests showing compliance with specified standard.

D. Manufacturer's Literature

1. Catalog cuts of joints, couplings, harnesses, expansion joints, restrained joints gaskets, fasteners and other accessories.
2. Brochures and technical data of coatings and lining's and proposed method of application.

1.05 QUALITY ASSURANCE

A. Pipe and fittings shall be inspected and tested at the foundry as required by the corresponding standards listed in Article 1.02 of this specification.

B. Owner reserves right to inspect and/or test by independent service at manufacturer's plant or elsewhere at his own expense.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials shall be provided in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013, and this specification. In the case of a discrepancy between the Pawtucket Water Supply Board requirements and this specification, the Pawtucket Water Supply Board Requirements shall govern.

2.02 PIPE

A. Ductile-Iron Pipe

1. Designed in accordance with AWWA/ANSI C150/ A21.50.
2. Manufactured in accordance with AWWA/ANSI C151/A21.51.
3. Unless otherwise indicated or specified, ductile-iron pipe shall be at least thickness Class 52

B. Pipe For Use With Couplings

1. As specified above except that the ends shall be plain (without bells or beads)

cast or machined at right angles to the axis.

2.03 FITTINGS

A. General

1. Mechanical-joint fittings shall be all-bell fittings unless otherwise indicated or specified.
2. Compact fittings in accordance with AWWA/ANSI C153/A21.53 and shall have a working pressure rating of 350 psi.
3. Mechanical-joint fittings shall utilize "MegaLug" restraining glands.

B. Nonstandard Fittings

1. Fittings having nonstandard dimensions and cast especially for this project shall be of acceptable design.
2. Manufactured to meet the requirements of these specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends shall be determined by their positions in the pipelines and by the particular piping to which they connect.

2.04 ADAPTERS/TRANSITIONAL COUPLINGS

- A. Where it is necessary to joint pipes of different type, furnish and install the necessary adapters unless solid sleeves are indicated on the drawings or permitted. Adapters shall have ends, conforming to the above specifications for the appropriate type of joint, to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell-and-spigot type joints will be sufficient for proper jointing.

2.05 JOINTS

A. Push-On and Mechanical

1. In accordance with AWWA/ANSI C111/A21.11.
2. The plain end of push-on pipe shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
3. Push-on and mechanical-joint pipe and fittings shall be provided with sufficient quantities of accessories conforming to AWWA/ANSI C111/A21.11.

B. Restrained

1. Restraining glands will be required on all fittings.
2. Pipe, fittings and appurtenances for restrained joints shall be in accordance with AWWA/ANSI C153/A21.53 for compact fittings. Only restraining glands which impart multiple wedging action against the pipe increasing its pressure as the pipe pressure increases will be allowed. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Twist off nuts shall be used to insure proper actuating of the restraining device.
3. Mechanical joint restraint shall have a working pressure rating of at least 250 psi.
4. Glands to be MegaLug manufactured by EBAA Iron, Inc., Eastland, Texas.

C. Gaskets

1. Gaskets shall be of a composition suitable for exposure to the product which the pipe is intended.

2.06 COUPLINGS

A. Flexible Connections

1. Where flexible connections in the piping are specified or indicated on the drawings, they shall be obtained by the use of sleeve-type couplings, split couplings, or mechanical-joint pipe and/or fittings as herein specified.

B. Sleeve Type Couplings

1. Pressure rating at least equal to that of the pipeline in which they are to be installed.
2. Provide style 441 Cast Coupling by Smith Blair, Inc, Texarkana, Texas; or be acceptable equivalent products.
3. Provided with galvanized-steel bolts and nuts, unless noted otherwise.
4. Provided with gaskets of a composition suitable for exposure to the liquid within the pipe.
5. Provided gaskets with metallic tips for electrical continuity through joints.

C. Solid Sleeve Couplings

1. Solid sleeve couplings and accessories shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed.
2. Couplings shall be ductile iron with gaskets of a composition suitable for exposure to the liquid within the pipe.

2.07 ACCESSORIES

A. Tapped Connections

1. Tapped connections in pipe and fittings shall be made in such manner as to provide a watertight joint and adequate strength against pullout. The maximum size of taps in pipe or fittings without bosses shall not exceed the listed size in the appropriate table of the Appendix to the above-mentioned ANS A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
2. Where the size of the connections exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of a tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or permitted by the Program Manager/Construction Manager.
3. All drilling and tapping of cast-iron pipe shall be done normal to the longitudinal axis of the pipe; fitting shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.

2.08 VALVES, HYDRANTS AND APPURTENANCES

- A. Provide in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

2.09 TAPPING SLEEVES AND VALVES

- A. Provide in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

2.10 INSERTION VALVES

- B. Provide in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

2.11 SERVICE CONNECTIONS

- A. Provide in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

- 1. Service corporations to be a minimum 1-inch diameter.
- 2. Contractor to provide pipe and couplings as required to reconnect new service pipe to existing building service.

2.12 FINISHES

A. Lining

- 1. Inside of pipe and fittings shall be coated with double thickness cement lining and a bituminous seal coat conforming to AWWA/ANSI C104/A21.4.

B. Coating

- 1. Outside of pipe and fittings shall be coated with the standard bituminous coating conforming to AWWA/ANSI C151/A21.51
- 2. Outside surfaces of castings to be encased in concrete shall not be coated.
- 3. Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.

2.13 METALIZED DETECTABLE IDENTIFICATION TAPE

- A. Provide in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

PART 3 EXECUTION

3.01 GENERAL

- A. Methods shall be performed in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013, and this specification. In the case of a discrepancy between the Pawtucket Water Supply Board requirements and this specification, the Pawtucket Water Supply Board Requirements shall govern.

3.02 OPERATION OF VALVES

- A. Unless precluded by unexpected events, the Contractor shall notify the Pawtucket Water Supply Board Supply Board at least seventy-two (72) hours prior to a water main shutdown. The PWSB shall determine if the operation of valves will be performed by PWSB work forces, the Contractor, or a PWSB Subcontractor. **The immediacy of water main shutdowns or valve operation is not warranted by PWSB.** In the operation of valves, for the purpose of shutting down existing mains, the PWSB does not guarantee or imply that shut down will be completely effective in stopping the flow of water to open ends.
- B. The Contractor should expect each water shutdown to take up to four (4) hours to complete. No claims for delays will be considered for any down time up to four (4) hours while the PWSB perform shutdowns.
- C. If so directed by the Owner, the Contractor shall operate all valves required to shut down (and subsequently reopen) existing water mains. If the Contractor is unable to shut down a valve after two (2) hours of attempting to do so, the Owner will direct the Contractor as to how to proceed.

3.03 HANDLING

A. Pipe and Fittings

- 1. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coatings.
- 2. Any fitting showing a crack and any pipe or fitting which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work.
- 3. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

3.04 CUTTING

A. Pipe

- 1. Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters, knives, or saws adapted to the purpose. Hammer and chisel or so-called wheel span cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.
- 2. Cut ends to be used with push-on joints shall be carefully chamfered to prevent cutting the gasket when the pipe is laid or installed.

3.05 INSTALLATION

A. Pipe and Fittings

1. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.
2. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.
3. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or required. Care shall be taken to ensure a good alignment both horizontally and vertically.
4. Pipe shall have a firm bearing along its entire length.
5. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the tabulation titled PIPE DEFLECTION ALLOWANCES.

PIPE DEFLECTION ALLOWANCES

Maximum permissible deflection, in.*

<u>Size of push-on pipe, in.</u>	<u>joint</u>	<u>Mechanical joint</u>
4	19	31
6	19	27
8	19	20
10	19	20
12	19	20
14	11	13-1/2
16	11	13-1/2
18	11	11
20	11	11
24	11	9
30	11	9
36	11	8
42	7-1/2	7-1/2
48	7-1/2	7-1/2
54	5-1/2	--

*Maximum permissible deflection for 18-ft. lengths; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18 ft.

6. When mechanical joint, push-on joint or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstructions and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

B. Castings

1. Castings to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned.
2. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale and other foreign material.

C. Temporary Plugs

1. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

D. Appurtenances

1. Valves, fittings and appurtenances shall be set and jointed as indicated on the drawings.

3.06 ASSEMBLING

A. Push-On Joints

1. Make up by inserting the gasket into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe.
2. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

B. Bolted Joints

1. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces.
2. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

C. Mechanical Joints

1. Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell, and spigot shall be lubricated by being washed with soapy water.
2. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated.
3. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket.
4. After all bolts have been inserted and the nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.
5. The correct range of torque as indicated by a torque wrench and the length wrench (if not a torque wrench) used by an average man to produce such range of torque, shall not exceed the values specified in the tabulation titled TORQUE RANGE VALUES.

TORQUE RANGE VALUES

Nominal pipe size, <u>in.in.</u>	Bolt diameter, <u>ft.-lb.</u>	Range of torque, <u>in.</u>	Length of wrench,
3	5/8	40-60	8
4 thru 24	3/4	60-90	10
30, 36	1	70-100	12
42, 48	1-1/4	90-120	14

If the effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

D. Restrained Joints

1. Install in accordance with manufacturers written instructions.
2. Do not exceed manufacturer's permissible pipe deflection allowance.

E. Sleeve Type Couplings

1. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8-inches
2. Soapy water may be used as a gasket lubricant.
3. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint.
4. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid.
5. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
6. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed the manufacturers recommended values
7. After assembly and inspection and before being backfilled, all exterior surfaces of buried sleeve-type couplings, including the middle and follower rings, bolts, and nuts, shall be thoroughly coated with an approved heavy-bodied bituminous mastic. Care shall be taken and appropriate devices used to ensure that the undersides, as well as the more readily accessible parts, are well coated.

3.07 VALVES, HYDRANTS AND APPURTENANCES

- A. Install in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.
1. Contractor to maintain pressure differential at all Division Valve locations during water main work.

3.08 TAPPING SLEEVES AND VALVES

- A. Install in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

3.09 SERVICE CONNECTIONS

- A. Install in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

3.10 PIPING SUPPORT

- A. Where necessary, bends, tees, and other fittings in pipelines buried in the ground may be backed up with Class B concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then restraining devices shall be provided.

3.11 CLEANING

- A. Prior to the pressure and leakage tests, thoroughly clean piping of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

3.12 METALIZED DETECTABLE IDENTIFICATION TAPE

- A. Install in accordance with the Pawtucket Water Supply Board, Specifications for Water Main and Service Materials, revised April 2013.

3.13 TESTING

- A. Except as otherwise directed, pipelines shall be given combined pressure and leakage tests in sections of approved length.
- B. Furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gages, relief valves, other necessary equipment; and all labor required.
- C. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires.
- D. However, pipelines to be embedded in concrete shall be tested prior to placing of the concrete and exposed piping shall be tested prior to field painting.
- E. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow offs are not available at high points for releasing air the Contractor shall make the necessary excavations and do the necessary backfilling and make the necessary taps. After completion of the tests, if directed by the Program Manager/Construction Manager, remove corporations and plug said holes.
- F. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- G. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure

- rating of the pipe but not to exceed 200 psi. Do not apply this pressure to items of equipment known to be incapable of withstanding such pressure.
- H. If the Contractor cannot achieve the specified pressure and maintain it for a period of **one** hour with no additional pumping, the section shall be considered as having failed to pass the test.
 - I. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test and is considered acceptable by the Program Manager/Construction Manager.
 - J. If, in the judgment of the Program Manager/Construction Manager, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure may be made as required and approved by the Program Manager/Construction Manager, but in any event the Contractor shall be fully responsible for the ultimate tightness of the line within the above leakage and pressure requirements.
 - K. All testing to be witnessed by the Program Manager/Construction Manager.

3.14 DISINFECTING AND FLUSHING OF PIPELINES

- A. The Contractor shall disinfect the lines carrying potable water.
- B. Furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in the AWWA Standard C651 except as otherwise specified herein.
- C. Upon completion of installation and testing, the Contractor shall disinfect all water mains in the following manner:
 - 1. Pipes shall be completely filled with water, all air released, and then thoroughly flushed out in the amount of twice the capacity of the section to be treated. Chlorine gas shall be introduced into the main near the point of water supply, in the concentration of 100 parts of available chlorine per million parts of water. The main shall then be wasted or bled from the extreme end opposite to the point of application of the disinfecting solution has reached the end opposite to the point of application in the concentration of not less than fifty (50) parts available.
 - 2. Close all gates. Leave the disinfecting solution in the mains under full pressure for a period of not less than 48 hours. The entire section shall then be flushed through Sulphur Dioxide Gas, which neutralizes Chlorine, until all traces of chlorine are removed from the water main.
 - 3. The Owner shall then take a sample, and perform laboratory analyses to determine the effectiveness of treatment. **Two sets of samples should be taken at least 24 hours apart and analyzed for total coliform and heterotrophic plate count.**
 - 4. Repeatedly treat any section of main that fails to meet laboratory standards until the desired results are obtained.

- D. Particular attention is directed to the requirement that a double check valve installation shall be made in the water supply to the main under treatment, to prevent possible backflow or siphonage of treated solution into the distribution system in service.
- E. Bacteriological sampling and testing shall be done in accordance with AWWA C651 and this specification for each main and each branch. Sampling shall be accomplished with the use of hose or fire hydrants. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.
- F. Permission of the Owner must be obtained by the Contractor before any main is placed into service.
- G. Dispose of the water used in disinfecting and flushing in an approved manner.

END OF SECTION

Pawtucket Water Supply Board

SPECIFICATIONS FOR

WATER MAIN AND SERVICE MATERIALS

Materials approved for use on water main installations and appurtenant services, as directed by the Water Supply Board:

- PIPE:** **Type:** Ductile Iron, AWWA C151, American Manufacture
Thickness Class: 52, AWWA C150
Joint Type: Push-On Joints, AWWA C111
Gasket: Rubber, AWWA C111
Interior Surface: Cement-mortar lining, double thickness, with bituminous material seal coat, AWWA C104
Exterior Surface: Asphaltic coating approx. 1-mil thick, AWWA C151
- RESTRAINED JOINT PIPE:** **Type:** Ductile Iron, AWWA C151, American Manufacture
Thickness Class: 54, AWWA C150
Joint Type: Restrained Push-On Joints, AWWA C111
(TR-Flex, as manufactured by U.S. Pipe & Foundry Co.)
Gasket: Rubber, AWWA C111
Interior Surface: Cement-mortar lining, double thickness, with bituminous material seal coat, AWWA C104
Exterior Surface: Asphaltic coating approx. 1-mil thick, AWWA C151
- PIPE FITTINGS:** **Type:** Ductile Iron, AWWA C153
Pressure Rating: 350 psi
Joint Type: Mechanical Joints, AWWA C111
Gasket: Rubber, AWWA C111
Interior Surface: Cement-mortar lining, double thickness, with bituminous material seal coat, AWWA C104
Exterior Surface: Asphaltic coating approx. 1-mil thick, AWWA C151
- PIPE JOINT RESTRAINT:** MEGALUG thrust restraint wedge, as manufactured by EBAA Iron, Inc. of Eastland, TX, or approved equal
- TAPPING SLEEVES:** **4" thru 10",** Mueller H-615 Mechanical Joint, or approved equal.
12" and larger, Smith-Blair Model 664, AWWA C223, stainless steel body with stainless steel (Type 304) nuts and bolts or approved equal.
- TAPPING VALVES:** **2" thru 12",** Mueller T-2360-16, AWWA C509
16" thru 24", Mueller H-667, AWWA C500,
OPEN RIGHT, Flanged x Mech. Joint, or approved equal
- GATE VALVES:** **4" thru 12",** Mueller A-2360-20, AWWA C509, OPEN RIGHT, Mechanical Joint, or approved equal.

INSERTION VALVES: 4" thru 12", EZ Valve as manufactured by Advanced Valve Technologies, LLC, AWWA C509 for material specifications, OPEN RIGHT, or approved equal.

BUTTERFLY VALVES: 16" and larger, Mueller B-3211-20, AWWA C504, OPEN RIGHT, Mechanical Joint, Class 150B or approved equal.

VALVE BOXES: 5-1/4", Telescope Type, with cover marked "WATER".

HYDRANTS: Mueller Super Centurion A-423, AWWA C502, ULFM approved, OPEN LEFT, 5'6" bury, Paint 2 coats approved Chrome Yellow, **NO SUBSTITUTION.**

SERVICE PIPE: 1" or 2" Type "K" Copper, AWWA C800.

CORPORATION STOPS: 1" or 2" Mueller B-25008 Ball Valve, AWWA C800, or approved equal.

CURB STOPS: 1" or 2" Mueller B-25209 Ball Valve, AWWA C800, or approved equal.

CURB BOXES: Erie Type, w/lid & plug, Range 4'6" to 5'6" Mueller H-10334, 33" rod, or approved equal.

PIPE COUPLINGS: Cast, bolted straight and transition; Smith-Blair No. 441, epoxy coated with stainless steel hardware, AWWA C219, or approved equal.

RESTRAINED COUPLINGS: Series 3800 MEGA-COUPLING, as manufactured by EBAA Iron, Inc. of Eastland, TX, AWWA C219 or approved equal.

AIR RELEASE: Mueller H-10284 (with a copper riser tube) or approved equal (to include TWO: 1" IPT to 1" type "K" copper fittings).

BLOW-OFF: 2" Gil Industries Aquarius Blow-Off System with a 2" stop & drain valve, 2" copper riser pipe to the length required, as manufactured by Gil Industries Inc. of Pensacola Florida, or approved equal, installed with a 5-1/4", telescope type valve box with cover marked "WATER".

**ABOVE GROUND
METER VAULT:** The vault shall be an insulated heated enclosure of aluminum construction and shall comply with ASSE 1060, Class I. The vault interior dimensions shall be appropriately sized by the manufacturer based on interior piping items. The enclosure must be capable of maintaining a minimum temperature of 40⁰ F (4⁰C) and shall be supported by a concrete pad in accordance with the manufacturer's recommendations. It shall be manufactured by Hot Box or an approved equal. Vaults located in open areas such as public parks, playgrounds or ballfields shall be enclosed by a 6-foot high chain link fence and locking gate in accordance with RIDOT Standard 31.2.

SECTION 02668

TEMPORARY POTABLE WATER BYPASS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish, install, disinfect, maintain and remove temporary potable water bypass pipe, connections, laterals and services required to adequately serve water customers.
2. The work includes excavation and backfilling, constructing ramps and/or burying piping at driveways and other access ways, replacement of temporary and permanent pavement, restoration of public and private property.

B. Related Sections

1. Section 01570 – Traffic Regulations
2. Section 02200 - Earth Excavation, Backfill, Fill and Grading
3. Section 02500 - Pavement
4. Section 02665 – Domestic Water Systems

1.02 SYSTEM DESCRIPTION

A. Design Requirements

1. The Contractor shall review the City of Pawtucket's water plans, available at the office of the Pawtucket Water Supply Board, to determine the extent of the by-pass, especially where dead ends and division gates may require bypass piping. No additional payment shall be considered for the extension of bypass to feed services fed from dead ended pipe or pipe where flow is interrupted by a division gate. This may or may not be noted on the plan. In either case the Contractor is responsible for determining the locations of all dead ends and all locations which require bypass piping.
2. The Contractor shall provide coordination with Pawtucket Water Supply Board and as needed, obtain approval or any necessary permits with Pawtucket Water Supply Board.
3. The number of temporary hydrants to be installed within the bypass piping system shall be equal to the number of hydrants existing within that system.
4. The Contractor shall provide temporary services for the customers whose permanent service line is:
 - a. Out of service due to the main pipe to which it is connected to is being replaced.

- b. Out of service due to the main pipe to which it is connected to is being served only by the main being rehabilitated or replaced, including dead end pipes and pipes ending at division gates.
- c. Out of service for any other reason in connection with work under this contract.
- 5. The bypass shall not be less than the sizes indicated in these specifications and in any case not less than 2-in. diameter. All temporary hydrants must be feed by either an in service hydrant or a direct connection to an underground water main with 4-in. temporary bypass piping.
- 6. Water for the temporary connection shall be from Owner's nearest available hydrants remaining in service.

B. Performance Requirements

- 1. The pipe and appurtenances utilized for temporary connections shall be suitable for potable water transmission and distribution and be capable of withstanding a service pressure of 150 psi.
- 2. The Contractor shall have readily available sufficient additional quantity of bypass pipe, connections, lateral and service material of suitable sizes to replace or supplement the temporary facilities in the event these prove inadequate in any way.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300 – Submittals,

- 1. Proposed layout plan and operations schedule for installing and removing temporary bypass, connections, services, valves and temporary hydrant locations.
- 2. Details of the installation, operation, maintenance, testing, disinfection and removal of temporary facilities including bypass, connections, laterals, customer services and customer connections and temporary fire hydrants.
- 3. List of materials with sizes for temporary bypass, connections and services.
- 4. The Contractor shall submit and obtain approval from the Engineer, for the temporary bypass system prior to start of construction.

1.04 QUALITY ASSURANCE

A. The Engineer's permission will be required for bypass pipelines, connections, services, and laterals to be laid across streets.

B. The Engineer's permission will be required to remove permanent customer services, laterals and water mains from normal services and to return these to normal service.

C. Safety

- 1. The proposed temporary connections shall be capable of preventing contamination of contiguous potable water distribution system and services.
- 2. The Contractor shall coordinate and cooperate with the Owner's water utility and fire department to maintain water distribution and fire protection capability.

3. The Contractor shall be responsible to ensure that all precautions have been taken for public safety considerations.
4. The Contractor's attention is directed to requirements within the Specifications regarding water supply for Contractor's operations.
5. The Contractor's attention is directed to requirements of Section 01570 regarding traffic control.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All pipes, fittings, hoses, connections, and valves suitable for potable water services shall be capable of supplying a service pressure of a minimum of 150 psi and have prior approval of the Engineer.
 1. All hose must be NSF approved.

PART 3 EXECUTION

3.01 EXAMINATION

- A. The Contract Drawings provide the size and location of most known fire pipes on the main streets impacted by the construction. The Contractor shall become familiar with the existing water systems and be responsible for the adequate temporary feed of all fire service lines.

3.02 PREPARATION

- A. The Contractor shall obtain all street opening permits required by the Town and/or State if applicable.
- B. The Contractor shall notify the Owner, the Owner's water utility and the fire department 48 hours in advance of the time of connecting and disconnecting temporary and permanent facilities so that representatives of the Owner's water utility and fire department may be present at installation or removal of permanent and temporary connections and to permit the Owner to inform customers and users as the Owner deems necessary.

3.03 OPERATION OF EXISTING VALVES

- A. In accordance with Specification Section 02665, 3.02, Operation of Valves.

3.04 INSTALLATION

- A. The Contractor shall furnish, install, maintain and later remove devices necessary to ensure public safety as required and as approved.

- B. Excavation and backfill in accordance with Section 02200.
- C. The Contractor shall not operate the Owner's valves, stops and hydrants without the Owner's prior approval.
- D. Temporary bypass, connections, laterals, and customer services shall not be installed across streets except as permitted and approved by the Engineer.
- E. Water main laterals that are to remain in service shall be connected to the temporary bypass.
- F. Work on existing water mains to be in accordance with Section 02665.
- G. The bypass shall be laid out of the traveled way in a manner as to protect the bypass piping from damage. Whenever possible the temporary bypass shall be laid in the gutter unless otherwise directed by the Engineer.
- H. Where bypass has received prior approval to cross streets and street intersections, it must be valved on both sides and should be laid in a trench with temporary pavement placed over it except as permitted otherwise, in writing by the Engineer.
- I. Where the bypass crosses driveways and similar access ways to properties, suitable ramp shall be constructed of cold patch to allow driving and passing over the pipe except where the Engineer requires bypass to be laid in a trench with temporary pavement placed over it. All 6-inch bypass crossing driveways, handicap ramps and similar access ways shall be buried to a minimum depth of 3" or as directed by the Engineer.
- J. The bypass shall have shut off valves approximately every 400 feet.
- K. During freezing, stormy and inclement weather, no work shall be done except work incidental to temporary connections or as directed by the Engineer.
- L. Backflow device shall be installed at all feed hydrants.
- M. Contractor to maintain pressure differential in the by pass system similar to the existing water system as delineated by the Division Valves as shown on the Utility Drawings.

3.05 HYDRANTS

- A. The Contractor shall keep existing fire hydrants in service and make appropriate connections to the bypass or install and maintain temporary fire hydrants adjacent to each existing fire hydrant affected by work until the existing fire hydrants are restored to services. All hydrants temporarily out of service shall be bagged.

- B. At locations where hydrants are out of service due to work under this contract, the Contractor shall provide temporary hydrants. A hydrant being used to feed temporary hydrants must be fed by a 4-inch bypass pipe including whip connections.
- C. The Contractor shall provide each temporary fire hydrant with individual valve control.
- D. The temporary fire hydrants which the bypass is connected to for the temporary water supply shall be flushed satisfactorily prior to making connections to prevent stagnant or discolored water from entering the bypass.
- E. The existing hydrants which the bypass is connected to for the temporary water supply shall be flushed satisfactorily prior to making connections to prevent stagnant or discolored water from entering bypass. A separate valved connection from the steamer/pumper nozzle (4") must be supplied for fire service.

3.06 TEMPORARY SERVICE CONNECTIONS

- A. The Contractor shall furnish, install, maintain and later remove the temporary service connections from the bypass to each building and service required to be supplied by the water main to be removed from service.
- B. Temporary connections shall be laid out of the traveled and access ways where possible.
- C. Temporary service connections shall be ramped or installed in a trench where directed and approved by Engineer.
- D. Temporary service connections shall be of equal size than the permanent service connections.
- E. The Contractor shall install and maintain pressure regulators for temporary services where necessary.
- F. The installation and removal of temporary service connections and back cleaning of permanent services shall take place only at times when the work can be observed by the Engineer and other representatives of the Owner.
- G. The Contractor shall coordinate and cooperate with the service user and the Owner's water utility and fire department to assure the minimum disturbance to the user's fire protection system and other special and automated use.
- H. The temporary service connections shall be made to the user's service line at the sill cock or other convenient and reasonable point or where acceptable to Engineer.
- I. Temporary "wye" fittings must be supplied at the sill cock to accommodate use of garden hoses, etc.

3.07 TESTING

- A. The temporary connections shall be tested to be shown to be of sufficient pressure and without leaks as demonstrated to the Engineer.
- B. If the bypass proves inadequate for the temporary service, the Contractor shall replace or supplement the bypass as appropriate to provide adequate temporary service, including replacement with a larger diameter bypass, and as approved by the Engineer.

3.08 DISINFECTION AND FLUSHING PIPELINES

- A. Disinfect temporary facilities prior to use to Owner and Engineers satisfaction in accordance with Specification Section 02665, 3.14, Disinfecting and Flushing of Pipelines.
- B. Contractor shall demonstrate that all valves are operational prior to activation and there is an adequate supply of on site replacement material.

3.09 MAINTENANCE

- A. The Contractor shall be responsible for providing labor, materials, and equipment on a twenty-four (24) hour stand-by status to maintain continuous water service to all PWSB costumers (connected to the temporary potable water bypass) no additional cost to the Owner. Any service interruptions, whether caused by defective piping, pipe jointing or other components; physical damage by vehicles; vandalism; frost action; or other unforeseen reasons, shall be immediately corrected and repaired so as to restore the temporary service to all PWSB customers as soon as possible.

3.10 RESTORATION

- A. After water mains are returned to service, the Contractor shall remove all temporary facilities not required for remaining work, and restore and clean up affected areas.
- B. Pavement restoration to be in accordance with Section 02500.

END OF SECTION

SECTION 02711

CLEANING AND LINING CAST IRON WATER MAIN

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements and specifications for cleaning and lining cast iron pipe.

1.02 RELATED SECTIONS

- A. Section 02200 – Earth Excavation, Backfill, Fill and Grading
- B. Section 02215 – Aggregate Material
- C. Section 02500 – Pavement
- D. Section 02618 – Ductile-Iron Pipe and Fittings For Buried Services
- E. Section 02619 – Valves, Hydrants and Fittings
- F. Section 02763 – Water Main Television Inspection
- G. Section 02765 – Cured in-Place Pipe Installation

1.03 REFERENCES

- A. AWWA C651, Disinfecting Water Mains.

1.04 PERFORMANCE REQUIREMENTS

- A. The Contractor shall furnish all labor, materials, tools and equipment necessary to clean and CIPP line, disinfect and place back in service potable water mains as indicated on the drawings and as herein specified.
- B. Minimum interference with operations and maintenance of contiguous potable water distribution systems.
- C. Opening and Closing Pipelines: Engineer to determine suitability of existing pipeline sections for reuse as closure pieces.
- D. Cleaning Pipeline: Engineer to inspect for satisfactory cleaning, defects in pipeline and possible repair or replacement.
- E. Cured-in-Place Pipe: The cured-in-place pipe (CIPP) shall be designed in accordance with Section 02765 – Cured In Place (CIPP) Installation in Water Main (Inversion Method)

1.06 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Submit detailed information regarding equipment, methods, access opening, disinfection and flushing, testing and operations schedules proposed for cleaning and lining work.

1.07 QUALITY ASSURANCE

- A. The newly lined water main shall be internally television inspected as per Section 02763 – Water Main Television Inspection.

1.08 QUALIFICATIONS

- A. Work under constant supervision of a foreman with at least three years experience in this type of work.

1.09 WARRANTY

- A. The Contractor guarantees that the work to be done under this Contract shall be done in a good and workmanlike manner in complete conformance with these specifications, and that the materials furnished by him and used in the construction of the same shall be free from defects and flaws. This guarantee shall be for a period of one year from and after the date of final acceptance of the work. It is hereby, however, specifically agreed and understood that this guarantee shall not include any repairs made necessary by any cause or causes other than defective work on materials.

PART 2 - PRODUCTS

2.01 PIPE REPAIR CLAMPS

- A. Pipe repair clamps shall consist of a rubber liner completely enclosed and fastened in a full circle design 18-8 type 304 stainless steel assembly all which is galvanically passive to cast or ductile iron, manufactured by Smith Blair, Inc, Texarkana, Arkansas, Romac Industries, Inc., Bothell Washington or approved equal.
- B. Pressure rating at least equal to that of the pipeline in which they are to be installed.

PART 3 - EXECUTION

3.01 GENERAL

- A. Contractor shall furnish, install, maintain and later remove all devices necessary to ensure public safety as required and as approved.

3.02 PREPARATION

- A. Dewater water mains in preparation to the starting of work and drain all low points.
- B. Operation of all valves in connection with work under the Contract shall be conducted by Pawtucket Water Supply Board employees unless specified or otherwise directed by the Owner/Engineer. No additional compensation will be made to the Contractor for any delays in the operation of said valves for any time or materials involved if given permission to have the Contractor's own forces operate said valves.
- C. Contractor will be responsible for excavating, if necessary, and raising the gate boxes to existing grade, repairing or supplying and installing new gate valve at locations where valves are inaccessible due to being buried or covered with asphalt on concrete, on tilted and/or broken gate box. The work shall include a permanent surface repair including concrete to anchor the top of the box and prevent settlement and asphalt conforming in depth to the original road surface.
- D. Excavation to be conducted in accordance with Section 02200.

3.03 OPENING AND CLOSING PIPELINES

- A. Access openings at each end of pipeline section to be cleaned and lined.
- B. Additional access openings at intermediate gates, bends, fittings and obstructions indicated on the drawings and at other locations necessary for satisfactory cleaning and lining.
- C. Additional openings due to bends, fittings or other obstructions not indicated on the drawings to be made as necessary.
- D. Cut cast-iron pipe with suitable power-operated saw approved by Engineer. Care required to prevent damage.
- E. Cutting cast-iron pipe by hammer and chisel or by wheel type cutters not permitted.
- F. Prevent dirt, debris, groundwater of foreign matter from entering pipeline except materials needed for cleaning and lining.
- G. Section of pipe cut to permit access be carefully removed to be discarded and new piece of sufficient size and strength to be provided and installed by Contractor.

- H. Pipe ends with possible cracks or pipe sections damaged by cutting to be replaced by Contractor as approved by Engineer.
- I. Closure of pipeline access to be suitable for system pressures expected without leakage.

3.04 CLEANING PIPELINE

- A. In accordance with AWWA C602 by means of suitable scraping machine.
- B. Scraping machine moved through pipeline by power winch or motorized driver, or forced by hydraulic pressure as appropriate for section to be cleaned.
- C. Provide clean interior metal surfaces in the water main ready to receive the CIPP lining.
- D. After cleaning interior of the pipe remove sharp projections that would affect thickness of lining and all matter detrimental to lining.
- E. Assure that cleaning debris will not interfere with operation of air valves, services, laterals, valves and other water main appurtenances.
- F. Remove debris from inside of pipe and dispose of in acceptable manner.
- G. At point debris is flushed or removed from pipe, provide suitable containment and settling area, acceptable to Engineer, to ensure sediment, other unsatisfactory material and flushing water do not enter into drains, sewers, waterways or onto private property.
- H. Immediately following each debris removal or flushing operation clean street and other affected areas to satisfaction of Engineer.
- I. Prevent entry of dirt, debris, groundwater, or other foreign matter into pipeline except materials needed for cleaning and lining of pipe.
- J. Upon completion of cleaning operations in each section of pipeline, furnish as appropriate suitable lights and mirrors for inspecting interior of cleaned pipeline section.
- K. Advise Engineer of any evidence encountered during cleaning indicating repair and replacement may be required before pipeline section is lined.
- L. Assist Engineer in making inspection to determine acceptability of cleaning and need for repair and replacement.

3.05 REPAIR AND REPLACEMENT

- A. Perform repair and replacement authorized and approved by Engineer.
- B. Pipe, fittings, valves damaged by Contractor's negligence repaired or replaced at Contractor's expense in manner acceptable to Engineer. Engineer determines if damage due to Contractor's negligence.

3.07 INSTALLATION OF NEW VALVES

- A. In accordance with Section 02618 and Section 02619.

3.08 TELEVISION INSPECTION

- A. In accordance with Section 02763.

3.09 DISINFECTION AND FLUSHING

- A. Disinfect and flush pipeline sections, including connections, valves, hydrant laterals, as specified in subsection titled Disinfection and Flushing under Section 02618 after lining completed and cured.

END OF SECTION

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SECTION 02720

CATCH BASINS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Requirements to construct, adjust abandon, or rebuild all catch basins as indicated on the drawing and as specified.
- B. Related Sections
 - 1. Section 03300 - Cast-In-Place Concrete

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. A48, Specification for Gray Iron Castings.
 - 2. C32, Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 - 3. C139, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - 4. C150, Specification for Portland Cement.
 - 5. C207, Specification for Hydrated Lime for Masonry Purposes.
 - 6. C478, Specification for Precast Reinforced Concrete Manhole Sections.

1.03 DESIGN REQUIREMENTS

- A. Catch basins shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or bound in the specifications or as ordered by the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Catch basin walls shall be precast concrete masonry units. The top of the cone (not to exceed 6 inches.) shall be built of brickwork to permit adjustment of the frame to meet the finished surface.
- B. Catch basin sumps shall be one piece precast concrete or concrete masonry units on cast-in-place or precast concrete bases.
- C. The cast-iron frames and grates shall be the standard as indicated on the drawings.
- D. All cast-in-place concrete shall be 4,000 psi and shall conform to the requirements specified under SECTION 03300.

2.02 PRECAST CONCRETE MASONRY UNITS

- A. Precast concrete masonry units shall be machine-made solid segments, conforming to ASTM C139 with the following exceptions and additional requirements:
 - 1. Type II cement shall be used except as otherwise permitted.

2. The width of the units shall be as indicated on the drawings.
3. The inside and outside surfaces of the units shall be curved to the necessary radius and so designed that the interior surfaces of the structures shall be cylindrical, except the top batter courses shall be designed to reduce uniformly the inside section of the structure to the required size and shape at the top.
4. Units shall be designed such that only full-length units are required to lay any one course.
5. Acceptance of the units will be on the basis of material tests and inspection of the completed product.

2.03 PRECAST CONCRETE SUMPS

- A. Precast concrete sumps shall conform to the ASTM C478, with the following exceptions and additional requirements:
 1. The wall section shall be not less than 6-inch thick.
 2. Type II cement shall be used except as otherwise permitted.
 3. Sumps shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees. F. for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the sections to meet the strength requirements.
 4. No more than two lift holes may be cast or drilled in each sump.
 5. Acceptance of the sumps will be on the basis of material tests and inspection of the completed product.
- B. All holes in sumps used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

2.04 BRICKS

- A. The brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Brick shall conform to ASTM C32 for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.
- B. Rejected brick shall be immediately removed from the work.

2.05 MORTAR FOR BRICKWORK

- A. The mortar shall be composed of Portland cement, hydrated lime, and sand, in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1:1/4 for dense, hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the proportions of 1-1/2:4-1/2.
- B. Cement shall be Type II Portland cement conforming to the ASTM C150.
- C. Hydrated lime shall be Type S conforming to the ASTM C207.
- D. The sand shall comply with the specifications for fine aggregate, specified in Section 03300, except that all of the sand shall pass a No. 8 sieve.

2.06 MORTAR FOR MASONRY UNITS

- A. Mortar shall be composed of one part portland cement and two parts of sand by volume with sufficient water to form a workable mixture. Cement and sand shall be as specified for mortar for brickwork.

2.07 CATCH BASIN FRAMES AND GRATES

- A. Furnish and install all cast-iron catch basin frames and grates conforming to the details indicated on the drawings and as specified.
- B. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of grates and frame seats shall be machined to prevent cocking of grates.
- C. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
- D. Castings shall be at least Class 25 conforming to the ASTM A48.
- E. Unless otherwise specified or indicated on the drawings, castings in paved areas shall be capable of withstanding AASHO H-20 loading and shall meet the requirements of the municipality in which they are installed.

2.08 CURB INLETS

- A. Granite for curb inlets shall have a horizontal bed. The stone shall be sawn or peen hammered on top, and the front and back edges shall be pitched true to line. The back face for a distance of 3-inches down from the top shall have no projection greater than 1 inch. The front face shall be straight split, free from drill holes, and it shall have no projection greater than 1-inch or depression greater than 1/2 inch for a distance of 10-inch down from the top, and for the remaining distance there shall be no depression or projection greater than 1 inch. The ends shall be squared with the top for the depth of the face finish and so cut that the curb inlet can be set with joints of not more than 1/2 inch.
- B. Granite curb inlet shall be, 3 ft. minimum in length, plus or minus 1/2 inch, from 17 to 19 inches in depth, 7 inch wide at the top and at least 7 inches wide at the bottom.
- C. A gutter mouth at least 3 inches in depth and at least 2 feet in length shall be cut in the front face of the stone as shown on the plans.
- D. Where curb inlets are used to replace a section of existing curbing, the width of the curb inlet shall be the same as the adjoining existing curbing.

PART 3 EXECUTION

3.01 LAYING BRICKWORK AND GRADING RINGS

- A. Only clean bricks and grading rings shall be used. Bricks shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

- B. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.
- C. Each grading ring shall be laid in a full bed of mortar and shall be thoroughly bonded.

3.02 PLASTERING AND CURING BRICK MASONRY

- A. Outside faces of brick masonry shall be plastered with mortar from 1/4 in. to 3/8 in. thick. If required, the masonry shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled. After hardening, the plaster shall be carefully checked by tapping for bond and soundness. Unbonded or unsound plaster shall be removed and replaced.
- B. Brick masonry and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other acceptable means, and shall be protected from the weather and frost, all as required.

3.03 SETTING CASTINGS

- A. Curb inlets and frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings or directed. Circular frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
- B. Grates shall be left in place in the frames on completion of other work at the manholes.

3.04 CATCH BASINS ADJUSTED TO GRADE

- A. Existing catch basin tops shall be adjusted to line and grade as indicated on the drawings or as directed by the Engineer.
- B. All catch basins adjusted to grade shall be provided with concrete grading rings or brick as specified for new drain manholes.

3.05 REBUILDING OF EXISTING CATCH BASIN

- A. Cut suitable openings in existing structures to make connections to drains as indicated on the drawings and as specified or directed. In doing so, confine the cutting to the smallest amount possible consistent with the work to be done.
- B. After the drains are installed, carefully fit around, close up, and repair the structures watertight, all as acceptable to the Engineer.
- C. Prior to starting work, assembled all tools, materials, and construction equipment required to complete the work in the shortest possible time.

END OF SECTION

SECTION 02750

ABANDONMENT OF EXISTING SEWERS AND DRAINS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for abandoning existing combined sewers, sanitary sewers, storm drains and structures as indicated on the Drawings and as specified.

B. Related Sections

1. Section 02149 – Maintaining Existing Flows
2. Section 02224 – Controlled Density Fill
3. Section 03300 - Cast-In-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. C32, Standard Specification of Sewer and Manhole Brick (Made from Clay or Shale), AASHTO Designation M91-42, Red Sewer Brick Only Grade SS.
2. C144, Standard Specification for Aggregate for Masonry Mortar.
3. C150, Standard Specification for Portland Cement.
4. C207, Standard Specification for Hydrated Lime for Masonry Purposes.

1.03 SUBMITTALS

A. Shop Drawings

1. In accordance with Specification SECTION 01300 - SUBMITTALS.

B. Samples

1. Provide representative samples of materials if requested by the Engineer.

PART 2 PRODUCTS

2.01 PLUGS

A. General

1. Plugs shall meet the following thickness requirements:

<u>Sewer/Drain Diameter</u>	<u>Thickness of Plug</u>	
	<u>Concrete</u>	<u>Brick & Mortar</u>
15-inch and less	12-inch	8-inch
15 to 30-inch	24-inch	16-inch
Greater than 30-inch	36-inch	24-inch

2. For non-circular pipes, the largest cross-sectional dimension shall govern in determining the size of the plug.
3. Bricks with more than one layer of thickness shall be interlocked.
4. Mechanical plugs will not be allowed.

B. Cement

1. Minimum 4,000 psi cement concrete materials in accordance with Section 03300, or brick masonry.

C. Brick

1. Sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer.
2. In accordance with ASTM C32, Red Sewer Brick Only Grade SS.
3. In accordance with AASHTO M91-42, Red Sewer Brick Only Grade SS.

D. Mortar for Brickwork

1. Composed of Portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volume of cement and lime.
2. The proportions of cement and lime shall be 1:1/2 .
3. Cement shall be Type II Portland cement in accordance with ASTM C150.
4. Hydrated lime shall be Type S conforming to the ASTM C207.
5. Hydrated lime shall be "Mortaseal" manufactured by U.S. Gypsum or
6. "4X Hydrate" manufactured by the New England Lime Company or
7. An acceptable equivalent product.
8. The sand shall conform to ASTM C144.

E. Pipe Fill Material

1. Class II Controlled Density Fill (excavatable fill, very flowable)

PART 3 EXECUTION

3.01 INSTALLATION

A. Plugs

1. Plug existing combined sewers, sanitary sewers and storm drains, as indicated on the Drawings and as specified.
2. Plugs shall withstand the full soil and groundwater pressure.
3. Pipe entering a manhole or catch basin that are to be abandoned shall have a plug installed that is flush with the interior of the structure.
4. Pipes to be abandon that enter the sewer at a manhole, shall be plugged at the manhole.
5. When man entry permits, lines indicated to plugged at the main, should be plugged from inside of the combined sewer.
6. Sewer and drain services 6-inches or 8-inches in diameter shall be plugged with a precast concrete plug. Such plugs shall be made watertight with an application around the plug of an approved watertight compound.

B. Pipe Fill

1. Existing combined sewers, sanitary sewers and storm drains to be abandoned that are greater or equal to 12-inches in diameter shall be abandoned, plugged and filled with Class II Controlled Density Fill (excavatable fill, very flowable). Fill a minimum of 95% of the total inside volume of the pipe.
2. Existing combined sewers, sanitary sewers and storm drains to be abandoned that are less than 12-inches in diameter shall be abandoned and plugged, but not filled.
3. Underdrains shall be filled if indicated on the Drawings
4. Additional excavations required to facilitate filling shall be the responsibility of the Contractor.

C. Manhole and Catch Basin Fill

1. Clean structure of all special waste and debris.
2. Plug pipelines entering structure as specified above.
3. Remove and dispose frame and cover and all concrete and masonry to a minimum depth of four (4) feet below existing ground surface.
4. Bottom of structure to be core drilled, drilled or broken to allow unrestricted migration of groundwater through the structure.
5. Fill remaining structure with compacted sand.

6. Backfill excavation in accordance with Section 02200,

END OF SECTION

SECTION 02763

WATER MAIN TELEVISION INSPECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Television inspection of water main.

1.02 RELATED SECTIONS

- A. Section 00700 - General Conditions.
- B. Section 00800 – Supplementary Conditions.
- C. Section 02618 – Ductile Iron Pipe and Fittings
- D. Section 02711 – Cleaning and Lining of Cast Iron Pipe

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Provide detailed plans and descriptions outlining television inspection procedures, equipment, provisions, and precautions.
- C. Provide two copies of inspection to the Owner showing documented conditions. Video shall be in DVD format.

1.04 QUALIFICATIONS

- A. Pipeline Television Inspection Company: Company specializing in performing the work of this section with minimum of three years experience.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 WATER MAIN TELEVISION INSPECTION

- A. After cleaning and lining, service blowback, and proper curing of the cement lining, the pipes shall be visually inspected by means of closed-circuit television. The inspection shall be recorded on videotape and printed TV inspection logs.
- B. Pan and Tilt TV Camera: Specifically designed and constructed for inspection of small diameter lines; equipped with a minimum of four lights to allow a clear picture

- of the entire periphery of the pipe; operative in 100 percent humidity conditions; and equipped with manual or power winch, TV cable, powered rewinds or other devices that do not obstruct the camera view to move the camera through the line.
- C. The television camera and apparatus shall be thoroughly disinfected before every inspection.
 - D. The video system shall be capable of producing picture quality acceptable to the Engineer.
 - E. The TV inspection equipment shall be equipped with a meter device to locate defects by measurement. Marking on the cable, or the like will not be allowed. Accuracy of the distance meter shall be acceptable to the Engineer.
 - F. If, during the inspection operation, the television camera will not pass through the entire water main section, set up equipment so that the inspection can be performed from the opposite end of the water main section.
 - G. Television inspection Logs: Printed location records clearly showing the location of each defect in relation points of significance. Defects shall include blocked services, cracks, areas of rough, patchy, or rutted lining and other discernible features.

3.02 FIELD QUALITY CONTROL

- A. After videotaping the cleaned and lined water main, any pipe not sufficiently lined shall be replaced or relined to obtain satisfactory results at no additional cost to the Owner.

END OF SECTION

SECTION 02764

TELEVISION INSPECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for television inspection of pipelines.

B. Related Sections

1. Section 01570 - Traffic Regulations
2. Section 02149 - Maintaining Existing Sewage Flow
3. Section 02762 – Pipeline Cleaning

1.02 REFERENCES

A. National Association of Sewer Service Companies

1. NASSCO Recommended Specifications for Sewer Collection System Rehabilitation.

1.03 SUBMITTALS

A. In accordance with Specification Section 01300, submit the following:

1. Outline of the procedures proposed to accomplish the work. Include a detailed description of the methods and equipment to be used for each operation. Outline TV inspection procedures and all provisions and precautions regarding the handling of existing sewage flows.

1.04 QUALITY ASSURANCE

A. Perform general work in accordance with NASSCO Recommended Specifications for Sewer Collection System Rehabilitation.

B. Utilize Pipeline Assessment and Certification Program (PACP) certified inspectors and PACP coding methods for all CCTV inspections.

1. Provide evidence of PACP certification for all operators working on the project prior to commencement of the Work.

1.05 QUALIFICATIONS

A. Company specializing in performing the work of this section with minimum five (5) years documented experience.

- B. Field Technicians must maintain current certifications for OSHA regulation, 29CFR1910 for Confined Space.

PART 2 PRODUCTS

2.01 DELIVERABLES

A. TV Inspection Logs:

1. Printed location records clearly showing the location, in relation to an adjacent manhole of each infiltration point observed during inspection and other points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, deposits, areas which exhibit loss of capacity, or other defects and other discernible features.
2. Logs shall be software generated, complete with the following information,
 - a. Upstream and downstream manhole identification numbers.
 - b. Address location.
 - c. Technicians name.
 - d. Inspection date/time and weather conditions.
 - e. DVD number.
 - f. Use of pipe (sanitary, storm, combined).
 - g. Type, shape, dimensions and material of pipe.

B. DVD Recordings:

1. Color video and audio record documenting TV inspection of conditions subsequent to cleaning.
2. The purpose of recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed.
3. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor.
4. Title to the tape shall remain with the Contractor; however, the Owner reserves the right to purchase any additional DVD's at the completion of the project.
5. Provide two (2) sets of DVD's complete in the required format.

C. PACP and Hansen/Neztek compliant software for documenting the inspection is to be used.

1. Viewing software to be WinCan, or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

- A. Control traffic in accordance with Specification Section 01570.

- B. Bypass sewage flow to allow performance of work. Handling existing sewage flows and bypass pumping shall be as specified in Specification Section 02149.
- C. Clean sewer lines in accordance with Specification Section 02763.

3.02 TV INSPECTION

- A. TV inspect sewer pipes following initial cleaning and following rehabilitation work prior to putting the line back in service.
- B. After cleaning, the sewer pipes shall be visually inspected by means of color closed-circuit television. The inspection shall be recorded on DVD and printed TV inspection logs.
- C. Equipment:
 - 1. Television Camera to be specifically designed and constructed for such inspection; equipped with a light to allow a clear picture of the entire periphery of the pipe; operative in 100 percent humidity conditions; and equipped with manual or power winch, TV cable, powered rewinds or other devices that do not obstruct the camera view to move the camera through the line.
 - 2. Camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. At areas of interest, the camera shall be capable of rotating its lens 360-degrees to obtain a clearer, more direct viewing angle. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
 - 3. Camera, television monitor, recording device and all other components of the video system shall be capable of producing picture quality acceptable to the Engineer.
 - 4. TV inspection equipment shall be equipped with a meter device to locate defects by measurement. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be acceptable to the Engineer.
 - 5. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure good communication between members of the crew.
- D. If, during the inspection operation, the television camera will not pass through the entire manhole section, set up equipment so that the inspection can be performed from the opposite manhole.

3.03 FIELD QUALITY CONTROL

- A. TV Inspection Records

**CSO PHASE IIIA-4
OF-210/213/214 FACILITIES**

1. Complete records shall be kept of TV inspection performed in each manhole section. The records shall identify the following information:
 - a. Identification of the manhole section tested.
 - b. Location (footage) of problem.
 - c. Defect classifications shall be PACP compliant.
2. Record on DVD all footage inside the sewer pipe. All DVD's and necessary playback equipment shall be readily accessible for review by the Engineer during the project.
3. TV inspection logs shall include the numbering or identification system utilized on the Contract Drawings or the Owners data base in the event Drawings are not provided.

END OF SECTION

SECTION 02765
CURED IN PLACE PIPE (CIPP) INSTALLATION IN WATER MAIN
(INVERSION METHOD)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. This section consists of the installation of cured-in-place linings for the structural rehabilitation of cast iron and ductile iron water pipes. When cured the lining will be closely formed to the original water main and provide a full structural rehabilitation. Only methods designated as Class 4 full strength CIPP linings in accordance with AWWA M28, Manual of Rehabilitation of Water Mains will be acceptable. Only methods that have NSF approval and approval from the Connecticut Department of Public Health are acceptable. The lining Contractor must be formally licensed by the line manufacturer to install the product.
2. Installation of resin impregnated flexible felt tube by pull-in-place process as approved by the Engineer will be considered an acceptable alternate to the inversion process.

B. Water for Construction

1. The Owner shall supply all water required by the Contractor for the pipeline cleaning and CIPP curing process. The Contractor must coordinate acceptable supply locations and contact the Owner in advance prior to use of any water for the Project.

C. Related Sections

1. Section 02711 – Cleaning and Lining Cast Iron Pipe
2. Section 02763 – Water Main Television Inspection

1.02 REFERENCES

A. American Society for Testing and Materials

1. ASTM D790
2. ASTM F1216
3. ASTM1743
4. NSF/ANSI Standard 61

1.03 DESIGN REQUIREMENTS

- A. The cured-in-place pipe (CIPP) shall be designed for a Fully Deteriorated design condition in which it is assumed that the existing host pipe provides no structural support and be considered a Class IV structural liner according to AWWA M28. The CIPP shall be designed to carry soil, and other superimposed loads.
- B. The CIPP design parameters shall be designed in accordance with ASTM F1216 under the following conditions:
 - 1. Host Pipe Condition: Fully Deteriorated
 - 2. Live Load: AASHTO HS20-44 under roadways
AASHTO E-80 under railroads
 - 3. Soil Weight: 120 lbs/cubic foot
 - 4. Internal Working Pressure: 150 psi
 - 5. Depth of Cover: 6 feet

The fully cured pipe liner shall conform to the following structural standards:

Tensile Strength at Yield	3,000 psi	ASTM D638
Flexural Strength	4,500 psi	ASTM D790
Flexural Modulus	250,000 psi	ASTM D790

- C. The CIPP design will assume no bonding to the original pipe.
- D. The inside diameter of the rehabilitated pipe shall not be smaller than 90% of the inside diameter of the original pipe.

1.04 SUBMITTALS

- A. Shop Drawings
 - 1. Submit in accordance with Specification Section 01300
 - a. Description of materials.
 - b. Installation process.
 - c. Wall thickness design calculations prepared by a professional engineer.
 - d. Installer's qualifications and relative experience.
 - e. Water bypass plan, if required.
- B. Samples
 - 1. Product samples as requested by the Owner/Engineer.

1.05 SAFETY REQUIREMENTS

- A. Perform all work in strict accordance with applicable OSHA standards. Particular attention is drawn to those safety requirements involving working with scaffolding and entering confined spaces.

1.06 SCHEDULING

- A. The Contractor shall notify all water users serviced by the water main being lined with coordination from the Owner and Engineer. Notification to such users shall be done one week and 24-hours prior to the scheduled installation of the liner.

1.07 WARRANTY

- A. During the one (1) year Warrantee Period any defects, which has affected or may affect the integrity and/or strength of the pipe shall be fully repaired at the Contractor's expense, in a manner approved by the Owner/Engineer.

1.08 QUALITY ASSURANCE

- A. Furnish reports to the Engineer of third party test data for chemical resistance, physical properties, structural capabilities, performance (both short-term and long-term), and flow coefficient properties.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The lining Contractor must be formally licensed by the liner manufacturer to install the product.

2.02 MATERIALS

- A. In accordance with ASTM F1216
- B. Resin Impregnated Felt Tube
 1. The lining material shall consist of one or more tubular felt or woven or unwoven polyester jackets with or without fiber reinforcement. The tube will be impregnated with the appropriate resin that is compatible with the requirements of the approved method resulting in a tightly fit structural liner. The tub shall be homogenous throughout its length.
 2. The tube shall have a uniform thickness specified in the approval submittals and shall be, when cured, resistant to internal exposure to drinking water treated by the Pawtucket Water Supply Board.

3. Manufactured to withstand installation pressures.
4. The wall color of the interior of the cured liner shall be a light reflective color.
5. Overlapping layers of felt in longitudinal seams that may cause lumps in the final product shall not be utilized.
6. Allow for circumferential stretching during installation including those necessary to accommodate and fit irregular pipe sections.
7. Provide tube length required to span distance between access points.
8. Resin and catalyst system compatible with the inversion process.
9. Outside layer of Tube to be coated with impermeable, flexible membrane that will contain resin.
10. Materials that are defective or damaged or deemed unacceptable by the Engineer shall be rejected and replaced at the Contractor's expense. Linear material damaged during installation shall be removed and replaced by the Contractor at the Contractor's expense.

PART 3 EXECUTION

3.01 ACCEPTABLE INSTALLERS

- A. Licensed by the patent holder/manufacturer of the cured-in-place inversion process with a minimum of five (5) active years of experience in installing similar size CIPP.

3.02 EXAMINATION

- A. Verify that the pipe surface is clean and there are no obstructions within the water main prior to impregnation.
- B. Verify all lengths between access pits prior to impregnation.

3.03 PREPARATION

- A. Cleaning Pipelines shall be in accordance with Specification Section 02711 with the following additional requirements.
 1. Remove all internal debris from the pipe line prior to the inversion process by utilizing any one or combination of rodding machines, high velocity water jet machines, hydraulically propelled machines, etc.
 2. Selection of the equipment used shall be based on the condition of the existing pipeline at the time the work commences.
 3. Methods to be approved by the Owner/Engineer.

4. Debris resulting from the cleaning operation shall be removed from the access manholes of the section being cleaned.
 5. Passing debris from one section to another will not be permitted.
 6. The Contractor shall remove all debris from site during the cleaning operation.
 7. Based on closed circuit television inspection, the Owner/Engineer shall be the sole judge for any final acceptance of the completed pipeline cleaning. Specific areas of pipeline, which have not been cleaned to the satisfaction of the Owner/Engineer shall be re-cleaned and re-inspected as necessary at the Contractor's expense.
- B. Inspection shall be in accordance with Specification Section 02764 with the following additional requirements.
1. The Contractor shall perform a pre-installation video to determine the location of all services lines, pipe bends, and conditions that may affect the installation of the pipe lining. The video shall clearly show the locations of all service connections. The Contractor shall review the video to ensure that the liner can be properly installed. If there are any obstructions in the pipe or bends that may prevent the installation of the liner then the Contractor shall notify the Engineer. Upon approval by the Engineer, the Contractor shall excavate to remove the obstruction or to use the location of the bend as an access pit.
 2. Using a "pan & tilt" camera, closed circuit television inspections shall be performed by experienced personnel trained in locating bends, obstacles and service connections, using equipment specifically designed for this purpose.
 3. Perform a "Before" CIPP liner installation interior inspection of the pipeline to locate any conditions which may prevent proper CIPP inversion into the existing pipeline, locate and document all existing bends, water service connections for future reinstatement, and to inspect the final pipeline condition, log the location of these conditions for correction.
 4. Two (2) copies of the Videotapes or DVD's and logs shall be provided to the Owner and the Engineer for record and future reference.

3.04 PRE-INSTALLATION

1. The Contractor shall provide temporary water service to all affected customers in accordance with provisions in the contract documents related to supply of temporary water during construction.
2. The Contractor shall plug all service connections to prevent resins from entering the service.
3. The Contractor shall verify the exact length of water main to be lined.
4. The Contractor shall contact Call Before You Dig and all other utilities not covered by Call Before You Dig to ensure complete utility mark-out.
5. Insert tube into vertical inversion standpipe and attach to create leak-proof seal.

6. Turn tube inside out at the lower end of inversion standpipe and attach to create leak proof seal.

3.05 INSTALLATION

A. Staging Area

1. Designate location where the tube will be resin impregnated prior to installation.

B. Inspection

1. Allow Owner/Engineer to inspect materials, wet-out procedures and all operations involved with television inspections, as well as installing and curing the liner.

C. Inversion

1. The Contractor shall wet out the tube with resin using caution to prevent the resin from spilling onto the surface. The impregnation of the resin shall be in accordance with the specifications of the resin manufacturer.
2. The wet out tube shall be inserted into the pipe by a pull-in or direct inversion method. The head used to extend the liner tube shall be sufficient to fully extend the tube both circumferentially and longitudinally.
3. Insert tube into vertical inversion standpipe and attach to create leak-proof seal.
4. Turn tube inside out at the lower end of inversion standpipe and attach to create leak proof seal.
5. Before installation begins the Contractor shall determine the minimum pressure required to hold the tube tight against the existing pipeline, and the maximum allowable pressure so as not to damage the tube. In order to ensure a proper fit of the CIPP tube to the host pipe, the pressure shall be maintained between the minimum and maximum pressures until the installation has been completed. Adjust inversion head or air pressure to sufficient height to cause impregnated pipe tube to invert from access pit to access pit. The Contractor may use a nontoxic, NSF/ANSI 61 certified lubricant to ease the installation if necessary.

D. Curing

1. After inversion is complete, apply suitable heat source and water recirculation equipment for the curing process.
2. Fit the heat source with suitable sensors to monitor the temperature of the incoming and outgoing water or steam supply. Fit another sensor between the impregnated tube and the pipe invert at the termination to monitor curing temperature.
3. Uniformly raise the water or steam temperature to a level required to effectively cure the resin as determined by the resin/catalyst system employed.

4. Maintain water or steam in tube to the temperature required in accordance to the resin manufacturer's instructions.
5. Initial cure deemed complete when inspection shows exposed portions of the tube to be hard and sound and remote temperature sensor indicates temperature is of a magnitude to realize a cure in the resin.
6. Continue cure period as recommended by the resin manufacturer, as modified for the cured-in-place inversion process, re-circulate water (if applicable) and cycle boiler to maintain temperature.

E. Cool Down

1. Cool hardened pipe to temperature below 100-degrees F before relieving static head in the inversion standpipe.
2. Cool down may be accomplished by introducing cool water into the inversion standpipe to replace water being drained from the downstream end.
3. Release static head with care to avoid developing a vacuum, which could damage new pipe.
4. The inversion water cannot be discharged into any river, stream or wetland.

F. Inspection, Testing and Disinfection

1. The finished pipe shall be continuous and watertight over the total length of the inversion run, and be free from defects, foreign inclusions, dry spots, pin holes, lifts and de-laminations.
2. Remove and replace defective areas.
3. Pressure testing shall be performed on all new CIPP sections. Testing will be completed for the section lined between valves only if valves were installed as part of this contract. In all other situations the Contractor will plug the pipe at each end and pressure test in accordance with the testing requirements provided with these specifications.
4. After completion of the work the Contractor shall perform chlorine disinfection of the newly installed liner in accordance with these specifications.

3.06 WATER SERVICE LATERAL CONNECTIONS

- A. After the new pipe has been cured-in-place, the Contractor shall reopen service connections from the interior of the pipe using a camera directed robotic cutting device designed for use for this system. The opening shall allow for full flow into the service and be the same size diameter as the service. The opening shall be smooth and flush with the interior of the liner at the locations recorded on the video tapes and record.

3.07 FIELD QUALITY CONTROL

A. Site Tests

1. The water-tightness of the pipe shall be gauged while curing under positive head.
2. Provide samples in accordance with ASTM F1743 Section 8.3.
3. Additional testing if required will be by the Owner. Recommissioning of water main shall be done in accordance with AWWA Standards or as ordered by the Engineer. Customer service shall be restored after acceptable samples have been obtained and approved by the Engineer.

B. Final Inspection and Acceptance

1. Provide the Owner and Engineer each with two (2) properly labeled and complete record videotape or DVD copies of the televised internal pipe inspection demonstrating Contract compliance and showing the completed work including all restored conditions and appurtenant water service connections.

3.08 CLEANING AND SITE RESTORATION

- A. Upon acceptance of the CIPP installation and any testing associated therewith, restore the project area affected during the operation to a condition at least equal to that existing prior to the work.

END OF SECTION

SECTION 02767

DISPOSAL OF MATERIALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for disposal of materials resulting from the cleaning of sewer pipes.

1.02 SUBMITTALS

- A. In accordance with Specification Section 01300, submit the following
 - 1. Outline of the procedures proposed to accomplish the work.
 - 2. Include a detailed description of disposal methods and locations of disposal.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.01 DISPOSAL PROCEDURES

- A. Material encountered in the cleaning of sewer lines is considered “Special Waste” by the State of Rhode Island, Department of Environmental Management. The materials include sludge, sand, grit, debris, etc.
- B. The Contractor is required to test and dispose of any waste material removed from pipeline, manholes, etc. within the project area in accordance with State and Federal requirements. Testing of waste material will be at the Contractor’s expense.
- C. The materials being removed from the pipelines and manholes during the cleaning process shall be deposited in such a manner as to not endanger the public, plant personnel or persons performing the work. Such debris deposits may be of such nature, high in biological organic contents, or chemically aggressive that they will require proper disposal in a safe, health risk free, environment. The Contractor shall contact the Owner and Engineer and all agencies having jurisdiction thereof, for approval of debris disposal methods and locations of disposal, prior to disposing of any or all debris removed from pipe cleaning methods. All solids or semi-solids resulting from the cleaning operations shall be removed and satisfactorily disposed of off-site at the Contractor’s expense.
- D. Debris must be transported in a watertight vehicle. The Contractor must ensure that no water leaks from the vehicle in any manner during the transportation. The Contractor is solely responsible for any cleanup of debris on route to disposal at a licensed disposal facility. The

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Contractor is also responsible for the payment of any fines that are incurred as a result of any incident which occurs during the transportation and/or disposal of the contents of the vehicle.

- E. Disposal must be at a licensed facility that is regulated to accept and properly dispose of the debris that is normally expected to be in a wastewater collection system.

END OF SECTION

SECTION 02768

TEMPORARY STREET LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to provide temporary street lighting when there is an interruption of service to existing overhead lighting.

1.02 PERFORMANCE REQUIREMENTS

- A. It is essential to public safety that there be no interruption of overhead lighting along Taft Street and Roosevelt Avenue Extension during the progress of the work. An interruption shall be considered, but may not be limited to, any condition that in the sole opinion of the Program Manager/Construction Manager impacts lighting of roadways and sidewalks.
- B. The Contractor shall coordinate and sequence construction to limit the need to provide temporary lighting.
- C. The Contractor shall provide, maintain, and operate temporary lighting units and all other labor and equipment to provide temporary lighting.
- D. The Program Manager/Construction Manager may prohibit the carrying out of any work at any time when in his sole judgment, streets and public ways are not adequately illuminated.

1.03 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:
 - 1. Detailed plans and equipment information and descriptions outlining the provisions for temporary lighting.
 - 2. Include such items as schedules, locations, elevations, materials, and all other incidental items necessary and/or required by the Owner to insure proper illumination of the sidewalks and roadways.
 - 3. Detailed proposal for noise prevention measures for review.
 - 4. Shop drawings for all equipment required to perform the illumination as required herein.

1.04 QUALITY ASSURANCE

- A. Qualifications
 - 1. The design, installation and operation of the temporary lighting system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can

demonstrate to the Program Manager/Construction Manager that he specializes in the design and operation of temporary lighting systems.

2. The vendor shall demonstrate the temporary lighting equipment is automated and is capable of functioning without the assistance of an operator.

B. Pre-Installation Meeting

1. Contractor to schedule and attend a pre-installation meeting with the vendor, Owner and Program Manager/Construction Manager prior to installation of temporary lighting systems.

PART 2 PRODUCTS

2.01 GENERAL

- A. At a minimum, all equipment shall be supplied integral with lighting fixtures, masting arm, controls, generator power supply, trailer, and stabilization mounting equipment.. Equipment and installation are subject to the approval of the Program Manager/Construction Manager.

2.02 LIGHT TOWER UNITS

- A. All light towers units and appurtenances shall be sized properly and placed to provide the proper lighting to match existing illumination levels.
- B. Lighting tower units shall have arm mast extendable up to 23' with top mounted aimable LED flood light type fixtures mounted on a portable road DOT approved trailer with an integral EPA Tier 4 diesel fueled generator and tank. The lighting tower units shall have an illuminated control panel with run time meter and seal switches that consist of a key off/run/start switch and light control switch. The control panel shall monitor the engine generator functions and shutdown the engine upon low coolant temperature or low oil pressure.
- C. The lighting tower units shall have automatic start/stop controls. The lighting units shall run and provide illumination from one hour prior to dusk until one hour after dawn.
- D. The lighting tower units shall have a 65MHP wind rating with fully extended arm mast.
- E. The Contractor shall be responsible to meet noise requirements in specified elsewhere in this section. All diesel driven power supplies shall be sound attenuated.

2.03 NOISE PREVENTION

- A. Noise prevention measures for all equipment shall be used to insure minimum noise impact or surrounding areas.

- B. Measures may include but shall not be limited to enclosures, insulation, and hospital grade silencers or mufflers.
- C. Noise levels shall be maintained such that increase shall not exceed 10 dBA over background at the nearest property line.
- D. Should at any time prior to or during the performance of above mentioned work, the Program Manager/Construction Manager determines the noise prevention measures being used are not adequate, the Contractor shall at no additional cost to the Owner suspend all work until acceptable measures are incorporated.

PART 3 EXECUTION

3.01 PUBLIC SAFETY AND CONVENIENCE

A. General

- 1. The Contractor shall at all times keep the streets, highways, roads, driveways, parking lots, private walks, and public sidewalks open for pedestrian and vehicular traffic unless otherwise authorized by the Program Manager/Construction Manager.

B. Public Travel Ways

- 1. Any authorized temporary closure of any streets, highways or roads shall be coordinated with the local Fire, Police and/or Department of Public Works as required by the municipality.

C. Municipal, Commercial and Private Property

- 1. Any authorized, temporary closure of any municipal, commercial or private driveway or access route will require the Contractor provide 48 hour notice to abutters of the temporary restriction of access to their property. The Contractor will make every attempt to schedule his work with as little inconvenience to the property owner as possible

3.02 INSTALLATION

- A. Keep the Program Manager/Construction Manager advised at all times of any changes made to the overall operation(s) to accommodate field conditions.
- B. Maintain auxiliary and/or equipment at the site to provide lighting in the event of a breakdown and/or loss of power.
- C. The Contractor shall be responsible for the proper functioning and operation of the temporary lighting tower units including all diesel fuel and refueling of tanks.
- D. No work shall begin until all provisions and requirements of this Section have been reviewed and approved by the Program Manager/Construction Manager.

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- E. The Program Manager/Construction Manager reserves the right to limit and/or otherwise restrict the Contractor's overall activities and/or operations at any time without claim should the Program Manager/Construction Manager deem it to be in the Owner's or public's best interest to do so.

END OF SECTION

SECTION 02831

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to furnish and install the chain-link fences, gates, and accessories.

1.02 DESIGN REQUIREMENTS

- A. The fence shall be of the height indicated and shall have a top rail and bottom tension wire.
- B. Fence materials and installation shall meet or exceed the standards of the Chain Link Fence Manufacturers Institute, Columbia, MD., except as otherwise specified in this section; also fence materials shall meet or exceed Fed. Spec. RR-F-191G/GEN for Fencing, Wire and Post Metal (and Gates, Chain-link Fence Fabric, and Accessories), and shall conform to the ASTM Standards noted in this Specification.

1.03 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete.
- B. Section 11152 - Parking Gate
- C. Section 13___ - Control Card Access System.

1.04 REFERENCES

- A. Fed. Spec. RR-F-191/1A, Type V, for Fencing, Wire and Post, Metal (Chain-link Fence Fabric).
- B. American Society for Testing and Materials
 1. A121, Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
 2. A392, Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 3. A491, Specification for Aluminum-Coated Steel Chain Link Fence Fabric.
 4. A824, Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link Fence.
 5. F 626, Specification for Fencing Fittings
 6. F668, Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain Link Fence Fabric.
 7. F669, Standard Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence.
 8. F900, Standard Specification for Industrial and Commercial Swing Gates.

9. F934, Standard Specification for Standard Colors for Polymer Coated Chain Link Fence Materials.
10. F1043, Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework
11. F1083, Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
12. F1183, Specification for Aluminum Alloy Chain Link Fence Fabric.
13. F1184, Specification for Industrial and Commercial Horizontal Slide Gates.
14. F1234, Protective Coatings on Steel Framework for Fences.
15. F1664, Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain Link Fence.
16. F1665, Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Barbed Wire Used with Chain Link Fence.

1.05 SUBMITTALS

A. Shop Drawings, submit in accordance with SECTION 01300.

1. Include detailed information, specifications, sizes and dimensions for all materials, accessories, colors and finishes.

B. Samples

1. Submit samples of the fencing materials to be used, in accordance with the requirements of SECTION 01300.
2. Each sample shall be identified by mark or tag.
3. Samples to include:
 - a. 2-inch length of each type of post.
 - b. 2-inch length of each type of brace and railing.
 - c. 2-inch length of framework for gates.
 - d. 2-inch length of diagonal truss brace.
 - e. 2-inch length of tension wire.
 - f. Each type of fitting used at terminal posts.
 - g. Fittings used at line posts.
 - h. Fittings for the gate leaf frame.
 - i. Gate hinge.
 - j. Gate latch.
 - k. Stretcher bar, 2-inch length.
 - l. Bolt and nut fastener.
 - m. Fence fabric, 2 weaves, 2 meshes long.
 - n. Tie.
 - o. Padlock with key and steel chain, 6-inch length.
4. Accompanying the samples, the Contractor shall submit a written statement that samples submitted comply with the requirements of these Contract Documents.
5. Samples shall be submitted for review at least 30 days prior to fence installation.

C. Quality Control Submittals

1. Manufacturer's recommended installation instructions.
2. Evidence of Supplier and installer qualifications.

PART 2 PRODUCTS

2.01 GENERAL

- A. Match style, finish, and color of each fence component with that of other fence components.
- B. All fittings, post, fence and gate framework, and all accessories shall be galvanized steel, then coated with PVC.

2.02 CHAIN LINK FABRIC

- A. Fabric shall be woven in 2-inch mesh from 6 gage wire, (heavy industrial). Diamond count shall be manufacturer's standard.
- B. Zinc-Coated Steel in accordance with ASTM A392, Class 2 (weight of zinc coating not less than 2.0 oz/sf); galvanized after weaving.
- C. Polyvinylchloride coated (PVC) chain-link fabric in accordance with ASTM F668,
 - Class 2A PVC coating extruded and adhered to wire that is zinc coated.
- D. Aluminum coated fabric conforming to ASTM A491.
- E. Aluminum Alloy fabric conforming to ASTM F1183.
- F. Fabric Height: 84 inches unless otherwise shown.
- G. Selvages: Fabric with 2 inch or 2 1/8 inch mesh, in heights less than 72-inches high, both selvages to be knuckled. For fences with fabric 72-inches high and greater, one selvaige to be knuckled and one selvaige to be twisted.
- H. Color of the PVC coating: Color shall be determined at the time of Shop Drawing review and shall be either A: Green, B: Brown, C: Black, and shall match the color of the total fence system.

2.03 FENCE POSTS, RAILS AND BRACES

- A. General
 - 1. In accordance with ASTM F669, Heavy Industrial Fence.
 - 2. Protective Coatings: Zinc Coating; ASTM F1234, Type A external and internal coating.
 - 3. Color coating: ASTM F934, minimum 10 mils thickness of PVC over zinc coating to match color of chain link fabric.]
- B. Line Posts
 - 1. 2.375 inch outside diameter steel pipe weighing not less than 3.65 lb. per ft.,
- C. End, Corner, and Pull Posts
 - 1. 2.875 inch outside diameter steel pipe weighing not less than 5.79 lb. per ft.,

D. Top and bottom railings and railings for top, middle and bottom braces between terminal posts and adjacent line posts.

1. 1 5/8 inch outside diameter steel pipe weighing not less than 2.26 lb. per ft.,

2.04 TENSION WIRE

A. No. 7-gage, marcelled, coated steel wire conforming to ASTM A824 Type II Zinc coated Class 2, 1.20 oz/sf.

2.05 TIE WIRES

A. 9 gage (outside diameter) galvanized steel wire for fastening fence fabric to line posts and rails.

2.06 STRETCHER BARS

A. Flat bars with minimum cross section dimensions of not less than 3/16 inch by 3/4 inch.

B. Not less than 2 inches shorter than height of the fabric with which they are to be used.

2.07 BANDS OR CLIPS

A. Bar bends of not less than 11-gage sheet steel, 3/4 inches wide for posts 4 inch OD or less and 7/8 inches wide for posts greater than 4 inch OD, in accordance with ASTM F626, and bolted with 5/16 inch diameter galvanized carriage bolts and nuts.

2.08 DIAGONAL TRUSS

A. Use between terminal and adjacent line posts and for gate framework.

1. 3/8 inch diameter steel rod.

2.09 FITTINGS

A. Malleable iron or pressed steel of suitable size to produce strong construction.

B. Post Caps

1. Accommodate passage of top rail.

2.10 SWING GATES

A. General

1. In accordance with ASTM F900.
2. Gate capable of being opened and closed easily by one person.
3. Paint welded steel joints with zinc-based paint.
4. Attach chain link fabric securely to gate frame at intervals not exceeding 15 inches.

B. Gate posts for gate leaves up to and including 6 ft. wide.

1. 2.875 inch outside diameter steel pipe weighing not less than 4.64 lb. per ft.,
 2. or 3.50 inch by 3.50 inch roll-formed, steel corner section weighing not less than 5.00 lb. per ft.
- C. Gate posts for gate leaves over 6 ft. up to and including 12 ft. wide.
1. 4.00 inch outside diameter steel pipe weighing not less than 8.65 lb. per ft.,
- D. Gate Posts for gate leaves over 13 ft. wide and up to and including 18 ft. 6.625 in. outside diameter steel pipe weighing not less than 18.02 lb. per ft.
- E. Gate Leaf framework
1. 1 7/8 inch outside diameter steel pipe weighing not less than 2.72 lb. per ft.
- F. Hinges
1. Heavy pattern of adequate strength for the gate size.
 2. Large bearing surfaces for clamping or bolting in position.
- G. Gate Stops
1. Mushroom type or flush plate with anchors, suitable for setting in concrete.
- H. Locking Mechanism
1. Provide with a suitable latch accessible from both sides and with provision for padlocking.
 2. Double leaf swing gates shall have a center bolt, center stop, and automatic backstops to hold leaves in open position.
 3. Padlocks
 - a. Solid brass cases.
 - b. Hardened steel shackles.
 - c. Removable core cylinders.
 - d. Galvanized steel chains attached to the shackle by a clevis.
 - e. Padlocks shall be manufactured by Eaton Corp Lock & Hardware Div., Yale Marketing Dept., Charlotte, N.C.; & P&F. Corbin, Div. of Emhart Corp., Berlin, Conn.; Best Universal Lock Co., Inc., Indianapolis, Ind.; or be an acceptable equivalent product.
 - f. Padlocks shall be furnished with four keys each.

2.11 FOUNDATIONS

- A. Concrete for post foundation bases shall be in accordance with SECTION 03300.
- B. Grout for posts set in solid rock shall consist of one part Portland cement and three parts of clean, sharp, well-graded sand with just enough water for proper workability.

PART 3 EXECUTION

3.01 GENERAL

- A. The fence and gates shall be erected by skilled mechanics.

- B. Change in direction of the fence line of 30 degrees or more shall be considered corners. Pull posts shall be used at any abrupt change in grade.
- C. Maximum area of unbraced fence shall not exceed 1,500 square feet.
- D. Terminal posts shall be braced to adjacent posts with horizontal brace rails and diagonal truss rods brought to proper tension so that posts are plumb.
- E. There shall be no loose connections or sloppy fits in the fence framework. The fence framework shall withstand all wind and other forces due to the weather.

3.02 POST SETTING

- A. Post spacing shall uniform with maximum spacing of 10 ft. in fences erected along straight lines. All posts shall be placed plumb and centered in the concrete foundations.
- B. Post foundations in earth shall be concrete cylinders with a minimum diameter of 12 inches, crowned at grade to shed water, and shall not be less than 36 inches deep in the ground. Posts shall be set in the full depth of the foundations except for 3 inch of concrete under the posts.
- C. Coat portion of galvanized or aluminum-coated steel post that will be embedded in concrete with Bitumastic Super Service Black, manufactured by the Koppers Co.; 450 Heavy Themecol, manufactured by Tnemec Co., North Kansas City, MO; or an acceptable equivalent product. Extend coating to 1-inch above top of finished concrete.
- D. If foundation holes are excavated in peat or other unstable soil, the Engineer shall be notified for determination of suitable construction precautions.
- E. If solid ledge is encountered without overburden of soil, posts shall be set into the rock a minimum depth of 12 inch for line posts and 18 inch for terminal posts. Post holes shall be at least 1 inch greater in diameter than the post and the grout shall be thoroughly worked into the hole so as not to leave voids, and shall be crowned at the top to shed water. Where solid rock is covered by an overburden, the total setting depth shall not exceed the depths required for setting in earth, and the posts shall be grouted into the rock as described.

3.03 FENCE FABRIC

- A. Fabric shall be stretched taut and tied to posts, rails, and tension wires with the bottom edge following the finished grade not more than 2 inch above the grade. The fabric shall be installed on the security side of the fence and shall be anchored to the framework so that the fabric remains in tension after pulling force is released. The fabric shall be attached to line posts with tie wires spaced at not more than 15 inch intervals and to rails and braces at not more than 24 inch intervals. The fabric shall be attached to the tension wire with hog ring ties on 24 inch centers.

3.04 GATES

- A. Gates shall be installed plumb, level, and secure for the full width of the opening and the hardware adjusted for smooth operation.

3.05 ELECTRICAL GROUNDING

- A. Ground fences in accordance with applicable requirements of National Electric Safety Code.

END OF SECTION

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SECTION 02930

LOAMING AND SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for loaming, fertilizing, seeding, and related work in areas disturbed in the process of performing the Work under this contract.

1.02 SUBMITTALS

- A. In accordance with SECTION 01300 submit the following:
 - 1. Submit with seed, certificates confirming seed mixture, purity, germinating value, and crop year identification.
 - 2. Submit test samples of loam.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Fertilizer:
 - 1. Delivered mixed as specified in standard size, unopened containers showing weight, analysis, and name of manufacturer.
 - 2. Store in weather proof place.
- B. Seed:
 - 1. Delivered in original unopened containers with mixture listed.

PART 2 PRODUCTS

2.01 LOAM

- A. Fertile, natural topsoil, typical of locality, without admixture of subsoil, refuse or other foreign materials, and obtained from well-drained arable site. Mixture of sand, silt and clay particles in approximately equal proportions. Free of stumps, roots, heavy or stiff clay, stones large than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other deleterious matter.
- B. Not less than 4 percent nor more than 20 percent organic matter as determined by loss on ignition of oven-dried samples.
- C. Loam test samples dried to constant weight at temperature of 230 degrees. F., plus or minus nine degrees.

- D. Use loam, having prior vegetative growth that did not contain toxic amounts of either acid or alkaline elements.

2.02 LIME, FERTILIZER AND SEED

- A. Ground agricultural limestone containing not less than 85 percent of total carbonates.
- B. Complete fertilizer, at least 50 percent of nitrogen derived from natural organic sources of ureaform and containing following percentages by weight:

Nitrogen 10% Phosphorus 10% Potash 10%

- C. Turf grass seed, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum Proportion by Weight	Percent Purity	Percent Germination
Kentucky bluegrass	20%	87%	85%
Merion Kentucky bluegrass	20%	87%	85%
Red Chewings fescue	45%	98%	85%
Italian rye	15%	98%	90%

PART 3 EXECUTION

3.01 GENERAL

- A. Supply suitable quantities of water, hose and appurtenances.

3.02 LOAM

- A. Spread loam on areas to 6-inch depth after compaction, fine grade and compact.

3.03 LIME, FERTILIZER AND SEEDING

- A. Apply lime by mechanical means at rate of 3000 pounds per acre.
- B. Apply fertilizer at rate of 1200 pounds per acre.

- C. Remove weeds or replace loam and reestablish finish grades, if any delays in seeding lawn areas and weeds grow on surface or loam is washed out prior to sowing seed and without additional compensation. Sow seed at rate of 175 pounds per acre on calm day, by mechanical means. "Hydro-Seeding" not permitted unless otherwise permitted or required by Engineer. Sow one-half of seed in one direction, and other half at right angles to original direction. Rake seed lightly into loam, to depth of not more than 1/4 inch and compact by means of an acceptable lawn roller weighing 100 to 150 pounds per linear foot of width.
- D. Water lawn areas adequately at time of sowing and daily thereafter with fine spray, and continue throughout maintenance and protection period.
- E. Seed during approximate time periods of April 1 to May 15 and August 15 to October 1, and only when weather and soil conditions are suitable for such work, unless otherwise permitted.

3.04 MAINTENANCE OF SEEDED AREAS

- A. Maintain lawn areas and other seed areas at maximum height of 2-1/2 inches by mowing at least three times. Weed thoroughly once and maintained until time of final acceptance. Reseed and refertilize with original mixtures, watering or whatever is necessary to establish over entire area of lawn and other seeded areas a close stand of grasses specified, and reasonably free of weeds and undesirable coarse native grasses.
- B. Begin maintenance immediately after each portion of lawn is seeded and continue for minimum of 45 days.
- C. Repair or replace all seeded areas which, in judgment of Engineer, have not survived and grown in satisfactory manner, for a period of one year after acceptance.
- D. Seeding replacement, same seed mixture as specified and furnished and installed as specified.

3.05 TEMPORARY COVER CROP

- A. Sow a temporary cover crop of buckwheat, domestic rye grass or other acceptable seed if there is insufficient time in the planting season to complete seeding, fertilizing, and permanent seeding at the option of Contractor or order of Engineer. Cut and water cover crop as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into soil, the areas shall be fertilized and permanent seed crop sown as specified.

END OF SECTION

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DIVISION 03

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for forms to be used for all concrete masonry including footings, except as otherwise permitted.

B. Related Sections

1. Section 03200 - Concrete Reinforcement.
2. Section 03300 - Cast-In-Place Concrete.

1.02 REFERENCES

A. American Concrete Institute (ACI)

1. ACI 318, Building Code Requirements for Structural Concrete.
2. ACI 347R, Guide to Formwork for Concrete.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300.

B. Shop Drawings:

1. Layout of panel joints, tie hole pattern, and form liners.
2. Form Ties - Tapered Through-Bolts: Proposed method of sealing form tie hole; coordinate with details shown.

C. Samples: One each as follows:

1. Form liners.
2. Form ties.

D. Quality Control Submittals:

1. Statements of qualifications for formwork designer.
2. Manufacturer's Certificate of Proper Installation. (After installation)

1.04 QUALITY ASSURANCE

- A. Qualifications: Formwork, falsework, and shoring designs prepared by an engineer licensed in the State of Rhode Island.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Surfaces to be given burlap-rubbed finish.

1. Form surface in contact with the concrete shall be made of heavy gage metal, new plywood (used plywood which, in the opinion of the Engineer, is substantially equal to new plywood may be used), tempered wood fiberboards with smooth surface, or similar materials.
2. Metal forms or form linings shall have square edges so that the concrete will not have fins or fluting. Joints between form panels shall be well fitted so as to be tight and result in substantially flush concrete surfaces on opposite sides of the joints.
3. Forms shall not be pieced out by use of materials different from those in the adjacent form or in such manner as will detract from the uniformity of the finished surface.

B. Surfaces other than those to be given burlap-rubbed finish.

1. Forms shall be made of wood, metal, or other acceptable material. Wooden forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots. Plywood shall be reasonable good, as accepted. Metal forms shall be of an acceptable type for the work involved. Edges of forms in contact with concrete shall be flush within 1/16 in.

C. Forms shall be of suitable material, design, and construction as to be rigid, tight enough to prevent the passage of mortar, and plane surfaces shall be plane within 1/16 in. in 4 ft. Particular care shall be taken to ensure that forms are true to line where deviations in the concrete would be obvious or objectionable, as where building superstructures are to be built thereon, or where the tops of walls are exposed. All such deviations which may occur shall be corrected by, and at the expense of the contractor, as directed, even to the extent of tearing down and rebuilding the concrete.

D. Forms for walls, columns, or piers shall have removable panels at the bottom for cleaning, inspection, and scrubbing-in of bonding grout. Forms for thin sections (such as walls or columns) of considerable height shall be arranged with suitable openings so that the concrete can be placed in a manner that will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the fresh concrete, unless special spouts are used to place concrete, and so that construction joints can be properly keyed and treated.

E. Forms shall be sufficiently rigid to prevent displacement or sagging between supports, and so constructed that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.

F. Wall Forms and Underside of Slabs and Beams:

1. Materials: Plywood, hard plastic finished plywood, overlaid waterproof particle board, or steel in "new and undamaged" condition, of sufficient strength and surface smoothness to produce specified finish. Use in combination with form liners where required.

G. All Other Forms: Materials as specified for wall forms.

H. Form Sealer:

1. Material: Surface sealer will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces, when applied to most forms of form liners. A ready-to-use water based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations and can be used in clean water treatment plants.
2. Manufacturer and Product: Master Builders, Inc.; Rheofinish; or Equal.

I. Rustication Grooves and Beveled Edge Corner Strips: Nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces. Match the rustication grooves with the existing configuration and style located at the plant.

2.02 FORM TIES

A. Form ties to be encased in concrete shall not be made of through-bolts or commonwire, but shall be of a well-established type, so made and installed as to embody the following features:

1. After removal of the protruding part of the tie, there shall be no metal nearer than 1 in. to the face of the concrete.
2. The part of the tie which is to be removed shall be at least 1/2 in. in diameter, or if smaller, it shall be provided with a wood or metal cone 1 in. long placed against the inside of the forms. cones shall be carefully removed from the concrete after the forms have been stripped.
3. Ties which pass through walls subject to hydrostatic pressure shall be provided with acceptable water stops, such as washers, securely fastened to the ties.

B. Form Ties:

1. Material: Steel.
2. Spreader Inserts.
 - a. Conical or spherical type.
 - b. Design to maintain positive contact with forming material.
 - c. Furnish units that will leave no metal closer than 1 inch to concrete surface when forms, inserts, and tie ends are removed.
3. Wire ties not permitted.
4. Flat bar ties for panel forms, furnish plastic or rubber inserts with minimum 1 inch depth and sufficient dimensions to permit patching of tie hole.
5. Water Stop Ties: For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one of the following:
 - a. Integral steel water stop 0.103-inch thick and 0.625 inch in diameter tightly and continuously welded to tie.
 - b. Neoprene water stop 3/16-inch thick and 15/16 inch in diameter whose center hole is 1/2 diameter of tie, or a molded plastic water stop of comparable size.
 - c. Water Stop: Oriented perpendicular to tie and symmetrical about center of tie.
 - d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.
6. Through-Bolts: Tapered minimum 1-inch diameter at smallest end.

7. Elastic Vinyl Plug: Design and size of plug to allow insertion with tool to enable plug to elongate and return to original length, and diameter upon removal forming a watertight seal.
 - a. Manufacturer and Product: Dayton Superior Co., Miamisburg, OH; Dayton Sure Plug, or equal.

PART 3 EXECUTION

3.01 SYSTEM DESIGN REQUIREMENTS

- A. Design formwork in accordance with ACI 347R and ACI 318 to provide the concrete finishes specified in Section 03300, CAST-IN-PLACE CONCRETE.
- B. Make joints in forms watertight.
- C. Limit panel deflection to 1/360 of each component span to achieve tolerances specified.

3.02 ERECTION

- A. General: Unless specified otherwise, follow the applicable recommendations of ACI347R.
- B. Forms shall be so constructed and placed that the resulting concrete will be of the shape, lines, dimensions, and to the elevations indicated on the drawings or specified, and exposed concrete will be substantially free from board or grain marks, poorly matched joints, and other irregularities or defects.
- C. Beveled Edges (Chamfer):
 1. Form 3/4-inch bevels at concrete edges, unless otherwise shown.
 2. Where beveled edges on existing adjacent structures are other than 3/4-inch, obtain ENGINEER's approval of size prior to placement of beveled edge.
- D. Wall Forms:
 1. Do not reuse forms with damaged surfaces.
 2. Locate form ties and joints in an uninterrupted pattern for smooth and uniform surface.
 3. Inspect form surfaces prior to installation to assure conformance with specified tolerances.
- E. Forms for Curbs, Sidewalks, and Driveways:
 1. Provide standard steel or wood forms to prevent movement.
 2. Set forms to true lines and grades, and securely stake in position.
- F. Form Tolerances: Provide forms in accordance with ACI 347R and ACI 318 and the following tolerances for finishes specified:
 1. Wall Tolerances:
 - a. Straight Vertical or Horizontal Wall Surface: Flat planes within tolerance specified.
 - b. Plumb within 1/4-inch to 10-feet.
 - c. Depressions in Wall Surface: Maximum 5/16-inch when 10-foot

straightedge is placed on high points in all directions.

- d. Thicknesses: Maximum 1/4-inch minus or 1/2-inch plus from dimensions shown.
2. Slab Tolerances:
 - a. Exposed Slab Surfaces: Comprise of flat planes as required within tolerances specified.
 - b. Slab Finish Tolerances and Slope Tolerances: Crowns on floor surface not too high as to prevent 10-foot straight edge from resting on end blocks, nor low spots that allow a block of twice the tolerance in thickness to pass under the supported 10-foot straightedge.
 - c. Steel gauge block 5/16-inch thick.
 - d. Slab drainage.
 - 1) Finish Slab Elevation: Slope slabs to floor drain and gutter, and shall adequately drain regardless of tolerances.
 - 2) Thickness: Maximum 1/4-inch minus or 1/2-inch plus from thickness shown, except where thickness tolerance will not affect slope, drainage, or slab elevation.

3.03 FORM SURFACE PREPARATION

- A. Thoroughly clean form surfaces in contact with concrete or previous concrete, dirt,
- B. Exposed Wood Forms in Contact with Concrete: Apply form sealer as recommended by the sealer material manufacturer.
- C. Steel Forms: Apply form sealer to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.

3.04 FORM COATINGS

- A. All forms shall be oiled with an acceptable nonstaining oil or liquid form coating before reinforcement is placed.
- B. Before form material is reused, all surfaces that are in contact with the concrete shall be thoroughly cleaned, all damaged pieces repaired, and all projecting nails withdrawn.

3.05 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer. forms shall not be removed until the concrete has aged for the following number of day-degrees*:
 1. Formwork not supporting weight of concrete, (i.e., sides of beams, walls, columns, and similar parts of the Work) may be removed after cumulatively curing at not less than a total of three 50-degree F days after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing protection operations are maintained.
 2. Leave forms and shoring for elevated structural slabs or beams in place, in accordance with ACI 318, Chapter 6, and until concrete has reached compressive strength equal to 80 percent of the specified 28-day compressive

strength as determined by test cylinders.

3. *Day-degree: total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily average temperature of 60 deg. F. equals 300 day-degrees.

3.06 MANUFACTURER'S SERVICES

- A. Provide form manufacturer's representative at site for installation assistance, and inspection.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for reinforcing steel bars, wire fabric and accessories as shown on the drawings, specified herein, and as needed for a complete and proper installation.

B. Related Sections

1. Section 03100 - Concrete Formwork.
2. Section 03300 - Cast-In-Place Concrete.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. A82, Specification for Steel Wire, Plain for Concrete Reinforcement.
2. A185, Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
3. A497, Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
4. A615, Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
5. A706, Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
6. A775, Specification for Epoxy-Coated Reinforcing Steel Bars.

B. American Concrete Institute (ACI).

1. ACI 318, Building Code Requirements for Structural Concrete.

1.03 SUBMITTALS

- A. In accordance with Section 01300 submit cutting and bending drawings and schedules for all reinforcement to be furnished.

B. Shop Drawings:

1. Prepare in accordance with Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice and ACI SP-66 Detailing Manual:
 - a. Bending lists.
 - b. Placing drawings.
2. Welded splice, Cadweld splice, and mechanical threaded splice.

C. Quality Control Submittals:

1. Lab test reports for reinforcing steel showing stress-strain curves and ultimate strengths.
2. Mechanical Threaded Connections:

- a. Current International Conference of Building Officials (ICBO) Research Report or equivalent code agency report listing findings to include acceptance, special inspection requirements, and restrictions.
 - b. Manufacturer's instructions.
 - c. Verification that device threads have been checked and meet all requirements for thread quality, in accordance with manufacturer's published methods.
3. Epoxy-Coated Reinforcing Bars: Written certification in accordance with paragraph 4.2.1 of ASTM A775.
 4. Welding Qualification: Prior to welding, submit welder qualifications and radiographic nondestructive testing procedures.

1.04 QUALITY ASSURANCE

- A. The steel shall be newly rolled stock substantially free from mill scale, rust, dirt, oil, grease, or other foreign matter. Bars shall be of billet steel and, unless otherwise indicated, shall be Grade 60 bars.
- B. Billet steel bars shall conform to ASTM A 615.
- C. All bars shall be rolled by an acceptable mill. The Contractor shall submit at his own expense certified copies of tests of the bars furnished. The tests shall be as specified in the appropriate ASTM Specification referred to above and shall be made by an acceptable laboratory.
- D. Welder Qualifications: Certified in accordance with AWS D1.4-79.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Unload, store, and handle bars in accordance with CRSI publication "Placing Reinforcing Bars."
- B. Coated Bars:
 1. Protect epoxy-coated bars contact areas from handling equipment.
 2. Lift bundles of coated bars at multiple pickup points to minimize bar-to-bar abrasion from sags in bundles.
 3. Do not drop or drag coated bars or bundles of coated bars.
 4. Store coated bars on protective cribbing.
 5. Color fading of coating is not cause for rejection of epoxy-coated reinforcing bars.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Deformed Billet-Steel Reinforcing Bars:
 1. Includes stirrups, ties, and spirals.
 2. ASTM A615, Grade 60, including Supplemental Requirements S1 where welding is not required.
 3. ASTM A706, Grade 60, including Supplemental Requirements for reinforcing to be welded.

- B. Splices and Mechanical Connections:
1. Metal Sleeve: Furnish with cast filler metal, capable of developing, in tension or compression, 125 percent of minimum tensile strength of the bar.
 2. Mechanical Threaded Connections: Furnish metal coupling sleeve for splicing reinforcing in secondary members or in areas of low stress with internal threads engaging threaded ends of bars developing in tension or compression 125 percent of yield strength of bar.
 - a. Manufacturers and Products:
 - 1) Erico Products, Inc., Cleveland, OH; Lenton Reinforcing Steel Couplers.
 - 2) Richmond Screw Anchor Co., Inc. Fort Worth, TX; Richmond DB-SAE Dowel Bar Splicers.
 - 3) Or equal.
- C. Epoxy-Coated Reinforcing Bars: ASTM A775, deformed bars, with bond strength not less than 80 percent of uncoated bars.
- D. Welded Wire Fabric:
1. ASTM A185, or A497, and ACI 318/318R, using ASTM A82, wire of 75 ksi minimum tensile strength.
 2. Furnish flat sheets only, rolled sheets not permitted.
- E. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than two times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness except for bars larger than 1 in., in which case the bends shall be made around a pin of eight bar diameters. All bars shall be bent cold.
- F. Bars shall be shipped to the work with bars of the same size and shape fastened in bundles with securely wired-on metal identification tags giving size and mark.
- G. Deformations on bars for concrete reinforcement shall conform to the requirements of the above-mentioned ASTM Specifications.

2.02 ACCESSORY MATERIALS

- A. Tie Wire:
1. Black, soft-annealed 16-gauge wire.
 2. Nylon-, epoxy-, or plastic-coated wire.
- B. Bar Supports and Spacers:
1. Precast concrete bar supports, cementitious fiber-reinforced bar supports, or all- plastic bar supports and side form spacers meeting the requirements of CRSI Manual of Standard Practice. Do not use other types of supports or spacers.
 2. In Beams, Columns, Walls, and Slabs Exposed to View After Stripping: Small rectangular concrete blocks made up of same color and strength as concrete being placed around them or all-plastic bar supports and side form spacers.
 3. Use supports made of dielectric material for epoxy-coated reinforcing bars supported from formwork.
 4. If epoxy-coated reinforcing is used, furnish epoxy-coated reinforcing bars for spreader bars.

- 5. Precast concrete supports of same strength as concrete for reinforcing in concrete place don grade.
- C. Welded steel wire fabric shall conform to the ASTM A 185. The gage and spacing of wires shall be as indicated on the drawings.
- D. Soffit Clips: Made galvanized steel wire not lighter than No. 12 Stl. W.C. They shall be shared so that the greater portion of the wire is held about 1 in. from the flange of the steel beam, and shall be spaced not less than 9 in. on centers, the spacing being maintained by suitable longitudinal wires.

2.03 FABRICATION

- A. Follow CRSI Manual of Standard Practice.
- B. Bend all bars cold.

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify ENGINEER when reinforcing is ready for inspection and allow sufficient time for inspection prior to placing concrete.
- B. Repair epoxy coating damaged due to handling, shipment, and placing. Repair with patching material in accordance with ASTM A775, and manufacturer's recommendations.
- C. Clean metal reinforcement of loose mill scale, oil, earth, and other contaminants.
- D. Coat wire projecting from precast concrete bar supports with dielectric material, epoxy, or plastic.
- E. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings, including ice, that tend to interfere with development of proper bond. Where there is delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.
- F. Reinforcement which is to be exposed for a considerable length of time after having been placed shall be painted with a heavy coat of cement grout, if required.

3.02 Reinforcing Bar Installation

- A. Bundle or space bars, instead of bending where construction access through reinforcing is necessary.
- B. Spacing and Positioning: Conform to ACI 318/318R.
- C. Location Tolerances: In accordance with CRSI publication, "Placing Reinforcing Bars".
- D. Splicing:

1. Follow ACI 318/318R.
 2. Use lap splices unless otherwise shown or permitted in writing by ENGINEER.
 3. Welded Splices: Accomplish by full penetration groove welds and develop at least 125 percent of yield strength of bar.
 4. Stagger splices in adjacent bars.
 5. Metal sleeves may be used.
- E. Mechanical Splices and Connections:
1. Use only in areas specifically approved in writing by the ENGINEER.
 2. Install as required by manufacturer with threads tightened and in accordance with ICBO Research Report.
 3. Maintain minimum edge distance and concrete cover.
- F. Tying Deformed Reinforcing Bars:
1. Tie every other intersection on mats made up of Nos. 3, 4, 5, and 6 bars to hold them firmly at required spacing.
 2. Bend all noncoated tie wire to prevent tie wire from being closer than 1 inch from the surface of concrete.
 3. Epoxy-Coated Bars:
 - a. Use epoxy-coated or nonmetallic clips.
 - b. Repair coating damage at clipped or welded intersection.
- G. Reinforcement Around Openings: Place an equivalent area of steel bars or fabric around pipe or opening and extend as shown, on each side sufficiently to develop bond with each bar. See drawing details.
- H. Welding Reinforcement:
1. Only A706/A706M bars may be welded.
 2. Do not perform welding until welder qualifications are approved.
 3. Provide suitable ventilation when welding epoxy-coated reinforcing bars.
 4. After completion of welding on epoxy-coated reinforcing bars, repair coating damage, welds, and steel splice members with same material as used for repair of coating damage.
- I. Straightening and Rebending: Field bending of reinforcing steel bars is not permitted.
- J. Unless permitted by Engineer, do not cut reinforcing bars in the field. When epoxy-coated reinforcing bars are cut in the field, coat ends of bars with same material used for repair of coating damage.
- K. Reinforcement shall be accurately positioned as indicated on the drawings, and secured against displacement by using annealed iron wire ties or suitable clips at intersections. Concrete blocks having a minimum bearing area of 2 in. by 2 in., and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Where the underside of slabs will be exposed to view in the finished work, stainless-steel supports shall be used
- L. Furnish and place all concrete reinforcement as indicated on the drawings and as herein specified. Concrete reinforcement in sizes No. 3 (3/8 in.) and larger shall be deformed steel bars of the shapes and sizes indicated on the drawings.

3.03 WELDED WIRE FABRIC INSTALLATION

- A. Extend fabric to within 2 inches of edges of slab, and lap splices at least 1-1/2 courses of fabric or minimum 8 inches.
- B. Tie laps and splices securely at ends and at least every 24 inches with tie wire.
- C. Place welded wire fabric on concrete blocks at correct distance as shown, above bottom of slab and rigidly support equal to that provide for reinforced bars. Do not use broken concrete, brick, or stone.
- D. Follow ACI 318/318R and current Manual of Standard Practice, Welded Wire Fabric.
- E. Do not use fabric that has been rolled. Install flat sheets only.

3.04 TESTS AND INSPECTION

- A. Test 10 percent of all welds using radiographic, nondestructive testing procedures referenced in AWS D1.4-79.
- B. Inspect each splice and verify each component is in accordance with manufacturer's instructions and ICBO Research Report.

END OF SECTION

SECTION 03250

EXPANSION, CONSTRUCTION, AND CONTROL JOINTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for making joints in concrete and masonry.

B. Related Sections

1. Section 03200 - Concrete Reinforcing
2. Section 03300 - Cast-In-Place Concrete
3. Section 03600 – Epoxy Grout
4. Section 07900 - Joint Sealants

1.02 REFERENCES

A. Army Corp. of Engineers.

1. CRD-C-572, Specification for Polyvinyl chloride Waterstop.

B. American Society for Testing and Materials (ASTM)

1. A36, Specification for Carbon Structural Steel.
2. D226, Specification for Asphalt-Saturated Organic Felt used in Roofing and Waterproofing.
3. D227, Specification for Smooth-Surfaced Asphalt Roll Roofing and Waterproofing.
4. D994, Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
5. D1506, Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
6. D1751, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

C. National Sanitation Foundation (NSF).

1. 61-90,

1.03 SUBMITTALS

A. Shop Drawings:

1. Plastic Type Water Stops: Details of splices to be used and method of securing water stop in the forms and supporting water stop so as to maintain proper orientation and location during concrete placement.
2. Construction Joints: Layout and location indicating type to be used.
3. Joint fillers for horizontal and sloped joints.
4. Preformed control joints.
5. Water stop.

- B. Samples: Splice, joint, and fabricated cross of each size, shape, and fitting of water stop(s) proposed for use.

C. Quality Control Submittals:

1. Water stop manufacturer's written instructions for product shipment, storage, handling, installation field splices, and repair.
2. Joint filler and primer. Manufacturer's written instructions for product shipment, storage, handling, application and repair.
3. Preformed Control Joint: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Acceptance of pourable joint filler for potable water structures by federal EPA or by a state health agency.

1. Pourable Joint Filler: Certified as meeting NSF 61-90.

1.05 DELIVERY, STORAGE AND HANDLING

A. Acceptance at Site: Verify that water stops delivered are in accordance with cross-section dimensions as shown and manufacturer's product data prior to unloading and storing on site.

PART 2 PRODUCTS

2.01 PLASTIC WATER STOP

A. Extruded from an elastomeric plastic compound of which the basic resin shall be polyvinyl chloride (PVC). Reclaimed PVC in the compound is not acceptable.

B. Specific Gravity: Approximately 1.37.

C. Shore Durometer Type A Hardness: Approximately 80.

D. Performance Requirements: Corps of Engineers' Specification CRD-C-572.

E. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.

F. Corrugated or tapered type water stops are not acceptable.

G. Thickness: Constant from bulb edge to the outside stop edge.

H. Minimum Weight per Foot of Water Stop:

1. 0.90 pound for 3/16 inch by 4 inch.
2. 1.62 pounds for 3/8 inch by 6 inch.
3. 2.30 pounds for 3/8 inch by 9 inch.

I. Manufacturers and Catalog Numbers:

1. Vulcan Metal Products, Inc., Construction Materials Division, Birmingham, AL; Catalog No. 3/81-15M: Type 8067 (4 inch by 3/16 inch), Type 8069 (6 inch by 3/8 inch), and Type 8070 (9 inch by 3/8 inch).

2. Vinylex Corp., Knoxville, TN; Catalog No. 03250/VIN (1987): No. RB6-38H (6 inch by 3/8 inch) and No. RB9-38H (9 inch by 3/8 inch).
 3. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03250/GRD (1987): Style 732 (6 inch by 3/8 inch) and Style 735 (9 inch by 3/8 inch).
 4. A.C. Horn, Inc., Beltsville, MD; Catalog No. CSP-162 (1987): Type 3 (4 inch by 3/16 inch), Type 9 (6 inch by 3/8 inch), and Type 10 (3/8 inch by 9 inch).
- 2.02 WIRE LOOPED PLASTIC WATER STOP
- A. Furnish as an alternative to plastic water stops.
 - B. Same material and geometry as plastic water stops.
 - C. Furnish with continuous galvanized wire looping at edge for convenience in positioning and securing stop in place in the forms.
 - D. Manufacturers and Catalog Numbers:
 1. Paul Murphy Plastics, Roseville, MI; "Wire Stop Water Stop"; geometry numbers ACR 6380, ACR 9380, as shown on Paul Murphy Plastics Co. Drawing No. CCP-120-12M dated 12-89.
 2. Or equal.
- 2.03 BOND BREAKER
- A. Tape for Expansion Joints: Adhesive-backed glazed butyl or polyethylene tape, same width as the joint, that will not adhere to the premolded joint material.
 - B. Use either bond breaker tape or a bond prevention material as specified in SECTION 03300, except where a tape is specifically called for.
- 2.04 PREMOLDED JOINT FILLER
- A. Bituminous Type: ASTM D994 or D1751.
 - B. Sponge Rubber: Neoprene, closed-cell, expanded; ASTM D1056-85, Type 2C5, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.
 1. Manufacturer and Product:
 - a. Rubatex Corp.; R451N
 - b. Or equal.
- 2.05 PREFORMED CONTROL JOINT
- A. One-Piece, Flexible, Polyvinyl Chloride Joint Former:
 1. Manufacturer and Product:
 - a. Vinylex Corp., Knoxville, TN; Kold-Seal Zip-Per Strip KSF-150-50-50.
 - b. Or equal.
 - B. One-Piece Steel Strip with Preformed Groove:
 1. Manufacturer and Product:
 - a. Burke Concrete Accessories, Inc., San Mateo, CA; Keyed Kold Retained Kap.

b. Or equal.

C. Furnish in full-length, unspliced pieces.

2.06 POURABLE JOINT FILLERS

A. Filler for Nonpotable Water Structure:

1. Specific Gravity: Greater than 1.0 for cured, in-place filler.
2. Sloped Joints: Furnish Gun Grade material that will remain as placed in joints and will not run down slope.
3. Manufacturers and Products:
 - a. W.R. Meadows, Inc., Elgin, IL: No. 164 Polymeric sealing compound, hot-pour, or Hi-Spec Polymeric joint sealing, hot-pour compound; or
 - b. A.C. Horn, Inc., North Bergen, NJ: No-Track two-component material (Code 2323), cold-applied, self-leveling filler; or
 - c. W.R. Meadows, Elgin, IL: Gardox, two-component, cold-applied compound filler.

2.07 STEEL EXPANSION JOINT DOWELS

A. Dowels: ASTM A36 round smooth steel bars.

B. Bar Coating: Two-coat system, fusion bonded, steel dowel coating, with a factory-applied lubricating coating.

2.08 ACCESSORIES

A. Joint Sealants: As specified in SECTION 07900.

B. Nonshrink Grout:

1. As specified in SECTION 03600.
2. Compatible with joint sealant.

C. Roofing Felt: ASTM D226, Type II, 30-pound asphalt-saturated or equal weight of ASTM D227 coal-tar saturated felt.

D. Reinforcing Steel: As specified in SECTION 03200.

E. Nails: As required for securing bituminous type premolded joint filler.

F. Masking Tape: As required to temporarily adhere to concrete at each side of joint to receive filler.

PART 3 EXECUTION

3.01 GENERAL

- A. Construct straight joints; make vertical or horizontal, except where walls intersect sloping floors.
- B. Commence concrete placement after the joint preparation is complete.

C. Time Between Concrete Pours: As specified in SECTION 03300.

3.02 SURFACE PREPARATION

A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:

1. Remove laitance and spillage from reinforcing steel and dowels.
2. Roughen surface to a minimum of 1/4-inch amplitude:
 - a. Sandblast after the concrete has fully cured.
 - b. Water blast after the concrete has partially cured.
 - c. Green cut fresh concrete with high pressure water and hand tools.
3. Perform cleaning so as not to damage water stop, if one is present.

B. Expansion Joint with Pourable Filler:

1. Use motorized wire brush or other motorized device to mechanically roughen and thoroughly clean concrete surfaces on each side of joint from plastic water stop to the top of the joint.
2. Use clean and dry high pressure air to remove dust and foreign material, and dry joint.
3. Prime surfaces before placing joint filler.
4. Avoid damage to water stop.

C. Expansion Joint without Pourable Filler:

1. Coat concrete surfaces above and below plastic water stop with bond breaker.
2. Do not damage water stop.

D. Control Joint:

1. Coat concrete surfaces above and below plastic water stop with bond breaker.
2. Do not damage water stop.
3. Furnish correct type and size of reinforcing and dowels.

3.03 INSTALLATION OF WATER STOPS

A. General:

1. Join water stops at intersections to provide continuous seal.
2. Center water stop on joint.
3. Secure water stop in correct position to avoid displacement during concrete placement.
4. Repair or replace damaged water stop.
5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
6. Joints in Footings and Slabs:
 - a. Ensure that space beneath plastic water stop is completely filled with concrete.
 - b. During concrete placement, make a visual inspection of the entire water stop area.
 - c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then place remaining concrete to full height of slab.
 - d. Apply procedure to full length of plastic water stops.

B. Plastic Water Stop:

1. Install in accordance with manufacturer's written instructions.

2. Splice in accordance with the water stop manufacturer's written instructions using a thermostatically controlled heating iron. Butt splice unless specifically detailed otherwise.
 - a. Allow at least 10 minutes before the new splice is pulled or strained in any way.
 - b. Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced materials.
3. Wire looped plastic water stop may be substituted for plastic water stop.

3.04 EXPANSION JOINT INSTALLATION

A. General:

1. Place bond breaker above and below water stop when premolded joint filler and pourable joint filler is not used.
2. Premolded Joint Filler:
 - a. Sufficient in width to completely fill the joint space where shown.
 - b. If a water stop is in the joint, cut premolded joint filler to butt tightly against the water stop and the side forms.
3. Precut premolded joint filler to the required depth at locations where joint filler or sealant is to be applied.
4. Form cavities for joint filler with either precut, premolded joint filler, or smooth removable accurately shaped material. Entire joint above water stop, in slabs, shall be formed and removed so that entire space down to water stop can be filled with the pourable joint filler.
5. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.

B. Bituminous Type Premolded Joint Filler:

1. Drive nails approximately 1 foot 6 inches on center through the filler, prior to installing, to provide anchorage embedment into the concrete during concrete placement.
2. Secure premolded joint filler in forms before concrete is placed.
3. Install in walkways, at changes in direction, at intersections, at each side of driveway entrances, and at 45-foot intervals, maximum.

C. Pourable Joint Filler:

1. General: Install in accordance with the manufacturer's written instructions, except as specified below:
 - a. Apply primer prior to pouring joint filler.
 - b. Fill entire joint above the water stop with joint filler as shown.
 - c. Use masking tape on top of slabs at sides of joints; clean spillage. Remove masking tape afterwards.
2. Rubber Asphalt Type, Hot-Applied:
 - a. Heat filler material in a double-walled boiler.
 - b. Place filler in the joint by means of a nozzle from a portable pouring type container to prevent spillage outside of the joint.
 - c. Begin pouring joint filler at the bottom of the horizontal joint and proceed upwards in a manner that will preclude the possibility of trapping air in the joint.
3. Rubber Asphalt Type, Cold-Applied: Place cold-applied two-component fillers in accordance with manufacturer's written instructions.

4. Multicomponent Type for Potable Water Structures: Install in accordance with manufacturer's written instructions.
- D. Steel Expansion Joint Dowels:
1. Install coated and lubricated bars parallel to wall or slab surface and in true horizontal position perpendicular to the joint in both plan and section view, so as to permit joint to expand or contract without bending the dowels.
 2. Secure dowels tightly in forms with rigid ties.
 3. Install reinforcing steel in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.
- 3.05 CONTROL JOINT INSTALLATION
- A. Locate reinforcing and dowels as shown.
 - B. Install PVC water stop.
 - C. Concrete surfaces shall be dense and smooth.
 - D. Install bond breaker to concrete surfaces above and below water stop.
- 3.06 PREFORMED CONTROL JOINTS
- A. Use only where specifically shown; do not use in water-holding basins.
 - B. Locate flush, or slightly below the top of slab.
 - C. Install in accordance with manufacturer's written instructions in straight, full-length unspliced pieces.
 - D. Steel Strip Type with Preformed Groove: Brace to withstand pressure of concrete during and after placement.

END OF SECTION

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SECTION 03252

WATERSTOPS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes requirements for the following:

1. Flexible PVC waterstops at construction, contraction, and expansion joints in new concrete construction as shown on the Contract Drawings.
2. Hydrophilic rubber waterstops at construction joints between new and existing concrete, or where installation of center bulb-type waterstops is not possible.
3. Preparation of existing concrete surfaces where hydrophilic rubber waterstops are to be installed.

1.02 RELATED SECTIONS

- A. Section 03250 – Expansion, Construction and Control Joints
- B. Section 03000 – Cast-In-Place Concrete

1.03 REFERENCES

- A. Except as noted, work shall conform to the latest edition of the following codes specifications and standards:
 1. American Society for Testing and Materials (ASTM)
 2. Army Corps of Engineers, “Specifications for Polyvinyl chloride Waterstop”, CRD-C572-74

1.04 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Manufacturer’s Data: for all types and sizes of waterstops, including but not limited to:
 1. Product data and material specifications
 2. Installation instructions
 3. Accessories including crosses, tees, splices, fasteners and adhesives

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: shall demonstrate five years (minimum) continuous, successful experience in production of waterstops.
- B. Installer Qualifications: Qualified to perform work specified by reason of experience or training provided by the product manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store Products in a location protected from dampness, damage, construction activity, dirt, and direct sunlight in strict accordance with the manufacturer's recommendations.

PART 2 – PRODUCTS

2.01 MATERIALS

A. PVC Waterstop

1. Provide flexible PVC waterstop as detailed on the Contract Drawings.
2. The PVC waterstop shall be extruded from an elastomeric plastic material of which the basic resin is prime virgin polyvinyl chloride. The PVC compound shall not contain any scrapped or reclaimed material or pigment whatsoever.
3. Performance requirements are as follows:
 - a. Minimum Tensile Strength 2000 psi
 - b. Specific Gravity, Approximately 1.4
 - c. Shore Durometer Type A Hardness 65 to 80
4. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.
5. Corrugated or tapered type waterstops are not acceptable.
6. Thickness: Constant from bulb edge to the outside stop edge.
7. Minimum Weight per Foot of Waterstop:
 - a. 0.90 pound for 3/16 inch by 4 inch.
 - b. 1.62 pounds for 3/8 inch by 6 inch.
 - c. 2.30 pounds for 3/8 inch by 9 inch.
8. Manufacturers of Products:
 - a. Greenstreak, Inc., St. Louis, MO; Style 679 (3/8 inch by 6 inch) and Style 735 (3/8 inch by 9 inch), or acceptable equivalent.

B. Hydrophilic Rubber Waterstop

1. Provide hydrophilic rubber waterstop at construction joints between new and existing concrete and as indicated on the Contract Drawings.
2. The waterstop shall be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties.
3. The waterstop shall have a delay coating to inhibit initial expansion due to moisture present in fresh concrete.
4. Performance requirements are as follows:
 - a. Minimum Tensile Strength

- b. (Chloroprene Rubber) 1300 psi
 - c. Minimum Tensile Strength
 - d. (Modified Chloroprene Rubber) 350 psi
 - e. Specific Gravity Approx. 1.4
 - f. Shore Durometer Type A Hardness 45 to 55
5. Manufacturers of Products
- a. Hydrophilic Waterstop:
 - 1) Greenstreak, Inc., St. Louis, MO; No. CJ-0725-3K.
 - 2) Adeka Ultraseal North America, distributed by Unique Techniques, Inc., West Coxsackie, NY; No. MC-2010M.
 - 3) Or approved equal.
 - b. Hydrophilic Sealant:
 - 1) Adeka Ultraseal North America, distributed by Unique Techniques, Inc., West Coxsackie, NY; No. P-201.
 - 2) Greenstreak, Inc., St. Louis, MO; No. LV-1.
 - 3) Or approved equal.

2.02 ACCESSORIES

A. PVC Waterstop

- 1. Provide factory made waterstop fabrications for all changes in direction, intersections, and transitions leaving only straight butt joint splices for the field.
- 2. Provide hog rings or grommets spaced at 12 inches on center along the length of the waterstop.
- 3. Provide Teflon coated thermostatically controlled splicing irons for field butt splices.

B. Hydrophilic Rubber Waterstop

- 1. Provide manufacturer's recommended adhesives for the appropriate field conditions. Provide adhesives for each surface to be adhered to (wet or dry concrete, either rough or smooth).
- 2. Provide a one-component sealant for sealing exposed cells.
- 3. Provide manufacturer's recommended adhesive for all splices.

PART 3 – EXECUTION

3.01 INSTALLATION

A. PVC Waterstop

1. Field butt splices shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at the manufacturer's recommended temperature. Follow approved manufacturer's installation procedures.
2. Lapping of waterstop, use of adhesives, or solvents shall not be allowed.
3. Allow at least 10 minutes before the new splice is pulled or strained in any way.
4. Finished splices shall provide a cross-section that is dense and free of porosity.
5. Center waterstop in joint and secure waterstop in correct position using hog rings or grommets at 12 inches on center along the length of the waterstop and wire tie to adjacent reinforcing steel. In no case shall the waterstop be bent over inside the keyways.
6. Place concrete and vibrate to obtain impervious concrete in the vicinity of the waterstop area.
7. Joints in footings and slabs:
 - a. Ensure that the space beneath PVC waterstop is completely filled with concrete.
 - b. During concrete placement, make a visual inspection of the entire waterstop area.
 - c. Limit concrete placement to elevation of waterstop in first pass, vibrate the concrete under the waterstop, lift the waterstop to confirm full consolidation without voids, then place remaining concrete to full height of slab.
 - d. Apply procedure to full height of PVC waterstops. Follow similar procedures for joints in walls.

B. Hydrophilic Rubber Waterstop

1. Cut Coil ends square (or at proper angle for mitered corners) with shears or sharp blade to fit splices together without overlaps.
2. Apply a continuous bead of manufacturer's recommended hydrophilic sealant before fastening waterstop. The waterstop shall be fastened to the existing concrete surfaces with appropriate fasteners as recommended by the waterstop manufacturer.
3. Splices shall be made using the manufacturer's recommended splicing adhesive. Manufacturer's recommended adhesive sealant shall also be applied to all joints after gluing.
4. Seal watertight any exposed cells with appropriate sealant.
5. A continuous bead of manufacturer's recommended hydrophilic sealant shall be applied along the edge of the waterstop.
6. Follow approved manufacturer's installation procedures.
7. Place concrete and vibrate to obtain impervious concrete in the vicinity of the waterstop area. Care shall be taken to avoid displacing waterstop during concrete placement.

3.02 FIELD QUALITY CONTROL

- A. Waterstop splicing defects which are unacceptable include, but are not limited to the following:
1. Tensile strength that is less than 80 percent of parent section.
 2. Misalignment of center bulbs, ribs, and end bulbs greater than 1/16 inch.
 3. Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness.
 4. Misalignment that reduces waterstop cross section more than 15 percent.
 5. Visible porosity in the weld.
 6. Bubbles or inadequate bonding.
 7. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.
 8. Charred or burnt material.
 9. Inadequate or incomplete bond between hydrophilic rubber waterstop and concrete surface.

END OF SECTION 03250

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing and installing forms, reinforcing steel, concrete and expansion and/or construction joints

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. A185, Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 2. A615, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 3. A1094, Specification for Continuous Hot-Dipped Galvanized Steel Bars for Concrete Reinforcement.
 - 4. C31, Practice for Making and Curing Concrete Test Cylinders in the Field.
 - 5. C33, Specification for Concrete Aggregates.
 - 6. C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 7. C42, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 8. C94, Specification for ready Mixed Concrete.
 - 9. C143, Test Method for Slump of Hydraulic Cement Concrete.
 - 10. C150, Specification for Portland Cement.
 - 11. C172, Practice for Sampling Freshly Mixed Concrete.
 - 12. C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 13. C260, Test Method for Air-Entraining Admixtures for Concrete.
 - 14. C494, Specification for Chemical Admixtures for Concrete.
 - 15. C920, Specification for Elastomeric Joint sealants.
 - 16. D994, Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
 - 17. D1056, Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - 18. D1751, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- B. American Concrete Institute (ACI):
 - 1. ACI 301, Specification for Structural Concrete for Buildings.
 - 2. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

3. ACI 305, Recommended Practice for Hot Weather Concreting.
 4. ACI 306, Recommended Practice for Cold Weather Concreting.
 5. ACI 315, Building Code Requirements for Reinforced Concrete.
 6. ACI 347, Guide to Formwork for Concrete.
- C. Concrete Reinforcing Steel Institute (CRSI):
1. Manual of Standard Practice.

1.03 SUBMITTALS

- A. Submit Shop Drawings in accordance with SECTION 01300 for the following:
1. Reinforcing Steel
 - a. Furnish in detail and completeness that all fabrication and placement at the site can be accomplished without the use of contract drawings for reference.
 - b. Include number of pieces, sizes, and grade of reinforcing steel, accessories, and any other information required for fabrication and placement.
 - c. Show joint layout and design
 - d. Check structural and site drawings for anchor bolts, anchors, inserts, conduits, sleeves, and any other items which are required to be embedded in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.
 2. Concrete mix designs.
 3. Grout manufacturer/design mix (if included in this section)
 4. Manufacturer's data for ancillary materials such as joint fillers and sealants, epoxy bonding compound.

1.04 QUALITY ASSURANCE

- A. Selection of testing laboratory in accordance with SECTION 01410.
- B. Sample and Test Concrete as follows:
1. Test Specimens: Make, cure and have tested, a minimum of one set of four test specimens from the concrete of each day's pour and for each fifty cubic yards of concrete cast in accordance with ASTM C172, C31 and C39. One cylinder shall be broken after seven days and three cylinders after twenty-eight day.
 2. Slump: A slump test shall be made for each truckload of concrete in accordance with ASTM C143. Slumps greater than design mix limit will be grounds for rejection of the concrete.
 3. Air Content: An air content test shall be made from each day's pour of concrete by the pressure method in accordance with ASTM C231. Air contents above or below the limits specified will be grounds for rejection of the concrete.
 4. In the event the compressive strength of the cylinders, when tested, is below the specified minimum, the Program Manager/Construction Manager may require test cores of the hardened structure to be taken by the Testing Laboratory in accordance with ASTM C42. If

such test indicates that the core specimen is below the required strength, the concrete in question shall be removed and replaced without cost to the Owner. Any other work damaged as a result of this concrete removal shall be replaced with new materials to the satisfaction of the Program Manager/Construction Manager at no additional cost to the Owner. The cost of coring will be deducted from the contract amount. Where the Testing Laboratory has taken core cylinders and the concrete proves to be satisfactory, core holes shall be filled in a manner satisfactory to the Program Manager/Construction Manager at no additional cost to the Owner.

5. The Contractor shall coordinate the date and location of tests with the Program Manager/Construction Manager before any concrete work is started.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reinforcing steel.

1. Transport to the site, store, and cover in a manner which will ensure that no damage shall occur to it from moisture, dirt, grease, or any other cause that might impair bond to concrete or chip protective epoxy coating.
2. Store on the site at all times, a supply of approved reinforcing steel to ensure that there will be no delay of the work.
3. Identification of steel shall be maintained after bundles are broken.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Portland Cement.

1. In accordance with ASTM C150, Type II of U.S. manufacture.
2. Only one brand of cement shall be used on the project.

B. Aggregates.

1. Fine aggregate, in accordance with ASTM C33, clean and graded from 1/4 inch to fines.
2. Coarse aggregate, in accordance with ASTM C33, clean and graded from 1/4 inch to maximum sizes hereinafter specified.

C. Air Entraining Agent.

1. In accordance with ASTM C260.

D. Water Reducing Agent.

1. In accordance with ASTM C494 Type A.

E. Microsilica Admixture.

1. Packaged in easily dispersing form.

F. Water.

1. Clean and potable,
2. Free of impurities detrimental to concrete.

G. Reinforcing Bars.

1. New, deformed billet steel bars, in accordance with ASTM A615, Grade 60, to be hot-dipped galvanized in accordance with ASTM A1094.

H. Welded Wire Fabric

1. In accordance with ASTM A185.

I. Accessories.

1. Reinforcement accessories, consisting of spacers, chairs, ties, and similar items shall be provided as required for spacing, assembling, and supporting reinforcement in place.
2. All accessories shall be dielectric coated steel or approved plastic accessories, conforming to the applicable requirements of the CRSI Standards.

J. Tie wire.

1. 16 gauge or heavier black annealed wire.

K. Form Ties and Spreaders.

1. Standard metal form clamp assemble and plastic cone, of type acting as spreaders and leaving no metal within 1 inch of concrete face.
2. Provide form tie with water stop for all walls to be in contact with earth or liquid.
3. Inner tie rod shall be left in concrete when forms are removed.
4. No wire ties or wood spreaders will be permitted. Use ½" x 1" C.T. plastic cones for sinkage.

L. Form Coatings.

1. Non-grain raising and non-staining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied to concrete surface.
2. "Nox-Crete Form Coating" as manufactured by Nox-Crete Company, or approved equal.
3. Coatings containing mineral oils, or the non-drying ingredients will not be permitted.

M. Grout.

1. High-strength, non-shrink grout with saltwater resistance.
2. Five Star Special Grout 120 or equivalent.

2.02 CONCRETE STRENGTHS AND PROPORTIONS

- A. Cast-in-place concrete shall have the minimum compressive strength at 28 days as indicated on the Drawings.
- B. The exact proportions for the mix, including amounts admixture (if any), and water, shall be determined by the concrete supplier.
- C. The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed for the work, but without permitting the materials to segregate or excess free water to collect on the surface.

D. Air-Entrainment: The air content in all concrete shall be maintained at 5 to 7 percent.

2.03 PREMOLDED JOINT FILLER

A. Bituminous Type.

1. In accordance with ASTM D994 or D1751.

B. Sponge Rubber Type.

1. Neoprene, closed cell, expanded in accordance with ASTM D1056, Type 2C5, with a compression deflection, 25 percent deflection (limits), 17 to 24 psi (119 to 168 kPa) minimum.

2.04 POURABLE JOINT FILLERS

A. Filler for Non-potable Water Structures

1. Specific Gravity: Greater than 1.0 for cured, in-place filler.

2. Vertical and Sloped Joints: Furnish gun grade material that will remain as placed in joints and will not run down slope.

3. Suitable for continuous immersion and exposure to liquid being contained in the structure.

2.05 JOINT SEALANTS

A. In slabs.

1. In accordance with ASTM C920 for poured 2-component polyurethane sealant.

2. Sikaflex-2c, as manufactured by Sika Corporation or approved equivalent.

B. In walls.

1. Type II, Class A, compound conforming to Interim Federal Specification TT-S-00227E

2. (3) (COM-NBS) for Sealing Compound; Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).

3. Sikaflex-1a, as manufactured by Sika Corporation or approved equivalent.

2.06 EPOXY BONDING COMPOUND

A. The epoxy bonding compound shall be a three-component, solvent-free, moisture-tolerant, epoxy modified, cementitious product specifically formulated as a bonding agent and anti-corrosion coating. The product shall have suitable contact time, fluidity, and application temperature for this type of application.

PART 3 – EXECUTION

3.01 FORMWORK

A. Falsework for Forms

1. Build and maintain necessary false work for the forms.

B. Construction of Forms

1. General
 - a. Construct in accordance with ACI 347.
 - b. Construct of sound material, to the correct shape and dimensions, mortar tight, of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of line or position.
2. Embedded Items
 - a. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
 - b. Do not embed wood, other than necessary nailing blocks, in concrete.
 - c. Extended complete cooperation to suppliers of embedded items in their installation.
 - d. Secure information for embedded items from other trades as required.
 - e. Securely anchored embedded items in correct location and alignment prior to placing concrete.
3. Openings for Items Passing Through Concrete
 - a. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 - b. Coordination work of this nature in order that there will be no unnecessary cutting and patching of concrete.
 - c. Cutting and repairing of concrete as a result of failure to provide for such openings shall be paid for by the Contractor at no additional expense to the Owner.

C. Removing Forms and False work

1. Forms shall not be removed for at least 72 hours after concrete has been placed.
2. Forms shall not be removed until the concrete has attained sufficient strength to insure stability.

3.02 REINFORCING STEEL

A. General

1. Place reinforcing steel in accordance with the drawings and approved shop drawings and the applicable requirements of the CRSI, Manual of Practice.
2. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

B. Reinforcing Steel Supports

1. Support bars on approved plastic or dielectric-coated metal chairs or spacers, accurately placed and securely fastened to forms or steel reinforcement in place.
2. Supply additional bars, whether specifically shown on the drawings or not, where necessary to securely fasten reinforcement in place.
3. Support legs of accessories in forms without embedding in form surface.

4. Spacing of chairs and accessories shall conform to CRSI, Manual of Standard Practice. Accurately space hoops and stirrups and wire to the reinforcement.
5. Permit no loose wood inside forms.
6. Lifting of welded wire fabric into proper position while concrete is being poured rather than supporting fabric on chairs will not be permitted.

C. Placing and Tying

1. Set in place, space, and rigidly and securely tie or wire with tie wire at all splices and at all crossing points and intersections in the positions shown, or as directed.
2. Rebending of bars on the job to accommodate the job to accommodate existing conditions will not be permitted without the written approval of the Program Manager/Construction Manager
3. Points ends of wire ties away from forms.

D. Spacing

1. Minimum center to center distance between parallel bars shall be in accordance with the details on the drawings, or, where not shown, the clear spacing shall be 2 times the bar diameter but in no case less than 1½ inches or less than 1½ times the maximum size aggregate.

E. Splices

1. Maximum 50% of steel spliced occurring within lap length.
2. Top bars shall be 1.3 times values given in 3.01.D.5.c.
3. Splice lengths in accordance with the Contract Drawings.

F. Concrete Covering

1. In accordance with ACI 315, except where shown otherwise on drawings.

3.03 CONCRETE

A. Mixing of Concrete

1. All concrete shall be ready-mixed concrete and shall be mixed and delivered in accordance with ASTM C 94. The batch plant of the concrete producer shall be certified for compliance with the standards established by the National Ready-Mixed Concrete Association.
2. In the event concrete is mixed at a central batching plant, the delivery shall be arranged so that intervals between batches are kept to a minimum, and in any event not more than thirty (30) minutes. Trucks shall be in first class condition and kept in constant rotation during delivery.
3. Concrete shall be placed within 90 minutes after cement has been mixed with aggregate or 45 minutes after addition of water and admixtures.
4. No admixtures, except those mentioned in paragraph 2.1 shall be used. Calcium chloride will not be permitted.
5. Truck delivery slips of all concrete delivered to the job shall indicate the quantity and quality of concrete, additives, date and time of batching and delivery, and the location of placement.

Delivery slips shall be forwarded to the Program Manager/Construction Manager at the end of each pour.

B. Cold Weather Concreting.

1. In accordance with ACI 306.
2. Concrete shall not be mixed or placed when the temperature is below 40 degrees F, or when conditions indicate that the temperature will fall below 40 degrees F within 72 hours unless precautions are taken to protect the concrete.
3. Concrete temperature shall be maintained, when deposited, at not less than 60 degrees F. Reinforcement, forms, and ground which concrete will contact must be completely free of frost.
4. Concrete and formwork must be kept at a temperature of not less than 50 degrees F. for not less than 96 hours after placing.
5. Calcium chloride shall not be used.

C. Hot Weather Concreting.

1. In accordance with ACI 305.
2. The maximum temperature of the concrete, when deposited, shall be 85 degrees F. If the weather causes the placing temperature to exceed 85 degrees F., the mix shall be cooled by methods approved by the Program Manager/Construction Manager.
3. No concrete shall be deposited when the air temperature is greater than 90 degrees F.

D. Conveying and Placing Concrete.

1. In accordance with ACI 304.
2. Notification: Before placing concrete, forms shall be thoroughly inspected. All chips, dirt, etc., shall be removed, all temporary bracing and cleats taken out, all openings for pipes, etc., properly boxed, all forms properly secured in their correct position and made tight, all reinforcement, anchors, and embedded items secured in their proper places. Concrete which may be on the forms or reinforcement, and which is set and dry, shall be cleaned off, and the forms and steel washed off before proceeding. Remove all foreign matter from forms and excavations.
3. Water shall be removed from place of deposit before concrete is placed unless otherwise permitted by the Program Manager/Construction Manager. Any flow of water into an excavation shall be diverted through proper side drains into a sump or shall be removed by other approved methods which will avoid washing away the freshly deposited concrete.
4. Soil on which concrete will be poured shall be thoroughly wetted (except in freezing weather).
5. Anchors and Embedded Items: Anchors, bolts, sleeves, inserts, wood blocking, and any other items to be embedded in concrete shall be accurately secured in position before the concrete is placed. Aluminum shall not be embedded in concrete.

E. Handling and Depositing

1. Before any concrete is placed, notify all whose work is in any way connected with or influenced by the concrete work, and give them reasonable time to complete all portions of their work that must be completed before concrete is deposited.

2. Immediately before concrete is placed, inspect all forms to ensure that they are in proper position, sufficiently rigid, thoroughly clean, properly oiled and free from foreign materials, and that all reinforcement is in proper position.
3. Concreting, once started, shall be carried on as a continuous operation until the section of approved size and shape is completed.
4. Concrete shall be conveyed as rapidly as practicable from the mixer to the place of final deposit by methods that prevent the separation or loss of ingredients. It shall be deposited, as nearly as practicable, in its final position to avoid rehandling or flowing.
5. Concrete shall not be dropped freely where reinforcement will cause segregation, nor shall it be dropped freely more than six (6) feet. Concrete shall be deposited to maintain a plastic surface approximately horizontal.
6. Concrete that has partially hardened shall not be deposited in the work.

F. Pumping

1. Concrete may be placed by pumping if first approved in writing by the Program Manager/Construction Manager for the location proposed.
2. Equipment for pumping shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of materials.
3. The concrete mix shall be designed to the same requirements as herein before specified and may be richer in lubricating components in order to allow proper pumping.
4. Concrete shall not be pumped through aluminum pipes.

G. Vibrating and Compacting

1. All concrete shall be thoroughly consolidated and compacted by suitable means during the operation of placing, and shall be thoroughly worked around reinforcement, embedded items, and into the corners of the forms. All concrete against forms shall be thoroughly spaded. Internal vibrators shall be used under experienced supervision and shall be kept out of contact with reinforcement and wood forms. Vibrators shall not be used in a manner that forces mortar between individual form members.
2. Vibrators shall be flexible electric type or approved compressed air type, adequately powered and capable of transmitting to the concrete not less than seven thousand (7,000) impulses per minute. Vibration shall be sufficiently intense to cause the concrete to flow or settle readily into place without separation of the ingredients. A sufficient number of vibrators shall be employed so that complete compaction is secured throughout the entire volume of each layer of concrete. At least one (1) vibrator shall be kept in readiness as a spare for emergency use. Vibrators shall be such that the concrete becomes uniformly plastic with their use.
3. Vibration shall be close to the forms but shall not be continued at one spot to the extent that large areas of grout are formed, or the heavier aggregates are caused to settle. Care shall be taken to not disturb concrete that has its initial set.
4. Where conditions make compacting difficult, or where the reinforcement is congested, batches of mortar containing the same proportions of cement to sand as used in the concrete shall first be deposited in the forms, to a depth of at least on inch.

5. The responsibility for providing fully filled out, smooth, clean, and properly aligned surfaces free from objectionable pockets shall rest entirely with the Contractor.

3.04 CONSTRUCTION JOINTS

- A. Construction joints shall be located a maximum of 40 feet apart. If, for any reason, the contractor feels a change is necessary, he shall prepare a placing plan and submit it to the Program Manager/Construction Manager for approval.
- B. Where a joint is to be made, the surface of the concrete shall be sandblasted or thoroughly picked, thoroughly cleaned, and all laitance removed. In addition to the foregoing, joints shall be thoroughly wetted, but not saturated, and slushed with a coat of grout immediately before the placing of new concrete.
- C. Approved keys shall be used at all joints, unless detailed otherwise.
- D. Forms shall be retightened before placing of concrete is continued. There shall be an interval of at least 48 hours between adjacent pours.
- E. Bonding Concrete at Construction Joints
 1. To new concrete construction joints:
 - a. Thoroughly clean and saturate joint with water.
 - b. Cover horizontal wall surfaces as specified in this Section, and immediately place concrete.
 - c. Limit concrete lift placed immediately on top of bonding compound to 12 inches thick.
 - d. Thoroughly vibrate to mix and consolidate bonding compound and concrete together.

3.05 BONDING NEW CONCRETE TO OLD CONCRETE:

- A. Mechanically roughen existing concrete surfaces to a clean, rough surface using appropriate mechanical means to remove the existing concrete surface and provide a minimum roughness profile of ¼-inch.
- B. Saturate surface with water for 24 hours, cover with epoxy bonding compound and place concrete as specified for new concrete.

3.06 EXPANSION JOINTS

- A. Expansion joints shall be located as shown on contract drawings.
- B. The joint shall include a joint filler, a bond breaker and joint sealant and installed as indicated on contract drawings.

3.07 JOINT SEALANTS.

- A. Prepare surface in accordance with manufacturer's directions.
- B. Apply primer as recommended by sealant manufacturer.
- C. Install sealant with the proper tools and methods as directed by the sealant manufacturer.

3.08 PATCHING

- A. Immediately after stripping forms, patch minor defects, form-tie holes, honeycombed areas, etc., before concrete is thoroughly dry.
- B. Repair gravel pockets by cutting out to solid surface, form key, and thoroughly wet before placing patching mortar consisting of 1 part cement to 2 parts fine sand; compact into place and neatly finish. Honeycombed areas or gravel pockets which, in the Program Manager/Construction Manager's opinion are too large and unsatisfactory for mortar patching as described above, shall be cut out to solid surface, keyed, and packed solids with matching concrete to produce firm bond and surface.
- C. The Contractor shall do all the cutting as required by himself or other trades. All such work shall be of the minimum size required. No excessive cutting will be permitted, or shall any structural members or reinforcement be cut.
- D. The Contractor shall do all patching after work by other trades has been installed, where required, using Portland Cement Mortar 1:2 mix.

3.09 PROTECTION AND CURING

- A. Protect concrete from injurious action of the elements and defacement of any nature during construction operations.
- B. Keep concrete in a thoroughly moist condition from the time it is placed until it has cured, for at least (7) days.
- C. Carefully protect exposed concrete corners from damage.
- D. Allow no slabs to become dry at any time until curing operations are complete. In general, slabs shall be cured with non-staining curing paper, hosing or fog spray; vertical surfaces shall be curing with Burlene or fog spray or an approved curing compound.
- E. Protect fresh concrete from drying winds, rain, damage, or spoiling. Curing paper shall be lapped 4 inches minimum at joints and sealed with waterproof tape.

3.10 CONCRETE FINISHES

- A. Unexposed Surfaces: All unexposed surfaces shall have any form finish, at the Contractor's option.
- B. Wearing Surface Finish: Float the surface by hand using a wooden or magnesium float. Finish with a flexible bristle broom. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.
- C. Addition of Material: The addition of cement, sand, water, or mortar to slab surfaces while finishing concrete is strictly prohibited.

3.11 DEFECTIVE WORK

- A. The following concrete work shall be considered defective and may be ordered by the Program Manager/Construction Manager to be removed and replaced at Contractor's expense:
 - 1. Incorrectly formed.
 - 2. Not plumb or level.
 - 3. Not specified strength.

4. Containing rock pockets, voids, honeycomb, or cold joints.
5. Containing wood or foreign matter.
6. Otherwise not in accordance with the intent of the Drawings and Specifications.

END OF SECTION 03300

SECTION 03320

CONCRETE SEALANT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to seal all exposed concrete shown on the drawings or specified herein.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

1.03 SUBMITTALS

- A. In accordance with Section 01300.
- B. Shop Drawings:
 - 1. Curing methods proposed.
 - 2. Manufacturer's data for the following products as applicable:
 - a. Exposed aggregate finish retardant on formed surface.
 - b. Evaporation retardant.
 - c. Curing compound.
 - d. Clear sealer.
 - e. Clear floor hardener.
- C. Quality Control Submittals:
 - 1. Curing Compound: Manufacturer's Certificate of Compliance showing moisture retention requirements.
 - 2. Retardants for Exposed Aggregate Finish: Manufacturer's Certification of Compliance.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Curing Compound:
 - 1. Solvent-based, high chlorinated rubber solids content curing compound meeting requirements of ASTM C309.
 - a. Moisture Loss: 0.030 gm/square cm/72 hours maximum.
 - b. Capable of meeting moisture retention with one coat.
 - 2. Manufacturers and Products:
 - a. Master Builders Co., Cleveland, OH; Masterkure CR.
 - b. Euclid Chemical Co., Cleveland, OH; Euco Super Floor Coat.
 - c. Or equal.

- B. Evaporation Retardant:
 - 1. Optional: Fluorescent color tint that disappears completely upon drying.
 - 2. Manufacturers and Products:
 - a. Master Builders Co., Cleveland, OH; CONFILM.
 - b. Euclid Chemical Co., Cleveland, OH; Eucobar.
 - c. Or equal.
- C. Clear Sealer (One-Component Penetrating Silane Siloxane Sealer):
 - 1. Manufacturers and Products:
 - a. Master Builders, Inc.; MASTERSEAL SL.
 - b. Euclid Chemical Co.; Eucoguard 200.
 - c. Or equal.
- D. Clear Floor Hardener:
 - 1. Colorless, aqueous premixed solution of zinc and magnesium fluosilicate.
 - 2. Each gallon of fluosilicate solution shall contain minimum 2 pounds of crystals.
 - 3. Manufacturers:
 - a. Master Builders Co., Cleveland, OH.
 - b. Euclid Chemical Co., Cleveland, OH.
 - c. Sonneborn, Minneapolis, MN.
- E. Water: Clean and potable, containing less than 50 ppm of chlorides.

PART 3 EXECUTION

3.01 CURING OF CONCRETE

- A. Use one of the following methods as approved by ENGINEER:
 - 1. Walls:
 - a. General: Where walls are to receive coatings, painting, cementitious material, or other similar finishes, or where solvent-based coatings are not permitted, use only water curing procedures.
 - b. Method 1: Leave concrete forms in place and keep entire surfaces of forms and concrete wet for 7 days.
 - c. Method 2: Apply curing compound, where allowed, immediately after removal of forms.
 - d. Method 3: Continuously sprinkle with water 100 percent of exposed surfaces for 7 days starting immediately after removal of forms.
 - 2. Slabs and Curbs:
 - a. Method 1: Protect surface by water ponding for 7 days.
 - b. Method 2: Cover with burlap or cotton mats and keep continuously wet for 7 days.
 - c. Method 3: Cover with 1-inch layer of wet sand, earth, or sawdust, and keep continuously wet for 7 days.
 - d. Method 4: Continuously sprinkle exposed surface for 7 days.
 - e. Other agreed upon method that will keep moisture present and uniform at all times on surface of slabs. Do not use curing compounds.

- f. Where water curing for slabs during cold weather is not possible, use an ENGINEER-approved curing compound at manufacturer's recommended coverage per gallon.
 - g. Where curing compound cannot be used, special methods using moisture shall be agreed upon prior to placing the concrete slabs.
 - h. Protect slabs during cold weather with plastic sheets or other materials inside required heated enclosure if foot traffic is permitted on slabs.
- B. Use only water curing on potable water structures.
 - C. Use only water curing methods where solvents in the curing compounds are prohibited by state or federal air quality laws.
 - D. Use only water curing where additional finishes such as clear sealer, hardeners, painting, and other special coatings are required.

3.02 EVAPORATION RETARDANT APPLICATION

- A. Spray onto surface of fresh flat work concrete immediately after screening to react with surface moisture.
- B. Reapply as needed to ensure a continuous moist surface until final finishing is completed.

3.03 CLEAR SEALER APPLICATION

- A. Apply where indicated in Finish Schedule.
- B. Before application, water cure concrete walls and floors to receive sealer for a minimum of 28 days, keep clean, unpainted, free from membrane curing compounds, with Work above them completed.
- C. Apply with stiff brush, short nap roller, squeegee, garden sprayer, or conventional paint spray equipment.
- D. Apply at a coverage rate of 125 to 200 square feet per gallon and cure the sealer on slabs for the following minimum cure time at the ambient temperatures shown prior to allowing foot traffic:
 - 1. 90 degrees F - 2 hours.
 - 2. 75 degrees F - 4 hours.
 - 3. 50 degrees F - 8 hours.
 - 4. 35 degrees F - 16 hours.

3.04 CLEAR HARDENER APPLICATION

- A. Before application, water cure floors to receive hardener for minimum 28 days, keep clean, unpainted, free to membrane curing compounds, and perfectly dry with all work above them completed.
- B. Apply hardener evenly, using three coats, allowing 24 hours between coats.

1. First coat 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength, mix with water
2. Apply each coat so as to remain wet on surfaces for 15 minutes.
3. Apply approved hardeners in accordance with manufacturer's instructions.
4. After final coat is completed and dry, remove surplus hardener from surface by scrubbing and mopping with water.

3.05 MANUFACTURER'S SERVICES

- A. Provide manufacturer's representative at site for installation assistance, inspection, and certification of proper installation for products specified.
- B. Provide clear sealer manufacturer's representative to demonstrate proper application of product.
- C. Provide floor hardener manufacturer's representative to demonstrate proper mixing and application of product.
- D. Provide curing compound manufacturer's representative to demonstrate proper application of curing compound to show coverage in one coat.

END OF SECTION

SECTION 03600

EPOXY BONDING COMPOUND/GROUT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for a two-component, solvent-free moisture insensitive epoxy resin bonding adhesive used to bond fresh, plastic concrete to clean sound hardened concrete and for grouting bolts and the bonding of mating materials.

B. Alternatives

1. Should the Contractor wish to use any brand or type of material other than as specified herein, he shall so state in writing to the Engineer naming the proposed substitution and manufacturer. This letter shall be accompanied by:
 - a. A current test report and notarized certificate of compliance from an approved independent testing laboratory that the proposed substitute meets or exceeds the specified requirements and has been tested within the past 12 months in accordance with the specified test standards.
 - b. Documented proof, to the Engineer's satisfaction, that the proposed brand or type of material has proven record of performance when used in the intended application.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. C-882, Test Method for Bond Strength of Epoxy Resin Systems used with Concrete by Slant Shear.
2. D-570, Test Method for Water Absorption of Plastics.
3. D-638, Test Method for Tensile Properties of Plastics.
4. D-695, Test Method for Compressive Properties of Rigid Plastics.
5. D-732, Test Method for Shear Strength of Plastics by Punch Tool.
6. D-790, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.03 SUBMITTALS

A. Shop Drawings.

1. In accordance with SECTION 01300.

B. Certificates of Conformance.

1. Prior to delivery, submit manufacturer's notarized certification attesting to compliance with the requirements of this specification.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

- A. Sikadur 32 Hi-Mod, as manufactured by Sika Corp., Lyndhurst, NJ, or acceptable equivalent product manufactured by H.B. Fuller Co., Palatine, IL, or Protex Industries, Inc., Denver, CO.
- B. Sure-Klean Degreaser and Etch, as manufactured by ProSoCo, Inc., Kansas City, KS, or acceptable equivalent product manufactured by Drew Chemical Co., Tampa, FL or Goldblatt Tool Co., Kansas City, KS.

2.02 MATERIAL

- A. The epoxy material shall conform to the following requirements:
 - 1. Component A shall be a modified epoxy resin of the Epichlorohydrin Bisphenol A type containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.
 - 2. Component B shall be primarily a reaction product of a selected amine blended with an epoxy resin of the Epichlorohydrin Bisphenol A type containing suitable viscosity control agents, pigments and accelerators.
 - 3. The ratio of Component A:B shall be 1:1 by volume.
 - 4. The materials shall not contain asbestos.
- B. Properties of the mixed material:
 - 1. Pot Life: 25 to 35 minutes.
 - 2. Tack-Free Time to Touch (20 mil thickness): 3 to 5 hours.
 - 3. Initial Viscosity (Brokfield Viscometer Spindle No. 3, Speed 100): 1,900 to 3,700 cps.
 - 4. Color: Gray
- C. Properties of the cured material. Note: All test data is based upon material and curing conditions of 73± degrees F, 50± 5% relative humidity.
 - 1. Compressive Properties (ASTM D-695) at 28 days:
 - a. Compressive Strength: 8,500 psi minimum.
 - b. Modulus of Elasticity: 3.75×10^5 psi minimum.
 - 2. Tensile Properties (ASTM D-638) at 14 days:
 - a. Tensile Strength: 4,000 psi minimum.
 - b. Elongation at Break: 1.5 - 2.25%.
 - c. Modulus of Elasticity: 2.75×10^5 psi minimum.
 - 3. Flexural Properties (ASTM D-790) at 14 days:
 - a. Flexural Strength (Modulus of Rupture): 6,300 psi minimum.
 - b. Tangent Modulus of Elasticity in Bending: 4.0×10^5 psi minimum.
 - 4. Shear Strength (ASTM D-732) at 14 days:
 - a. Shear Strength: 5,000 psi minimum.
 - 5. Water Absorption (ASTM D-570: Section 6.5) at 14 days:
 - a. Water Absorption: 1% maximum.
 - 6. Bond Strength (ASTM C-882) Hardened to Plastic:
 - a. Bond Strength (14 days moisture cure): 1,500 psi minimum.
- D. Aggregate: As recommended by the manufacturer.
- E. Degreasing and etching chemical:
 - 1. Composition and materials: A blend of organic and inorganic acids with a special solvent system incorporating wetting agents for emulsification.

2. Color: Water White.
3. Flash Point: Above 150 degrees F.
4. Weight/Gallon: 9.0 lbs.

PART 3 EXECUTION

3.01 GENERAL

- A. Mix and apply the epoxy compound in accordance with the manufacturer's instructions.

3.02 PREPARATION OF CONCRETE SURFACES

- A. All work involving epoxy, cement base coating and protective coating to adhere strictly to the manufacturer's current printed recommendations as to temperatures at time of application. No use of epoxy materials allowed when either the temperature of the concrete to be repaired or the ambient temperature is below 50 degrees F, 24 hours before, during, or for a period of 48 hours after the completion of the repair. Temporary heat may be used to meet the specified requirements.
- B. All epoxy, cement base coating, and protective coating materials to be new and used within the shelf life limitations set forth by the manufacturer. The shelf life limitations to be clearly marked on each container.
- C. All existing reinforcement and concrete to be sound and clean before receiving new materials.
- D. Surfaces shall be clean and sound. Surfaces may be dry, damp or wet, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles and disintegrated materials by mechanical abrasion methods such as sandblasting. Sandblast steel to appropriate finish.
- E. If the concrete surfaces are sound and it is only necessary to remove laitance, grease or dust, the Contractor may, with the prior written approval of the Engineer, forego sandblasting and wash the concrete with a degreasing and etching chemical applied in accordance with the manufacturer's written instructions and as specified herein.
- F. Application of degreaser and etching compound: Pre-wet concrete surfaces with clean water. Brush concentrated cleaner onto concrete surface. Let stand three to four minutes and reapply, brushing stained areas vigorously. Rinse off with fresh water applied at a minimum pressure of 800 psi and a minimum volume of 5 to 10 gallons per minute.

3.03 PROPORTIONING, MIXING AND APPLYING EPOXY COMPOUND

- A. Volumetric ratio of bonding compound shall be 1:1 (B:A) to mix, proportion one part B and one part A into clean pail. Mix thoroughly for three minutes with a steel mixing paddle on a low speed (400 to 600 rpm) drill until blend is a uniform gray color. Mix only that amount of epoxy that can be used in 30 minutes at 73 degrees F.

- B. Application for Bonding: Cover the area to be overlaid with one coat of the epoxy compound applied with long-nap paint rollers, brushes, brooms or by spray. Apply at the rate of 80 square feet/gallon maximum on smooth concrete.
- C. As the concrete increases in roughness, decrease the rate of coverage proportionately. While the epoxy compound is still tacky (three to five hours at 73 degrees F), place the concrete. If the bonding compound should harden before the concrete is placed, reprepare surface. Then recoat with additional epoxy bonding compound and proceed.
- D. Application for Grouting: To prepare a grout for anchor bolts, mix the epoxy compound with aggregate recommended by the epoxy manufacturer. The amount of aggregate used shall be the maximum amount possible while still maintaining a pourable consistency. The ratio shall be approximately 1:1, 1/2 by loose volume of aggregate. Apply grout in accordance with the manufacturer's instructions.
- E. Limitations:
 - 1. Do not thin the epoxy bonding compound, as solvents will prevent proper cure.
 - 2. Use only oven-dry aggregate to avoid encapsulation of moisture.

END OF SECTION

SECTION 03610

CEMENTITIOUS GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for non-shrink cementitious grout for leveling base plates and grouting pumps and miscellaneous patching as approved by the Engineer...
- B. Anchors for machinery, framing, etc... shall not be grouted using the material specified under this section. Refer to SECTION 03600 - Epoxy Bonding Compound/Grout.

1.02 SUBMITTALS

- A. Submit in accordance with the provisions of SECTION 01300.
 - 1. Product Data: Submit manufacturer's technical data sheets for the Grout.

1.03 QUALITY ASSURANCE

- A. The grout manufacturer shall be ISO 9001 certified and have at least five (5) years experience manufacturing of precision cement-based grouts.

PART 2 PRODUCTS

2.01 GROUT

- A. The Grout shall be a non-shrink cementitious, preproportioned, prepackaged, precision grout requiring only the addition of potable water. The grout shall not contain metallic aggregate, expansive cement, or gas generating additives such as aluminum powder. The grout shall be formulated for exposure to a salt/chemical environment. The grout shall meet the following minimum requirements:

1. Early Height Change, ASTM C827	0.0 to 4.0%
2. Hardened Height Change, ASTM C1090	0.0 to 0.3%
3. Effective Bearing Area	95%
4. Minimum Compressive Strength, ASTM C109 5	500 psi (7 days)
5. Minimum Bond Strength, ASTM C882	2,000 psi (28 days)
6. Meets ASTM C1107 Performance Grade	Grade C

- B. Grout shall be Five Star Special Grout 120 as manufactured by Five Star Products, Inc. of Fairfield, CT or Engineer approved equal. For cold weather applications, Grout shall be Five Star Instant Grout as manufacture red by Five Star Products, Inc. of Fairfield, CT or Engineer approved equal.

PART 3 EXECUTION

3.01 GENERAL

- A. Mix and apply the grout in accordance with the manufacturer's instructions.
- B. Work requiring Grout shall adhere strictly to manufacturer's current printed recommendations for air and substrate temperatures at the time of application. Temporary heat may be used to meet the specified requirements and shall be maintained for the minimum amount of time recommended by the manufacturer to ensure performance of the Grout. The method of providing and maintaining temporary heat shall be submitted to the Engineer for approval prior to construction.
- C. Grout shall be new material, delivered in manufacturer's unopened containers. The Grout shall be stored to maintain the integrity of the product by protecting it from exposure to weather.
- D. Grout shall be used within the shelf and pot life limitations set forth by the manufacturer. The shelf life shall be clearly marked on the containers.

3.02 PREPARATION OF SURFACES

- A. Surfaces to receive Grout shall be clean and sound. Remove dust, laitance, grease, curing compounds, waxes, and other foreign particles by mechanical abrasion.

END OF SECTION

DIVISION 04

SECTION 04100

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish, prepare, and protect as a perishable material, mortar and grout, complete with specified admixtures for use in the installation of masonry structures.

B. Related Sections

1. Section 04200 - Unit Masonry
2. Section 04230 – Reinforced Unit Masonry

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. C144, Specification for Aggregate for Masonry Mortar.
2. C150, Specification for Portland Cement.
3. C207, Specification for Hydrated Lime for Masonry Purposes.
4. C270, Specification for Mortar for Unit Masonry.
5. C404, Specification for Aggregates for Masonry Grout.
6. C476, Specification for Grout for Masonry.
7. C780, Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

1.03 SUBMITTALS

A. In accordance with Section 01300.

B. Product Data

1. Submit manufacturer's product data for each product, including certification that each product complies with the specified requirements.

C. Samples

1. Before the start of work samples of sand shall be submitted to the Engineer for approval.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store cementitious materials off the ground, under cover and in dry location. Store in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.

B. All perishable materials included in this Section shall be delivered, stored and handled so as to prevent deterioration, intrusion of foreign matter or moisture, or damage of any nature.

PART 2 PRODUCTS

2.01 MANUFACTURES

- A. Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

2.02 COMPONENTS

A. Portland Cement

- 1. ASTM C150, Type II. The same brand and color of cement shall be used throughout the job to ensure uniformity of color.

B. Hydrated Lime

- 1. ASTM Designation C207, Type S.

C. Aggregate for Mortar

- 1. ASTM Designation C144
- 2. Clean, durable particles, free from injurious amounts of organic matter.

D. Aggregate for Grout

- 1. ASTM Designation C404

E. Water

- 1. Clean and Potable

F. Mortar Color

- 1. Chemically inert, non-fading color, manufactured from alkali fast mineral oxides, finely ground and specifically prepared for use in cement and lime mortars. They shall be added to the mixture where so specified and used in accordance with the manufacturer's recommendations. Colored mortar shall be used on all new building face brick and, as standard of color only, shall be Davis Colors, 7011 Muirkirk Rd., Beltsville, MD 20705; "Chromix" L.M. Schofield Company, 6533 Bandini Blvd., Los Angeles, CA 90040; Solomon Grind-Chem Service, Springfield, Ill. 62705, or equal. Color shall match the existing mortar color.
- 2. Color of mortar joints on both new and existing masonry work is to be the same. Color shall be selected by the Engineer from the manufacturer's full range of standard colors.

2.03 MORTAR AND GROUT MIXES

A. General

- 1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar. No anti-freeze liquids, salts, or other substances shall be used in the mortar or grout to lower the freezing point. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar or grout. Integral water-proofing compounds, accelerators, or other admixtures shall not be used in mortar or grout without approval in writing by the Engineer.

B. Grout

1. In accordance with ASTM Designation C476, for grout for use in construction of reinforced and nonreinforced masonry, and shall be mixed 2 1/2 cubic feet of sand to one bag of cement, adding only enough water to make a flowable consistency. Neat grout shall be composed of cement and water only. Non-staining cement shall be used for non-staining grout.
2. Use grout of the appropriate consistency (fine or course) as follows:
 - a. Fine grout in spaces less than 4 inches in any horizontal dimension.
 - b. Course grout in spaces greater than 4 inches in any horizontal dimension.

C. Mortar

1. In accordance with ASTM C270. (Proportional Specification)
2. The mortar mixtures hereinafter tabulated are standard mixtures for which measurement shall be by volume. For the purposes of these Specifications, the weight of one cubic foot of the respective materials used as ingredients in the mortar shall be as follows:

<u>Materials</u>	<u>Weight, lb per cu ft (kg/m³)</u>
Portland Cement	94(1504)
Hydrated Lime	40(640)
Sand, damp and loose	80(1280) dry sand

3. The Contractor shall use mortar Type S1 for all masonry work. Quantities of materials in parts by volume are given below:

<u>Mortar Type</u>	<u>Portland Cement</u>	<u>Hydrated Lime</u>	<u>Sand, Measured in a <u>Damp</u>, <u>Loose Condition</u></u>
S1	1	1/2	No less than 2 1/4 and not more than 3 times the sum of volumes of cement and lime used.

4. Mortar ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor, or by other method approved in writing by the Engineer. Measurement by shovel will not be allowed.
5. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5 minutes, approximately two minutes of which shall be for mixing the dry materials and not less than three minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring a lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into a lime putty as specified below. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that cementitious material has been thoroughly distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.
6. All mortar shall be freshly mixed and the quantity of each batch shall not be in excess of the amount that will be used before the same has started to set. Mortar that has begun to set shall not be used. Retempering will not be permitted. Mixer drums shall be entirely emptied of a batch before charging with a succeeding batch. Mortar boxes shall be cleaned out at the end of each day's work, and all tools shall be kept clean.

PART 3 EXECUTION

3.01 MIXING

- A. Cementitious materials and aggregate shall be mixed between 3 and 5 minutes in a mechanical batch mixer with the maximum amount of water to produce a workable consistency.

3.02 PLACING MORTAR

- A. In accordance with the requirements of Section 04200.

3.03 GROUTING MASONRY CELLS

- A. In accordance with Section 04230.

3.04 TESTING

- A. Construction-site-prepared mortar shall be tested in accordance with ASTM C780
- B. Samples tested during the progress of the work may be accepted on the basis of the 7 day test. The right is reserved to rescind such acceptance if the mortar fails on the 28 day test.
- C. Costs for testing shall be in accordance with Section 01410.

END OF SECTION

SECTION 04210

BRICK MASONRY FOR SEWER REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Brick masonry work in utility construction for permanent or temporary installation of below ground structures.
- B. Brick masonry in repair and rehabilitation of utility lines and associated structures.

1.02 RELATED SECTIONS

- A. Section 02607 - Precast Concrete Manholes

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. C32 - Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 - 2. C55 - Standard Specification for Concrete Building Brick.
 - 3. C62 - Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
 - 4. C67 - Methods of Sampling and Testing Brick and Structural Clay Tile.
 - 5. C91 - Specification for Masonry Cement.
 - 6. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).
 - 7. C140 - Standard Method of Sampling and Testing Concrete Masonry Units.
 - 8. C270 - Standard Specification for Mortar for Unit Masonry.

1.04 SUBMITTALS

- A. Submit in accordance with requirements of Section 01300.
 - 1. Submit certification from the manufacturer that brick units meet applicable requirements of reference standards.
 - 2. As an alternate to providing certification, submit test results that show brick units meet applicable requirements of reference standards, when tested by an approved independent testing laboratory. Test result submittals shall be at no cost to the City.

1.05 HANDLING AND STORAGE

- A. Handle and store brick to prevent damage.
- B. Store brick and mortar mix off the ground and in a dry place. Cover mortar mix to protect from weather.

PART 2 PRODUCTS

2.01 CLAY AND SHALE BRICK MASONRY UNITS

- A. Manholes and Structures: Use brick units made from clay or shale conforming to requirements of ASTM C 32, Grade MM, either cored or solid. Units shall have the following physical properties:
 - 1. Compressive Strength: 2200 psi minimum for individual brick; 2500 psi average for five bricks.
 - 2. Size: 2-1/4" by 7-5/8" by 3-5/8".
 - 3. Test Procedure: ASTM C 67.
- B. Sewer Brick: Use brick units made from clay or shale conforming to requirements of ASTM C 32, Grade SM, either cored or solid. Units shall have the following physical properties:
 - 1. Compressive Strength: 3750 psi minimum for individual brick; 5000 psi average for 5 bricks.
 - 2. Size: 2-1/4" by 7-5/8" by 3-5/8".
 - 3. Test Procedure: ASTM C 67.

2.02 CONCRETE BRICK MASONRY UNITS

- A. Manholes and Structures: Conform to requirements of ASTM C 55, grade S-1.
- B. Dimensions: 2-1/4" by 7-5/8" by 3-5/8".

2.03 MORTAR

- A. Provided mortar conforming to the requirements of Section 02607.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Ensure that foundations and other surfaces to support brickwork are at proper grades and elevations. Correct improperly prepared surfaces. Work surfaces and masonry shall be free of dirt, grease, oil, or other harmful materials before starting brick masonry work.

3.02 WEATHER REQUIREMENTS

- A. Lay no masonry when temperature of outside air is below 50 F, unless satisfactory means are provided to heat materials and protect work from cold and frost.
- B. Maintain mortar at 50 F or above and ensure that mortar will harden without freezing.

3.03 CONSTRUCTION

- A. Brick Placement

1. Use sewer brick where exposed to flow. Where not exposed to flow, use manhole brick.
2. Lay sewer brick with the 2-1/4" by 7-5/8" side exposed to flow.
3. Lay manhole bricks so that in every fifth course the long axis of bricks are perpendicular to the long axis of the four preceding courses.
4. Lay curved courses and courses in different planes, using bonded and keyed construction.
5. Lay brick plumb and true with courses level and uniformly spaced. Adjust the bond of face brick so that no course will terminate with a piece less than one-half length of brick.
6. Dampen brick prior to placement.
7. Where fresh masonry joins partially set or totally set masonry, clean surfaces of set masonry. Remove loose mortar and brick. Wet brick to obtain the best possible bond.
8. Immediately remove mortar droppings and splashings as work progresses to facilitate final cleaning.

B. Joints

1. Completely fill joints in brick and other materials with mortar as each course is laid.
2. Make joints in exposed brickwork a uniform 3/8-inch wide, unless otherwise shown on Drawings.
3. When mortar is "thumbprint" hard, tool exposed joints with a round or other suitable jointer that is slightly larger than width of the mortar joint. In tooling, make sure that cracks and crevices are closed.
4. Point holes in exposed masonry. Cut out defective joints and repoint.

3.04 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of Section 01410.
- B. A minimum of one set of mortar samples shall be molded for each day's placement as directed by the Engineer. Mold three 2-inch cube specimens. One cube will be tested for compressive strength at 7 days and 2 cubes will be tested for compressive strength at 28 days in accordance with ASTM C 109.
- C. Each load of bricks delivered to the jobsite shall be tested.
 1. Test clay bricks in accordance with ASTM C 167.
 2. Test concrete bricks in accordance with ASTM C 140.

END OF SECTION

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DIVISION 05

SECTION 05200

STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, power, and equipment for designing, furnishing, installing, and maintaining systems for structural steel.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.

1. Section 01300 – Submittals

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.

1. American Institute of Steel Construction (AISC)
 - a. Manual of Steel Construction, Allowable Stress Design
 - b. Specification for Structural Steel Buildings - Allowable Stress Design, Plastic Design
 - c. Code of Standard Practice for Steel Buildings and Bridges
 - d. Allowable Stress Design - Specification for Structural Joints using ASTM A325 or ASTM A490 Bolts
2. Detailing for Steel Construction
 - a. Latest AASHTO Standard Specifications for Highway Bridges
3. American Welding Society (AWS)
 - a. Structural Welding Code Steel, D1.1
 - b. Structural Welding Code – Reinforcing Steel, D1.4
4. American Society for Testing and Materials (ASTM)
 - a. ASTM A6/A6M: Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
 - b. ASTM A36/A36M: Specification for Structural Steel
 - c. ASTM A108-90A: Specification for Steel Bars, Carbon, Cold Finished, Standard Quality

- d. ASTM A109-91: Specification for Steel, Strip, Carbon, Cold-Rolled
- e. ASTM A123: Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- f. ASTM A143: Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
- g. ASTM A153: Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- h. ASTM A194/A194M: Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
- i. ASTM A325: Specification for High-Strength Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- j. ASTM A370: Test Methods and Definitions for Mechanical Testing of Steel Products
- k. ASTM A449: Specification for Quenched and Tempered Steel Bolts and Studs
- l. ASTM A490: Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
- m. ASTM A563: Specification for Carbon and Alloy Steel Nuts
- n. ASTM A572: Specification for High Strength Low Alloy Columbium-Vanadium Structural Steel
- o. ASTM A780: Practice for Repair of Damaged Hot-Dip Galvanized Coatings
- p. ASTM F 436: Specification for Hardened Steel Washers

1.04 DEFINITIONS (NOT USED)

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Personnel Qualifications
- C. Welding to be performed by certified welders in accordance with AWS D1.4. Certifications shall be provided for each welder, and valid for each process, method, position, and bar sized used.
- D. The Design-Builder shall employ a Testing Agency using trained and experienced personnel in accordance with ASTM E329 to perform the required tests.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Shop and erection drawings for all structural steel components. Show materials, anchor bolts, member and connection details, piece marks, openings, shop and field bolting and welding, in conformance with AISC Detailing Manual for Steel

Construction and AISC Manual of Steel Construction. Indicate cleaning, shop painting and hot-dip galvanizing.

- C. Welding procedure specifications in accordance with AWS D1.1.
- D. Qualification test reports bearing witness certification of an independent testing laboratory accredited by the State of Rhode Island for each welder, welding operator, and tacker employed in work.
- E. Mill certificates and copy of reports for all analyses and tests required by referenced ASTM Standard Specifications and AWS Structural Welding Code.
- F. Galvanizing
 - 1. Provide a written statement that the galvanizer has applied specified process in his own shop for a minimum of five years in the past 10 years.
- G. Record documents and shop drawings marked to record actual construction.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS (NOT USED)

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and the Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, and schedule for the work.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufacturer's recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.
- C. Store structural shapes off ground on platform or skid supports, with webs of flanged shapes vertical. Cover and protect steel from snow, rain and ground splatter.
- D. Use nylon slings or padded cables for handling all galvanized material. Do not drop or drag galvanized material.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall be either new or in serviceable condition.

- B. The Contractor shall furnish all installation tools, materials, and miscellaneous components.

2.02 MATERIALS

A. Structural Steel

1. Provide ASTM A36 steel
2. Provide high strength steel in accordance with ASTM A572, Grade 50
3. Items indicated to be galvanized shall be hot-dip galvanized after fabrication in accordance with ASTM A123, ASTM A143, or ASTM A153 as applicable.

B. Fasteners

1. High-strength steel bolts, ASTM A325 or ASTM A490 or as shown on Drawings.
2. Provide Hot-Dip Galvanized Bolts, Nuts and Washers where indicated in accordance with ASTM A153.
3. ASTM A563 Grade DH or ASTM A194 Grade 2H nuts.
4. Hardened steel washers in accordance with ASTM F436.
5. Bees wax lubrication for threaded parts of bolts and nuts.
6. Purchase bolts, nuts and washers from a single supplier.

C. Welding

1. Provide Class E70XX electrodes.

D. Galvanize Touch-up

1. Galvanize where indicated in accordance with ASTM A123 and ASTM A153.
2. Provide galvanize touch-up to repair damaged surfaces. Use Endupor, zinc-rich coating by Dampney Manufacturing Co., Everett, MA; ZiRP, zinc-rich coating by Duncan Galvanizing Corp., Everett, MA; ZRC Cold Galvanizing Compound by ZRC Chemical Products Co., Division of Norfolk Corp., Quincy, MA, or equal.

2.03 EQUIPMENT

- A. Provide equipment for welding, electrodes, welding wire, and fluxes capable of producing indicated welds when used by certified welders using AWS welding procedures. Provide welding materials that comply with requirements of AWS Structural Welding Code.

PART 3 EXECUTION

3.01 FABRICATION

- A. After shop drawings are submitted for review by the PM, fabricate each element to the size and connection indicated on the fabrication shop drawings. Fabricate and shop- assemble work, in accordance with following publications:

1. AISC Manual of Steel Construction
 2. AISC Specification for Structural Steel Buildings
 3. AISC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts
 4. AISC Detailing for Steel Construction
 5. AWS Structural Welding Code – D1.1 for Steel and D1.4 for Reinforcing Steel.
- B. Do not allow residual stress to be induced through cutting metal by shearing, manual flame cutting with mechanically guided torch, or chipping. Radii of re-entrant corners to be not less than 3/4-inch and larger when possible. Perform flame cutting so that metal being cut is stress free. Finish exposed edges.
- C. Provide full cross-section bearing on milled ends of steel ribs.
- D. Connect all members with ASTM A325X high strength bolts unless otherwise indicated or specified. Provide clean-cut holes without torn or ragged edges and remove all outside burrs.
- E. Welded Connections
1. Provide connections as indicated.
 2. Weld or bolt shop connections in conformance with specified AISC publications.
 3. Furnish anchor bolts with washer and heavy hex nuts. Hot-dip galvanize all anchor bolts, washers and nuts receiving galvanized members.
- F. Bending
1. Structural steel shall be bent to the curved radii shown on the reviewed shop drawings.
 2. Bending shall not exceed the steel shape manufacturer's recommendation for minimum outside radius; induction bending or cold working of steel or pressing cold in dies shall result in a steel section having a yield point no less than that of an unbent section.
 3. Hot bending shall only be permitted at maximum temperature for the steel in accordance with the AISC Manual of Steel Construction.
 4. Tolerances for bent segments shall conform to a true template with no departure greater than 1/8-inch along any 3-foot length.

3.02 ERECTION

- A. Provide anchor bolts with necessary templates for correct placement into concrete, masonry and other supporting materials.
- B. Hold steelwork securely in place with temporary bracing and stays to resist all vertical and lateral loads, until members are permanently fastened and floors and roofs completed.

- C. Tighten all high-strength bolts, unless indicated on the drawings to be slip-critical, to the snug-tight condition in accordance with AISC Specification for Structural Joints Using ASTM A325X or ASTM A490X Bolts.
- D. Use only calibrated wrenches for tensioning high-strength bolts for connections subjected to direct tension.
- E. Contractor's Testing Laboratory will inspect field-assembled bolted construction in accordance with AISC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts. Contractor shall repair bolted construction rejected by the PM to meet AISC Specification at no additional cost to the NBC.
- F. Align and adjust members forming parts of a complete assembly after assembly and before permanent fastening.
- G. Fasten splices of compression members with slip-critical connections after the abutting surfaces have been brought completely into contact.
- H. Report immediately to PM errors in shop fabrication or deformation resulting from handling or transportation which prevents the proper erection and fitting of parts. Replace and remove from job site improperly fabricated or deformed material at no additional cost to the NBC.
- I. As erection progresses, perform temporary bracing and bolting of work to support construction live load and combined dead, wind, earthquake, and erection loads.
- J. If holes are enlarged or metal in vicinity of holes is damaged by drift pins during assembly, replace damaged members at no additional cost to the NBC.
- K. Enlarge holes to admit bolts for connections only if accepted by the PM. Make enlargement by reaming and not by burning. Refinish enlarged holes as specified with galvanize touch-up, or paint to match the steel finish.
- L. Where erection bolts are abandoned in place, remove bolts, completely plug weld holes, grind smooth with adjacent surfaces, and galvanize touch-up, or paint to match the steel finish as specified.
- M. Roughen by means of hand wire brushing all galvanized faying surfaces of slip-critical bolted connections and bolted connections subject to direct tension.

3.03 HIGH STRENGTH BOLTING

- A. Bolting Operations: Provide workmanship and techniques for bolted construction in conformance with requirements of AISC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
- B. Install ASTM A325 bolts with hardened washer under element being turned in tightening. When using oversize and slotted holes, install plate washer in both outer plies. When using galvanized bolts, install galvanized washer under bolt head and nut.
- C. Do not reuse high-strength bolts and nuts.

3.04 WELDING

- A. Welding Operations: Provide workmanship and techniques for welded construction in conformance with requirements of AWS Structural Welding Code.

- B. No field welding is permitted unless shown on drawings or as approved by the PM/CM.

3.05 GALVANIZING

- A. Provide structural steel with nickel-zinc (galvanize) coating as indicated on Drawings.
- B. Provide bolts, nuts and washer connectors with nickel-zinc (galvanize) coating for all galvanized steel.
- C. Complete all fabrication, and prepare surfaces of steel by removing all weld spatter, flux and residue, burrs and metal surface defects before galvanizing. Clean welds with power wire brush prior to galvanizing.
- D. Provide steel dipped into solution of zinc chloride plus ammonium chloride immediately prior to galvanizing. Do not use the type of galvanizing process utilizing flux blanket overlaying molten zinc.
- E. After galvanizing, chromate treat all pieces that will be in contact with concrete.
- F. Tap bolt nuts after hot-dip galvanizing.
- G. Inspect galvanized material for compliance with these specifications. Mark the material with a clearly visible stamp or wire-on tag indicating the name of the galvanizer, the ASTM number and the weight of zinc coating in ounces per square foot.

END OF SECTION 05200

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SECTION 05500

METAL FABRICATIONS AND CASTINGS

PART 1 – GENERAL

1.01 SUMMARY

- A. The work specified in this section includes all work necessary to provide all miscellaneous metals as shown on the Drawings and as specified herein. The work includes the following:
1. Grating, support frames, and bent plate brackets.
 2. Access hatches.
 3. Lifting hooks.
 4. Trash rack.
- B. All miscellaneous metals specified in this section and shown on the Drawings shall be hot-dip galvanized unless otherwise indicated or specified.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.
1. Section 03300 – Cast-in-Place Concrete
 2. Section 05200 – Structural Steel

1.03 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
1. American Galvanizers Association (AGA): Inspection of Products Hot-Dip Galvanized After Fabrication.
 2. American Institute of Steel Construction (AISC)
 - a. S329, Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
 3. American Iron and Steel Institute (AISI)
 - a. Stainless Steel Types.
 4. American National Standards Institute (ANSI)
 - a. A10.11, Construction and Demolition Operations - Personnel and Debris Nets.
 5. American Society for Testing and Materials (ASTM)

- a. A36, Standard Specification for Carbon Structural Steel.
- b. A48, Standard Specification for Gray Iron Castings.
- c. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- d. A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
- e. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- f. A143, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
- g. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- h. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
- i. A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service.
- j. A240, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
- k. A276, Standard Specification for Stainless Steel Bars and Shapes.
- l. A283, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- m. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- n. A325, Standard Specification for Structural Bolts, Steel, Heat Treated 120/105 ksi Minimum Tensile Strength.
- o. A384, Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
- p. A385, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
- q. A489, Standard Specification for Carbon Steel Lifting Eyes.
- r. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- s. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- t. A563, Standard Specification for Carbon and Alloy Steel Nuts.
- u. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- v. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - w. A786, Standard Specification for Rolled Steel Floor Plates.
 - x. A793, Standard Specification for Rolled Floor Plate, Stainless Steel.
 - y. D1056, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
 - z. F436, Standard Specification for Hardened Steel Washers.
 - aa. F468, Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
 - bb. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - cc. F594, Standard Specification for Stainless Steel Nuts.
 - dd. F844, Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
 - ee. F1554, Standard Specification for Anchor Bolts, Steel, 36-, 55-, and 105-ksi Yield Strength.
- 6. American Welding Society (AWS)
 - a. D1.1, Structural Welding Code-Steel.
 - b. D1.2, Structural Welding Code-Aluminum.
 - c. D1.6, Structural Welding Code – Stainless Steel.
 - 7. International Conference of Building Officials (ICBO): Evaluation Reports for Concrete and Masonry Anchors.
 - 8. Occupational Safety and Health Administration (OSHA)
 - 9. Code of Federal Regulations, 29 CFR Part 1910 and 1926
 - 10. Specialty Steel Industry of North America (SSINA)
 - a. Specifications for Stainless Steel.
 - b. Design Guidelines for the Selection and Use of Stainless Steel.
 - c. Stainless Steel Fabrication.
 - d. Stainless Steel Fasteners.

1.04 DEFINITIONS

- A. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling or floor surface inside a covered water-holding structure, or exterior below grade wall or roof surface of water-holding structure, open or covered.
- B. Exterior Area: Location not protected from the weather by a building or other enclosed structure.

- C. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or washdown, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.
- D. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or washdown, nor where wall or roof slab is common to a water-holding or earth-retaining structure.
- E. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.

1.05 QUALITY ASSURANCE

- A. Installation and testing of metal work shall be in accordance with this specification and the instructions provided by suppliers.

1.06 SUBMITTALS

A. Shop Drawings

1. Metal fabrications, including welding and fastener information.
2. Specific instructions for concrete anchor installation, including drilled hole size, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

B. Quality Control Submittals

1. Concrete and Masonry Drilled Anchors
 - a. Manufacturer's product description and installation procedures.
 - b. Current test data.
 - c. Adhesive Anchor Installer Certification.
2. Certification of all welders.

C. Qualifications

1. Adhesive Anchor Installers: Trained and certified by manufacturer.
2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.
3. All Welding shall be performed by qualified welders and shall conform to the applicable AWS Code.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Insofar as practical, factory assemble items specified herein. Assemblies that due to necessity have to be shipped unassembled shall be packaged and tagged in manner that will protect materials from damage and will facilitate identification and field assembly.

- B. Protect painted coatings and hot-dip galvanized finishes from damage due to metal banding and rough handling. Use padded slings and straps.
- C. Store fabricated items in dry area, not in direct contact with ground.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Unless otherwise indicated, meet the following requirements:

<u>Item</u>	<u>Quantity</u>
Neoprene Gasket	Two for each location requiring neoprene gaskets.
Neoprene Gasket Adhesive	One (manufacturer’s recommended) for each location requiring neoprene gaskets.
<u>Item</u>	<u>ASTM Reference</u>
Steel Shapes and Plates	A36
Welded, Seamless Steel Pipe	A501 or A53, Type E or S, Grade B Structural Steel
Structural Steel Tubing	A500, Grade B
Stainless Steel	
Bars and Angles	A276, AISI Type 316
Shapes	A276, AISI Type 316
Steel Plate, Sheet, and Strip	A240, AISI Type 316
Bolts, Threaded Rods, Anchor Bolts, and Anchor Studs	F593, AISI Type 316
Nuts	F594, AISI Type 316
Steel Bolts and Nuts	
Carbon Steel	A307 bolts, with A563 nuts
High-Strength	A325, Type 1 bolts, with A563 nuts
Anchor Bolts and Rods	F1554, Grade 55, with weldability supplement S1.
Eyebolts	A489
Threaded Rods	A36
Flat Washers (Unhardened)	F844
Flat and Beveled Washers (Hardened)	F436
Thrust Ties for Steel Pipe	
Threaded Rods	A193, Grade B7
Nuts	A194, Grade 2H
Plate	A283, Grade D
Welded Anchor Studs	A108, Grades C-1010 thru C-1020
Cast Iron	A48, Class 35
Galvanizing	ASTM A123, ZN w/.05 % minimum Ni
Galvanizing Hardware	ASTM A153, ZN w/.05% minimum Ni
Welding electrodes, steel	AWS A5.1 E70xx

- B. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, zinc-plated steel, and aluminum material types as indicated in FASTENER SCHEDULE at end of this section.

2.02 ANCHOR BOLTS

A. Cast-In-Place Anchor Bolts

1. Headed type, unless otherwise shown on Drawings.
2. Material type and protective coating as shown in fastener schedule at end of this section.

2.03 CONCRETE DRILLED ANCHORS

A. General

1. AISI Type 316 stainless, hot-dip galvanized, or zinc-plated steel, diameter as shown on Drawings. Refer to fastener schedule at end of this section for material type.
2. Current evaluation and acceptance reports by ICBO or other similar code organization.
3. Acceptable for use in potable water structures by EPA and local health agencies or NSF.

B. Wedge Anchors

1. Manufacturers and Products
 - a. ITW Ramset/Red Head, Wood Dale, IL; Trubolt Wedge Anchor.
 - b. Hilti, Inc., Tulsa, OK; Kwik-Bolt II Stud Anchor.
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Wedge-All Anchor.
 - d. Wej-It Corp., Tulsa, OK; ANKRtite Wedge Anchor.
 - e. U.S. Anchor, Pompano Beach, FL; Kingpin Wedge Anchor.
 - f. Or equal.

C. Expansion Anchors

1. Self-drilling anchors, snap-off or flush type, zinc-plated.
2. Nondrilling Anchors: Flush type for use with zinc-plated or stainless steel bolt, or stud type with projecting threaded stud.
3. Manufacturers and Products:
 - a. ITW Ramset/Red Head, Wood Dale, IL; Multi-Set II Drop-In and Self Drill Anchor.
 - b. Hilti, Inc., Tulsa, OK; Hilti HDI Drop-In Anchor.
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Drop-In Anchor.
 - d. Or equal.

D. Sleeve Anchors

1. Manufacturers and Products
 - a. ITW Ramset/Red Head, Wood Dale, IL; Dynabolt Hex Nut Sleeve Anchor.
 - b. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Sleeve-All Hex Head Anchor.
 - c. Wej-It Corp., Tulsa, OK; Wej-It Sleeve Anchor.
 - d. Or equal.
- E. Adhesive Anchors
 1. Threaded Rod
 - a. ASTM F593 stainless steel threaded rod, diameter as shown on Drawings.
 - b. Length as required to provide minimum depth of embedment.
 - c. Clean and free of grease, oil, or other deleterious material.
 2. Adhesive
 - a. Two-component, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
 - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
 - c. Non sag, with selected viscosity base on installation temperature and overhead application where applicable.
 3. Packaging and Storage
 - a. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
 - b. Store adhesive cartridges on pallets or shelving in covered storage area, in accordance with manufacturer's written instructions.
 - c. Cartridge Markings: Include manufacturer's name, product name, material type, batch or serial number, and adhesive expiration date.
 - d. Dispose of cartridges if shelf life has expired.
 4. Manufacturers and Products
 - a. ITW Ramset/Red Head, Wood Dale, IL; Epcon Ceramic 6 Epoxy or A7 Adhesive Anchor System. (Use only Epcon A7 Adhesive System for hollow masonry.)
 - b. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT HY 150 (HIT HY 20 for hollow masonry).
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Epoxy-Tie Adhesive ET.
 - d. Covert Operations, Inc., Long Beach, CA; CIA-Gel 7000 Epoxy Anchors.
 - e. Unitex, Kansas City, MO; Pro-Poxy 300 and Pro-Poxy 300 Fast Epoxy Adhesive Anchors.

f. Or equal.

F. Adhesive Threaded Inserts

1. Stainless steel, internally threaded insert.
2. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIS-R Insert with HIT HY 150 adhesive, or equal.

2.04 WELDED ANCHOR STUDS

A. Headed anchor studs (HAS) or threaded anchor studs (TAS), as indicated on Drawings.

1. Carbon Steel: ASTM A108, Grades C-1010 through C-1020, unless indicated otherwise.
2. Stainless Steel: ASTM F593, AISI Type 316 where indicated.

B. Manufacturers:

1. Nelson Stud Welding Div., TRW, Inc., Elyria, OH.
2. Stud Welding Associates, Inc., Elyria, OH.
3. Or equal.

2.05 PIPE SLEEVES

A. ASTM A53, Schedule 40 steel pipe sleeves with continuously welded 3/16-inch thick seep ring with outside diameter 3 inches greater than sleeve outside diameter. Hot-dip galvanize in accordance with ASTM A123.

2.06 METAL GRATING

A. Bar type grating shall have rectangular 3/16-in thick bearing bars spaced at 1-3/16- in on center with cross bars spaced at 4-in on center unless otherwise indicated.

1. Grating shall be of the sizes shown on the Drawings and shall not exceed the fabricator's maximum recommended span for that size.
2. Openings 2-in or greater in diameter/dimension and grating edges shall be banded with a bar of the same depth and thickness as the bearing bars. Cut bearing bars or cross bars shall be welded to the banding bars.
3. Grating fastening devices including clamps, clips, nuts, bolts, washers and other fastening devices for rating and grating supports shall be galvanized steel. All grating shall be anchored to the supporting system using grating clamps.
4. Grating material shall be galvanized steel. Cross bars shall be attached to the bearing bars as recommended by the manufacturer. The grating shall be Type B by IKG Borden, Type 19-W-4 by Ohio Gratings, Inc. or approved equal.

2.07 ACCESS HATCHES

A. Access hatches shall be of single leaf construction in sizes shown on the drawings. Covers shall be 1/4" minimum aluminum plate reinforced for an AASHTO H-20 wheel

load with a maximum deflection of $1/150^{\text{th}}$ of the span length. Channel frame shall be $1/4''$ minimum with full anchor flange around the perimeter.

- B. Covers shall be equipped with forged hinges with stainless steel pins and shall pivot so cover does not protrude into the channel frame. Hinges shall be bolted to the covers with tamperproof lock bolts and shall be through bolted to the frame with stainless steel bolts and lock nuts. Covers shall be equipped with compression springs enclosed in telescopic tubes. Upper tube shall be the outer tube to prevent accumulation of moisture, grit and debris inside the tube assembly. Lower tube shall interlock with a flanged support shoe fastened to a formed $1/4$ -inch gusset support plate.
- C. Covers shall be fitted with the required number and size of compression spring operators to afford ease of operation through the entire arc of opening and to act as a check in retarding downward motion when being closed. Springs and operating mechanisms shall be designed to allow one person to open or close all hatches. Covers shall be equipped with a hold-open arm which automatically and positively locks the cover in the open position. A conveniently located handle shall release the covers for closing.
- D. A stainless steel snap lock with fixed turn handle shall be mounted on the underside of the cover. A removable exterior latch handle shall be provided and the latch release shall be protected by a flush and gasketed removable screw plug. Covers shall have a lift handle that is designed to be flush with the walking surface when not in use. A 1-1/2 inch drain coupling shall be welded under the frame drainage trough for pipe connection. Hardware shall be Type 316 stainless steel including spring tubes, springs, lifting mechanism supports and tube caps, support shoes, hold open arms, hold-open arm guides, hinges, hinge pins, snap lock and lock strike, all fasteners and padlock.
- E. Exterior hatches shall be equipped with a watertight stainless steel slamlock with threaded plug, removable outside key, and fixed inside handle and have a recessed hasp padlock frame and cover. The slamlock must latch onto a stainless steel catch that is bolted to the frame.
- F. Fall through prevention system: The access hatch shall be equipped with a fall through protection grating which is lockable. The grating shall be constructed of 1 inch bar aluminum, be hinged with a positive latch and lock. The grating shall be finished with a safety orange or yellow coating. All hardware shall be Type 316 stainless steel.
- G. Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame. Installation shall be in accordance with the manufacturer's instructions and manufacturer shall guarantee satisfactory operations. Manufacturer shall guarantee against defects in material or workmanship for a period of five years.
- H. Hatches shall be Type J by Bilco Co. with modifications and features noted or equal.

2.08 FABRICATION

A. General

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.

2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Grind cut edges smooth and straight. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Fit and assemble in largest practical sections for delivery to site.

B. Welding

1. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
2. Welded fabrications shall be free from twisting or distortion caused by improper welding techniques.
3. Steel: Meet fabrication requirements of AWS D1.1, Section 5.
4. Stainless Steel: Meet requirements of AWS D1.6.
5. Welded Anchor Studs: Prepare surface to be welded and weld with stud welding gun in accordance with AWS D1.1, Section 7, and manufacturer's instructions.
6. Complete welding before applying finish.

C. Painting

1. Shop prime with rust-inhibitive primer as specified in Section 09900, PAINTING, unless otherwise indicated.
2. Coat surfaces of galvanized steel and aluminum fabricated items to be in contact with concrete with System No. 27 as specified in Section 09900, PAINTING.

D. Galvanizing

1. Fabricate steel to be galvanized in accordance with ASTM A143, A384, and A385. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.
3. Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.
4. Hot-dip galvanize steel members, fabrications, and assemblies after fabrication in accordance with ASTM A123.
5. Hot-dip galvanize bolts, nuts, washers, and hardware components in accordance with ASTM A153. Oversize holes to allow for zinc alloy growth. Shop assemble bolts and nuts.
6. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.

- E. Fitting: Where movement of fabrications is required or shown, cut, fit, and align items for smooth operation. Make corners square and opposite sides parallel.
- F. Accessories: Furnish as required for a complete installation. Fasten by welding or with stainless steel bolts or screws.

2.09 SOURCE QUALITY CONTROL

- A. Visually inspect all fabrication welds and correct any deficiencies.
 - 1. Steel: AWS D1.1, Section 6 and Table 6.1, Visual Inspection Acceptance Criteria.
 - 2. Stainless Steel: AWS D1.6.

PART 3 – EXECUTION

3.01 INSTALLATION OF METAL FABRICATIONS

- A. General
 - 1. Install metal fabrications plumb or level, accurately fitted, free from distortion or defects.
 - 2. Install rigid, substantial, and neat in appearance.
 - 3. Install manufactured products in accordance with manufacturer's recommendations.
 - 4. Obtain PM/CM approval prior to field cutting steel members or making adjustments not scheduled.
- B. Pipe Sleeves
 - 1. Provide where pipes pass through concrete or masonry.
 - 2. Holes drilled with a rotary drill may be provided in lieu of sleeves in existing walls.
 - 3. Provide a center flange for water stoppage on sleeves in exterior or water-bearing walls where indicated on the Drawings.

3.02 ANCHOR BOLTS

- A. Accurately locate and hold anchor bolts in place with templates at the time concrete is placed.
- B. Use sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt.

3.03 CONCRETE DRILLED ANCHORS

- A. Begin installation only after concrete to receive anchors has attained design strength.
- B. Install anchors in accordance with manufacturer's instructions.
- C. Provide minimum embedment, edge distance, and spacing as follows, unless indicated otherwise by anchor manufacturer's instructions or shown otherwise on Drawings.

- D. When embedded steel or rebar is encountered in the drill path, slant drill to clear obstruction. If drill must be slanted more than 10 degrees to clear obstruction, notify PM/CM for direction on how to proceed.
- E. Adhesive Anchors
 - 1. Do not install adhesive anchors when temperature of concrete is below 40 degrees F or above 100 degrees F.
 - 2. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry where required by manufacturer's instructions.
 - 3. Do not disturb anchor during recommended curing time.
 - 4. Do not exceed maximum torque as specified in manufacturer's instructions.

3.04 ACCESS HATCHES

- A. Install access hatches in accordance with manufacturer's instructions.
- B. Accurately position prior to placing concrete, such that covers are flush with floor surface.
- C. Protect from damage resulting from concrete placement. Thoroughly clean exposed surfaces of concrete spillage to obtain a clean, uniform appearance.

3.05 ELECTROLYTIC PROTECTION

- A. Painted Galvanized Surfaces: Prepare as specified in Section 09900, PAINTING.
- B. Zinc coating which has been burned by welding, abraded, or otherwise damaged shall be cleaned and repaired after installation. The damaged areas shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to repair painting. The cleaned area shall be painted with two coats of approved metallic zinc-dust paint. The paint shall be properly compounded with a suitable vehicle and shall contain 83 percent metallic zinc by weight.

3.06 FASTENER SCHEDULE

- A. Provide fasteners as follows:

Service Use and Location	Product
1. Anchor Bolts Cast Into Concrete for Equipment Bases	
Interior Dry Areas	Stainless steel headed anchor bolts, unless otherwise specified with equipment
Submerged, Exterior, Interior Wet and Corrosive Areas	Stainless steel headed anchor bolts, unless otherwise specified with equipment
2. Anchor Bolts Cast Into Concrete for Metal Fabrications and Structural Components	
Interior Dry Areas	Stainless steel headed anchor bolts
Submerged, Exterior, Interior Wet and Corrosive Areas	Stainless steel headed anchor bolts with fusion bonded coating
3. Drilled Anchors for Metal Components to Concrete (e.g., Electrical Panels and Equipment)	
Interior Dry Areas	Zinc-plated or stainless steel wedge or expansion anchors
Submerged, Exterior, Interior Wet, and Corrosive Areas	Adhesive stainless steel anchors
4. Connections for Steel Fabrications and Wood Components	
Exterior and Interior Wet and Dry Areas	Stainless steel bolts
5. Connections of Aluminum Components	
Submerged, Exterior and Interior Wet and Dry Areas	Stainless steel bolts
6. All Others	
Exterior and Interior Wet and Dry Areas	Stainless steel fasteners

B. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION 05500

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SECTION 05510

ALUMINUM STAIRS AND LADDERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for the fabrication and installation of aluminum stair and ladder systems.

B. Related Sections

1. Section 05500 – Metal Fabrications
2. Section 05520 - Aluminum Handrails and Railings.
3. Section 05530 – Metal Grating

1.02 SYSTEM DESCRIPTION

A. Design Requirements

1. Comply with the provisions of the following codes, standards, and specifications, except as otherwise shown or specified.

a. The Aluminum Association Designations:

Structural rolled or extruded shapes	6061-T6
Extruded shapes	6063-T5
Plates	6061-T6
Gratings (bearing bars)	6061-T6
(crimp bars)	6063-T6
Sheets	Alcad 3003-H14 and 3003
Bolts and nuts	2024-T4

B. Performance Requirements

1. Stairs are to be fabricated to support a live load of 100 lbs. /sq. ft. and a moving concentrated load of not less than 300 lbs.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Complete shop drawings and design computations, stamped by a Professional Engineer registered in the State of Rhode Island who is experienced in this type of work. All computations shall be in conformance with the Specifications for Aluminum Structures, (SAS) 30, by the American Aluminum Association. This submission will be reviewed by the Engineer but design responsibility remains with the Contractor and the Contractor's Engineer and under no circumstances, does the Engineer assume responsibility for the means, methods, sequences, procedures or techniques in connection with the performance of any of the work of the Contractor.
2. Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor, details and installation instructions for products to be used in the fabrication of aluminum stair work, include coating products. Transmit copy of instructions to the installer.

3. Shop drawings for the fabrication and erection of aluminum stair assemblies and ladders. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.
4. Mill certificates and a signed statement from the fabricator that all aluminum work furnished is of the proper alloys as specified herein.

1.04 SEQUENCING

A. Inserts and Anchorages:

1. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the handrails and railings work.
2. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.
3. Coordinate delivery with other work to avoid delay.

PART 2 PRODUCTS

2.01 STAIR SYSTEMS

A. Aluminum stairs

1. Provide structural aluminum channel stringers and supports, aluminum tread plate treads and platforms, sheet aluminum risers, grating treads and platforms as indicated on the Drawings and in the details.

B. Plate treads

1. Formed from ¼ inch thick aluminum tread plate and the risers shall be formed from 0.080-inch thick sheet aluminum.
2. Treads shall be supported by and attached to 1-1/4 inch by 1-1/4 inch by 3/16 inch aluminum carrier angles bolted to the stringers.
3. Treads shall be the widths indicated.
4. Risers shall be bolted to the treads.

C. Plate platforms

1. Fabricated of ¼ inch thick aluminum tread plate and shall be supported on the edges by structural aluminum angles and at the mid spans by structural aluminum tees.

D. Aluminum tread plate for treads and platforms shall have an acceptable nonskid pattern surface.

E. Provide all structural aluminum angle hangers, struts, rod hangers, closure plates, and brackets indicated or necessary to complete the stairs as indicated.

F. Grating stair treads

1. In accordance with SECTION 05530 and the following:
2. Welded aluminum safety treads with 1-1/4 inch abrasive or extruded aluminum corrugated nosings.
3. Punched and slotted integral carrier plates for attaching to the channel stringers.

G. Grating platforms

1. In accordance with SECTION 05530 and the following:
2. Constructed of the specified aluminum grating and shall have the same nosings as the treads.
3. Supported at the ends on structural aluminum angles and at the mid spans by structural aluminum tees.

2.02 LADDERS

- A. Constructed of pipe uprights with solid round rod rungs mortised and welded to the uprights. Securely anchor to the wall with angles or bent plates, as indicated, welded to the uprights and expansion bolted to the wall. All welds shall be ground smooth.
- B. Interior ladders shall be secured to the floor slabs with floor flanges as indicated.
- C. The uprights of ladders to roofs or platforms shall widen at the top, extend above the roof or platform level, and shall be turned back to form guard rails.
- D. Construct from 1-1/2 inch IPS, Schedule 40 aluminum pipe uprights and 1 inch solid round aluminum rod rungs unless otherwise indicated on the drawings. After fabrication, the aluminum ladders shall be given an Aluminum Association Standard Finish, Designation M12C22A31 followed by a shop coat of methacrylate lacquer.

2.03 HANDRAILS

- A. In accordance with Specification SECTION 05520.

2.04 SHIP LADDER

- A. Constructed of aluminum channel stringers, aluminum pipe handrails and aluminum riveted grating treads. The treads to be Type K manufactured by Borden Metal products Co., Elizabeth, NJ; Reticuline Type M manufactured by IKG Industries, Long Island City, NY; Type KM manufactured by Kerrigan Iron Works, Inc., Nashville, TN; or acceptable equivalent product.
- B. Bearing bars of treads to be 3/16 inch thick by 1-1/4 inch deep and be fabricated of 6061-T6 aluminum alloy.
- C. Crimp bars to be fabricated of 6063-T5 aluminum alloy, riveted on 7 inch centers, and raised slightly above the bearing bars and serrated.
- D. Treads to be provided with integral slotted and punched end plates for attaching to stringers. Treads to be provided with 1-1/4 inch abrasive or extruded aluminum corrugated nosings.
- E. Provide structural aluminum clip angles, brackets and fasteners to complete the ship ladders as detailed on the Drawings.

2.05 FASTENERS

- A. Stainless steel in accordance with SECTION 05500.

2.06 FABRICATION

A. Shop Assembly

1. Use materials of the size and thickness shown, or if not show, of the required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to conform to the dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use the type of materials shown or specified for the various components of work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 of an inch unless otherwise shown. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.
3. Weld corners and seams continuously in accordance with the recommendations of the American Welding Society. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flathead (countersunk) screws or bolts.
5. Provide for anchorage of the type shown, coordinated with the supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support for the intended use of the work.
6. Pre-assemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Anchorages

1. Furnish setting drawings, diagrams, templates instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors.
2. Install inserts and anchorage devices in accordance with Section 05500.
3. The use of impact imbedded fasteners will not be allowed.

3.02 FASTENING TO IN-PLACE CONSTRUCTION

- A. Provide anchorage devices and fasteners where necessary for securing stair items to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required.

3.03 CUTTING, FITTING AND PLACEMENT

- A. Perform all cutting, drilling and fitting required for the installation of the miscellaneous metal items. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or

anchors in framework for items which are to be built into concrete, masonry or similar construction.

- B. Fit exposed connections accurately together for form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations.

3.04 FIELD WELDING

- A. Comply with AWS Code for the procedures of manual shielded metalarc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.05 ALUMINUM WORK PROTECTION

- A. Aluminum surfaces be in contact with concrete or masonry to be protected by a coat of Coal Tar 46-465 H. B. Themecol manufactured by Tnemec Company, North Kansas City, MO; Bitumastic Super Service Black manufactured by KOP-COAT, Inc., Pittsburgh, PA; or an acceptable equivalent product.
- B. Areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances, and shall be immersed in or swabbed with an acceptable solvent. Next, the surfaces shall be rinsed with clear water and thoroughly dried.
- C. Protect against electrolysis where aluminum is to be used in conjunction with dissimilar metals.
- D. Where a shop coating of methacrylate lacquer has been specified on aluminum work to protect the surface from stain, the protective coating of lacquer worn off due to handling or erection shall be replaced in the field by a new coating of lacquer of the same type.
- E. During construction, care shall be taken to prevent damage to the aluminum work from splashing or by the accumulation of paint, concrete, mortar, or other similar materials.

3.06 CLEANING ALUMINUM WORK

- A. After aluminum has been erected, it shall be cleaned with mild soap and water, followed by a clear water rinse.

END OF SECTION

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SECTION 05520

ALUMINUM HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for fabrication and installation of aluminum handrails and railing.

B. Related Sections

1. Section 05500 – Metal Fabrications

1.02 PERFORMANCE REQUIREMENTS

- A. Railing assembly including anchoring of posts and framing members shall be capable of withstanding a minimum load of at least 200 lb. applied in any direction at any point on the top rail.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Manufacturer's specifications, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of handrails and railings, include coating products. Transmit copy of instructions to the installer.
2. Shop drawings for the fabrication and erection of handrail and railing assemblies. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

1.04 QUALITY ASSURANCE

A. Qualification for Welding Work.

1. Confirm welding processes and welding operators in accordance with the American Welding Society, AWS D1.2, Structural Welding Code – Aluminum.

1.05 PROJECT CONDITIONS

A. Field Measurements.

1. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of the work to existing features and work completed under this Contract.
2. Coordinate fabrication with Construction Schedule.
3. Where field measurements cannot be made without delaying the Work, proceed with fabricating metal fabrications upon receipt of Engineer reviewed and approved shop drawings, without field measurements. Allowance shall be made for trimming and fitting.

1.06 SEQUENCING

A. Inserts and Anchorages:

1. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for the installation of the handrails and railings work.
2. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.
3. Coordinate delivery with other work to avoid delay.

PART 2 PRODUCTS

2.01 HANDRAILS AND RAILINGS

A. General

1. All-welded construction.
2. Fabricated as indicated on the Drawings.
3. Stanchions to be 1-1/2 inch IPS, Schedule 80 aluminum pipe, alloy 6063-T6
4. Top and intermediate rails and returns to be 1-1/2 inch Schedule 40 aluminum pipe, alloy 6063-T6.
5. Fabricate in panels with joints made in a neat and inconspicuous manner.
6. All exposed welds shall be ground smooth.
7. Provide stainless steel anchor bolts and fasteners in accordance with SECTION 05500.

B. Removable pipe railings

1. Fabricated in the same manner as fixed railings.
2. Installed as indicated.

C. Brackets for wall-mounted handrails

1. Cast aluminum pipe rail brackets with curved tops.
2. 3 inch projection from wall to the center of the handrail.

D. Brackets for floor mounted stanchions

1. Cast aluminum of the round, flat base flange configuration.
2. Designed to withstand the required loading and to support and reinforce the post.

E. Brackets for side-mounted stanchions

1. Aluminum brackets as detailed on the Drawings.
2. Provide a 1-3/8 inch projection from wall to the center of the stanchion.

2.02 HANDICAPPED PROVISIONS

- A. Provide knurled, abrasive or other textured finish on portions of handrails, a distance of 4 feet from stairs and other openings, to indicate a danger signal in accordance with applicable ADA requirements.

2.03 FABRICATION

A. Shop Assembly:

1. Form exposed work true to line and elevation with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 of an inch, unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.
2. Weld corners and seams continuously in accordance with the recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
3. Form exposed connections with flush, smooth, hairline joints, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flathead (countersunk) screws or bolts.
4. Provide for anchorage of the type shown, coordinated with the supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support.
5. After fabrication, all aluminum pipe railings shall receive an Aluminum Association Standard Anodic Finish, Designation M12C22A31.
6. Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Anchorages

1. Furnish setting drawings, diagrams, templates instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors.
2. Install inserts and anchorage devices in accordance with Section 05500.
3. The use of impact imbedded fasteners will not be allowed.

3.02 FASTENING TO IN-PLACE CONSTRUCTION

A. Provide anchorage devices and fasteners where necessary to secure handrails and railings to in place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wedge anchors and other connectors as required.

3.03 CUTTING, FITTING AND PLACEMENT

- A. Perform all cutting, drilling and fitting required for the installation. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in framework for items which are to be built into concrete, masonry or similar construction.
- B. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop-welded because of shipping size limitations.
- C. Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 8 feet on centers, unless

otherwise shown. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Handrail stanchions shall be mounted on the top of stair stringers as indicated on the drawings.
 2. The stanchions set into concrete curbs shall be set into preformed holes and secured in place with nonshrinking grout. The holes shall be at least $\frac{3}{4}$ inches greater in diameter than the outside diameter of the stanchions and shall be a minimum of 5 inches deep.
 3. Products offered by manufacturers to comply with the requirements for hydraulic cement include the following:
 - a. Embeco: Master Builder's
 - b. Ferrolith G; Sonneborn Bldg. Products, Inc.
 - c. Por-Rok; Halemite Mfg. Co.
 4. The stanchions to be side-mounted to structure walls shall be attached to brackets anchored to the structure wall with wedge anchors or suitable fasteners providing a system capable of withstanding the minimum load as specified.
- D. Anchor rail ends into concrete and masonry with aluminum round flanges (unless shown otherwise) welded to rail ends and anchored into the wall construction with lead expansion shields and bolts.
- E. Secure handrails to walls as shown, or by means of wall brackets, and wall return fitting at handrail ends.
- F. Provide brackets with not less than 3 inch projection from the finish wall surface to the center of the pipe handrail, and with the wall plate portion of the bracket drilled to receive on $\frac{3}{8}$ inch bolt. Locate brackets not more than 60 inches on center. Provide flush-type wall return fittings with the same projection as that specified for wall brackets. Secure wall brackets and wall return fittings to building construction as follows:
1. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.
 2. For hollow masonry anchorage use toggle bolts having square heads.

3.04 FIELD WELDING

- A. Comply with AWS Code for the procedures of manual shielded metalarc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.05 ALUMINUM WORK PROTECTION

- A. Aluminum surfaces be in contact with concrete or masonry to be protected by a coat of Coal Tar 46-465 H.B. Themecol manufactured by Tnemec Company, North Kansas City, MO; Bitumastic Super Service Black manufactured by the KOP-COAT, Inc., Pittsburgh, PA; or an acceptable equivalent product.
- B. Areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as directed so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected. Before application of coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances, and shall be immersed in or swabbed with an acceptable solvent. Next, the surfaces shall be rinsed with clear water and thoroughly dried.

- C. Protect against electrolysis where aluminum is to be used in conjunction with dissimilar metals.
- D. During construction, care shall be taken to prevent damage to the aluminum work from splashing or by the accumulation of paint, concrete, mortar, or other similar materials.

3.06 CLEANING ALUMINUM WORK

- A. After aluminum has been erected it shall be cleaned with mild soap and water followed by a clear water rinse.

END OF SECTION

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SECTION 05530

METAL GRATING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements for the fabrication and installation of metal gratings and appurtenances.

B. Related Sections

1. Section 05500 - Metal Fabrications.
2. Section 05510 - Aluminum Stairs and Ladders.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A36, Specification for Carbon Structural Steel.
2. A123, Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
3. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
5. A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
6. A568, Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled.
7. B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
8. F593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
9. F594, Specification for Stainless Steel Nuts.
10. F844, Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

B. American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)

1. MBG 531, Metal Bar Grating Manual.
2. MBG 532, Heavy Duty Metal Bar Grating Manual.

1.03 SUBMITTALS

A. In accordance with Section 01300 submit the following:

1. Shop Drawings

- a. Grating: Show dimensions, weight, and size, and location of connections to adjacent grating, supports, and other work.
- b. Grating Anchorage: Show structural calculations and details of anchorage to supports to prevent displacement from traffic impact.
- c. Grating Supports: Show dimensions, weight, size, location, and anchorage to supporting structure.
- d. Catalog information and catalog cuts.

e. Manufacturer's specifications, to include coatings.

B. Samples:

1. Two samples of aluminum grating approximately 4 inches by 8 inches, showing at least four crossbars each and four bearing bars each.
2. One sample will be retained at the site to be used as a basis for acceptance or rejection of grating installed.

C. Quality Control Submittals:

1. Special handling and storage requirements.
2. Installation instructions.
3. Factory test reports.
4. Manufacturer's Certification of Compliance for specified products.
5. Written Test Report that swaged crossbars, if used on grating, meet the requirements of the specified test and additional requirements of these Specifications.

1.04 PREPARATION FOR SHIPMENT

- A. Insofar as is practical, factory assemble items provided.
- B. Package and clearly tag parts and assemblies that are of necessity shipped unassembled and protect the materials from damage, and facilitate identification and final assembly in the field.

PART 2 PRODUCTS

2.01 FOOT TRAFFIC GRATING

A. Design:

1. Uniform Service Load: 200 psf minimum uniform load and 300 pound minimum concentrated load, unless otherwise shown.
2. Maximum Deflection: 1/4 inch, unless otherwise shown.
3. Space bearing bars at 1-3/16-inch center-to-center.
4. Banding: 3/16-inch minimum.

B. Material:

1. Aluminum Bar Type Grating:
 - a. Press-locked rectangular design, as manufactured by IKG/Borden, Clark, NJ; IKG/Borden Type B or Type F.
 - b. Swage locked aluminum grating, rectangular bar type, as manufactured by:
 - 1) IKG/Borden, Clark, NJ; IKG/Borden Type BS or Type FS.
 - 2) Seidelhuber Metal Products, Inc., San Carlos, CA; Type A-2.
 - 3) Ohio Gratings, Inc., Canton, OH; Aluminum Flush Top, Type 19SGF2.
 - 4) Klemp Corp., Chicago, IL; Type KRP.

or

2. Aluminum Bar Type Grating:
 - a. Swage locked, rectangular bar grating in accordance with ASTM B221, 6061-T6
 - b. Provide with clear, Class II, anodized finish in accordance with Aluminum Association Designation AA-A31, 0.4 mils thick minimum.
 - c. Layout as indicated on the Drawings.

- d. Bearing Bars shall be of the depth noted on the drawings and shall be spaced at 1-3/16" on center.
 - e. Cross bars shall be spaced at 4" on center. Individual grating panels shall be banded around their edges and clipped to framing members with the grating manufacturer's standard fastening devices.
 - f. A serrated surface shall be provided where indicated on the Drawings.
 - g. Grating shall be 19-SG-4 as manufactured by Ohio Gratings, Inc. of Canton, OH, Type BS as manufactured by IKG Borden or Paramus, NJ, or Engineer approved equal.
3. Galvanized Steel Bar Type Grating: Press-locked, deep rectangular crossbar design, as manufactured by IKG/Borden, Clark, NJ; Type B or Type F.
 4. Stair Treads:
 - a. In accordance with this SECTION and the applicable requirements of SECTION 05510.

2.02 LIGHT VEHICULAR TRAFFIC GRATING

A. Design:

1. Maximum Load: 2,000 pounds per wheel, minimum wheel base and axle width of 4 feet 0 inch.
2. Space main bars at 1-3/16-inch center-to-center.
3. Banding: 1/4 inch.

B. Material:

1. Aluminum Bar Type Grating: Press-locked deep rectangular crossbar designed as manufactured by IKG/Borden, Clark, NJ, IKG/Borden; Type B or Type F.
2. Galvanized Steel Bar Type Grating:
 - a. After Fabrication: ASTM A123, zinc coating.
 - b. Manufacturer and Product: IKG/Borden, Clark, NJ; IKG/Borden heavy-weld Type HWF or Type HWB or press-locked, rectangular crossbar, Type FJ or BJ.

2.03 HEAVY VEHICULAR TRAFFIC GRATING

A. Design:

1. Loading: AASHTO HS 20-44.
2. Banding: 1/4 inch.

B. Material:

1. Galvanized Steel Bar Type:
 - a. Heavy-duty, main bars spaced at 1-7/8-inch maximum center-to-center.
 - b. After Fabrication: ASTM A123, zinc coating.
 - c. Manufacturer and Product: IKG/Borden, Clark, NJ; KG/Borden heavy-weld Type HWF or HWB or press-locked, rectangular crossbar, Type BJ or FJ.

2.04 ACCESSORIES

A. Anchor Bolts and Nuts:

1. Carbon Steel: ASTM A307 or A36.

2. Stainless Steel: ASTM F593 and ASTM F594, Type 316.
 3. Galvanized Steel Bolts and Nuts: ASTM A153, zinc coating for ASTM A307 or A36.
- B. Flat Washers
1. Carbon Steel: (Unhardened): ASTM F844; use ASTM A153 for zinc coating.
 2. Stainless Steel: see SECTION 05500.
- C. Removable Fastener Clips and Bolts:
1. Removable from above grating walkway surface.
 2. Hat Bracket: Type 304 stainless steel.
 3. Bolt: type 316 stainless steel.
 4. Cast iron, galvanized body.
 5. Manufacturer and Product: Struct-Fast, Wellesley Hills, MA; Gratefast.
- D. Partially Removable Anchor:
1. Bolt: Threaded stud, Type 316 stainless steel.
 - a. Manufacturer: Nelson Stud Welding Co., Lorain, OH.
 2. Hat Bracket: Type 304 stainless steel.
 - a. Manufacturer:
 - 1) Struct-Fast, Wellesley Hills, MA.
 - 2) Or equal.

2.05 FABRICATION

- A. General:
1. Exposed Surfaces: Smooth finish and sharp, well-defined lines.
 2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in a neat, substantial manner.
 3. Conceal fastenings where practical.
 4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
 5. Weld Connections: Not permitted on grating except at banding bars.
- B. Design:
1. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
 2. Section Length: Sufficient to prevent its falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.
 3. Minimum Bearing: ANSI/NAAMM MBG 531.
 4. Metal Crossbar Spacing: 4-inch maximum, unless otherwise shown or specified.
 5. Crossbars: Flush with top of main bar and extend downward a minimum of 50 percent of the main bar depth.
 - a. Swaged Crossbars:
 - 1) Within 1/4 inch of top of grating with 1/2-inch minimum vertical dimension after swaging, and minimum before swaging dimension of 5/16-inch square.
 - 2) Crossbar Dimension After Swaging: Minimum 1/8-inch wider than the opening at minimum of two corners at each side of each square opening in main bar.
 - 3) Crossbars may be a special extruded shape so that after swaging the top will be flat, 3/16 inches wide and will be flush with the top surface of the bearing bars for a minimum of 5/8 inches at center between bearing bars.

- 4) Flush crossbar meeting all of the above except that after swaging shall overlap one corner by a minimum of 1/8 inch. A sample of one bearing bar and one crossbar shall be tested by holding the bearing bar and pulling on the crossbar. The crossbar to bearing bar shall sustain a minimum of 300 pounds without pullout of the bearing bar.
 - 5) Tightly fit main bars and crossbars allowing no differential movement.
 6. Do not use weld type crossbars.
 7. Banding: Same material as grating: ANSI/NAAMM MBG 531 and ANSI/NAAMM MBG 532.
 8. Furnish stainless steel Type 316 threaded anchor studs, as fasteners for grating attachment to metal supports either not embedded or partially embedded in concrete, as manufactured by Nelson Studs Welding Co., Loraine, OH.
- C. Supports:
1. Seat angles and beams where shown:
 - a. Same material as rectangular bar grating.
 - b. Extruded aluminum frame with slot for recessed grating clips, as manufactured by Thompson Fabricating Co., for aluminum I-Bar type grating.
 2. Coordinate dimensions and fabrication with grating to be supported.
 3. Coordinate dimensions with increased depth due to serrations.
 4. Welded Frames With Anchors: Continuously welded.
- D. Slip-Resistant Surface:
1. Rectangular Steel and Aluminum Bar Grating (as noted): As manufactured by:
 - a. IKG/Borden, Clark NJ; EZ Weldslip-Resistant Coating.
 - b. Seidelhuber Metal Products, Inc., Hayward, CA; Safety Grit Non-Slip System.
 - c. Ohio Gratings, Inc., Canton, OH with "Slip-Not" Safety Surface manufactured by W.S. Molnar Co., Detroit, MI.
 2. I-Bar grating aluminum shall incorporate a striated anti-skid walking surface produced during the extrusion process, as manufactured by:
 - a. IKG/Borden, Clark, NJ.
 - b. Seidelhuber Metal Products, Inc., Hayward, CA.
 - c. Klemp Corp., Chicago, IL.
- E. Aluminum:
1. ASTM B221 extruded shapes.
 2. Fabricate as shown and in accordance with manufacturer's recommendations.
 3. Grind smooth sheared edges exposed in the finished work.
 4. Swage crossbars, if used, with equipment strong enough to deform crossbars.
 5. Eliminate any loose crossbar intersections on swaged grating.
- F. Foot Traffic Grating: Any single grating section, individual plank, or plank assembly shall be not less than 1 foot 6 inches or greater than 3 feet 0 inch in width or weigh more than 150 pounds.
- G. Light Vehicular Traffic Grating: Any single grating section, individual plank, or plank assembly shall not be less than 1 foot 6 inches or greater than 3 feet 0 inch in width (except 3/8-inch thick bearing bar grating), or weigh more than 150 pounds.
- H. Heavy Vehicular Traffic Grating: Minimum width of grating sections shall be 2 feet 0 inch regardless of length or weight.

PART 3 EXECUTION

3.01 PREPARATION

A. Electrolytic Protection:

1. Aluminum surfaces in contact with dissimilar metals, other than stainless steel, and embedded or in contact with masonry, grout, and concrete, to be protected by a coat of Bitumastic Super Service Black manufactured by KOP-COAT, Inc., Pittsburgh, PA; 46-465 Heavy Themecol manufactured by Tnemec Company, North Kansas City, MO; or an acceptable equivalent product.

3.02 INSTALLATION

- A. Install supports such that grating sections have a solid bearing on both ends, and that rock and wobble grating movement does not occur under designed traffic loading.
- B. Install plumb or level as applicable.
- C. Install welded frames with anchors to straight plan without offsets.
- D. Anchor grating securely to supports using minimum of four fasteners clips and bolts per grating section.
- E. Use stainless steel anchors and accessories with aluminum gratings.
- F. Completed installation shall be rigid and neat in appearance.
- G. Commercially Manufactured Products:
 1. Install in accordance with manufacturer's recommendations.
 2. Secure grating to support members with fasteners.
 3. Welding is not permitted.
 4. Fasteners: Field locate and install.
 5. Permit each grating section or plank style grating assembly to be easily removed and replaced.
- H. Protect painted surfaces during installation.
- I. Should coating become marred, prepare and touch up surface in accordance with paint manufacturer's instructions.

END OF SECTION

DIVISION 06

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements to provide rough carpentry necessary for the proper completion of all work shown on the Drawings or specified herein which generally shall consist of the following:
 - 1. Furnish, erect and maintain all exterior staging over eight feet in height required by all trades for the proper execution of their work.
 - 2. Install all wood blocking, wood grounds, and wood nailers in all areas requiring attachment of work of other sections of this Specification.
 - 3. All miscellaneous carpentry work not specifically shown on the Drawings or specified herein, but customarily done under this Section and necessary to proper completion of the work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All lumber shall be of sound stock delivered dry and shall be fully protected at all times from injury and dampness. Split, broken or otherwise damaged pieces will not be allowed in the work.
- B. Wood members that will be in contact with concrete shall be pressure treated. Treatment shall consist of a wood preservative applied under pressure using chromated copper arsenate (Fed. Spec. TT-W-550b), AWWA Std. P5, or fluor chrome arsenate phenol (Fed. Spec. TT-W-535a), AWWA Std. P5, in accordance with the requirements for treating wood. Net final retention of oil shall be not less than 0.35 lb per cu ft. Lumber and treatment shall conform to GENERAL REQUIREMENTS FOR TREATED LUMBER hereinafter.
 - 1. Lumber shall be of the form, structural grade and dressing as shown, specified or required.
 - 2. Lumber shall be fastened with approved nails, spikes, bolts, rods, plates and all other hardware of indicated or required sizes and lengths.
 - 3. Treatment shall consist of a wood preservative applied under pressure by the empty cell process of impregnation using pentachlorophenol solution in petroleum to 5 percent (Fed. Spec. TT-W-570a), AWWA Std. P8. Net final retention of oil shall be not less than 10 lb per cu ft. Lumber and treatment shall conform to GENERAL REQUIREMENTS FOR TREATED LUMBER hereinafter. Lumber shall be dressed, tongue and grooved, bored and framed as required prior to treatment.
 - 4. Wood for blocking, and nailers shall be Construction Grade, Douglas Fir or Ponderosa Pine.
 - 5. Nails, spikes, etc., where sizes are not indicated or specified, shall be of suitable size and number to securely fasten and hold members in place. All fasteners for exterior workmanship of furring shall be hot-dip galvanized.

2.02 GENERAL REQUIREMENTS FOR TREATED LUMBER

- A. All pressure treatments shall conform to the latest appropriate standard specifications of the American Wood-Preservers' Association.
- B. Lumber shall be conditioned for treatment by air-seasoning, by kiln drying, by steaming, by heating in the preservative either at atmospheric pressure or under vacuum, or by a combination of them, in such a manner as will not cause damage to the timber for the use intended. Conditioning of lumber for pressure treatment shall conform to the requirements of AWWA Spec. C1 "Standard for Preservative Treatment by Pressure Processes -- All Timber Products".
- C. Pressure treatments shall comply with all applicable portions of AWWA Standards C2, C9, and C28.
- D. Tests of pressure treated material shall conform to Paragraph 3, "Results of Treatment" of AWWA Spec. C1.
- E. Treated timber shall be handled, bored, framed and field treated in complete conformance with AWWA Spec. M4 "Standard Instructions for the Care of Pressure Treated Wood After Treatment", where permitted by the Engineer. Treated lumber or timber injured so as to impair its structural capabilities or its preservative qualities will be rejected, and such material shall be removed from the job.
- F. When pressure treated materials have been cut into, or bored after treatment, where permitted, all cuts, chamfers, holes and damaged portions of lumber shall be carefully field treated with hot preservative solution and over-coated with a hot coal tar pitch coating. All holes bored after treatment shall be treated with equipment to apply preservative under pressure, using the Greenlee Bolt Treater or equal. Counterbored holes shall be coated with hot preservative followed by filling with an approved pitch or asphalt mastic.
- G. The Contractor shall furnish a certificate by the preservative treating plant warranting the grade of lumber, the quality of preservative used and the net final retention of preservative in pounds per cubic foot.

PART 3 EXECUTION

3.01 ROUGH CARPENTRY

- A. Framing shall be well nailed, spiked, or bolted together, erected plumb and true in accurate planes, and set accurately to support finished work.
- B. Wood anchored to concrete or masonry shall be rigidly fastened with 5/8-in. bolts countersunk flush, or as shown on the Drawings.
- C. Provide and set all grounds for finish.
- D. Do all necessary blocking of sizes and shapes as shown for all finish; use merchantable wood well secured in place.

3.02 INSTALLATION

- A. Fabricated products shall be installed in strict accordance with manufacturer's instruction, and/or as shown on the drawings.
- B. Work shall be done in neat, workmanlike manner by carpenters experienced in work of the type required herein.

END OF SECTION

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SECTION 06501

FLOATABLES CONTROL SCREEN

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to design, fabricate and erect the floatables control screen and associated support framing as shown on the Drawings , and specified herein.

B. Related Sections

1. Section 01400 – Quality control

1.02 DESIGN REQUIREMENTS

- A. This Section contains components and connectors that require Contractor design. Alternative support frames are allowable provided the design criteria, specified herein, is attained and the support frames do not exceed 3-inches in diameter.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM C 881: Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
2. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.
3. ASTM D 785: Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
4. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM D 792: Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement.
6. ASTM A312/A312M-00: Specification for Seamless and Welded Austenitic Stainless Steel Pipes submittals

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300

B. Floatables Control Screen

1. Product Data: Catalog information, catalog cuts, and manufacturer's specifications.
2. Detailed drawings showing dimensions, weights, panel sizes, connection locations, and connection details.

3. Structural calculations, including complete stress and deflection calculations.
 4. Hydraulic calculations showing headloss through unobstructed floatables control screens.
- C. Support Framing: (if support frame different from dimensions provided on Contract Drawings)
1. Detailed drawings showing dimensions, member sizes, connection details, and anchorage details for attaching the framing to the supporting concrete structure.
 2. Structural calculations, including complete stress and deflection calculations for the members, connections, and anchorages to the supporting concrete structure.
- D. Adhesive Anchors:
1. Product Data: Catalog cuts and allowable load tables.
 2. Current test data or ICBO or CABO evaluation report.
 3. Quality Control Submittals:
 - a. Handling and storage requirements.
 - b. Manufacturer's installation instructions.
 - c. Factory test reports for physical properties of product.
 - d. Manufacturer's Certification of Compliance for specified products.
 - e. Fabricator's qualification experience.
 - f. Manufacturer's qualification experience.

1.05 QUALIFICATIONS

- A. Designer: Calculations required for Contractor design shall be stamped by a registered PROFESSIONAL ENGINEER licensed in the state of Rhode Island.
- B. Fabricator: Minimum of 3 years' experience.
- C. Manufacturer: Minimum of 5 years' experience in the manufacturing of products meeting these specifications.
- D. Adhesive Anchor Installers: Trained and certified by manufacturer.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Division 1.
- B. Deliver materials to the site in the manufacturer's sealed bags, unopened containers, and banded pallets.
- C. All materials and equipment necessary for the assembly and installation of the floatables control screens, support framing, and appurtenant items shall be transported, handled, and stored in a manner to prevent cracking, twisting, bending, breaking, chipping, corrosion, or damage of any other kind to the materials.

- D. Store materials off ground on platform or skid supports, and protect with covers from snow, rain, and ground splatter.
- E. Identify and mark all materials, items, and fabrications for installation and field assembly.
- F. Deliver items to job site as complete units ready for installation or erection, with anchors, fasteners, and miscellaneous items required for installation.

PART 2 – PRODUCTS

2.01 FLOATABLES CONTROL SCREENS

A. General:

- 1. The floatables control screens shall be non-metallic and non-corrosive consisting of vertical blades that are assembled into panels by passing horizontal tie rods through the blades. The specified clear spacing between the blades shall be maintained by the use of blade spacers and the fabricated unit is to be secured with self-locking nuts on the ends of the tie rods.
- 2. The materials used in the manufacture of the screens shall be free from all defects and imperfections that might affect the performance of the finished product.

B. Deflection and Safety Factors:

- 1. Deflection Criteria: Not to exceed $L/360$ under specified loading, where L is the span length in inches.
- 2. Safety Factor: Minimum ratio of ultimate stress to allowable service stress shall be 1.5.

C. Design Loads: Design the floatables control screens for hydrostatic pressure, assuming that the screens are completely blocked with trash and that water is at the top of the screens on the upstream side and no water is present on the downstream side.

D. Hydraulic Criteria: Headloss through floatables control screens shall not exceed $vb^2/2g$, where vb = velocity through screen, computed as flow rate divided by area between screen blades. Area between screen blades shall be computed as the gross screen area minus the cross-sectional area of the vertical blades.

Design Flows for Floatables Control Screen Hydraulic Calculations OF-213 and OF-214 Diversion Structure		
Site	Peak 2-Year Flow (MGD)	Peak 2-Year Flow (CFS)
OF-213	83.2	128.7
OF-214	116.2	179.8

E. Vertical Blades and Blade Spacers:

- 1. Manufactured of Extra High Molecular Weight Hexene Copolymer polyethylene by profile extrusion. The polyethylene shall be manufactured to incorporate antioxidants

and be resistant to UV radiation and petroleum for at least 30 years. UV inhibitors shall consist of 1 to 2 percent carbon black. Material properties of the polyethylene shall meet the criteria specified hereinafter under Article "Material Properties of EHMW-HD Polyethylene."

2. Size of Vertical Blades: 1/2-inch thick by 6 inches wide, with uniformly rounded edges on the leading and trailing edges.
3. Clear Spacing between Vertical Blades: 3 inches.
- F. Horizontal Tie Rods: High strength pultruded fiberglass rods, 1-1/4 inches diameter with threaded ends. Thread length at each end not to exceed 4 inches.
- G. End Nuts: Self-locking, injection molded nylon with tapered internal threads.
- H. Dimensions and Elevations: As shown on the Drawings.
- I. Angle: Install all floatables control screens at an angle of 30 degrees from the vertical unless otherwise shown on the Drawings.
- J. Panel Widths: Limit panel widths to allow for ease of removal.
- K. Fasteners: Attach floatables control screens to support framing using Type 316 stainless steel J-bolts, U-bolts, or other suitable fasteners as recommended by the screen manufacturer.
- L. Manufacturers:
 1. Hydro Component Systems, Watertown, WI (920-261-2139 ext. 3031)
 2. Or equal components

2.02 SUPPORT FRAMING:

- A. General: The floatables control screens are to be supported horizontally and vertically with fabricated stainless steel frames that are attached to the concrete walls of the diversion structures with adhesive anchors. The support frames for structure OF-213, and OF-214 shall be comprised of 3-inch diameter stainless steel structural pipe and shall have channels along their sides to allow the floatables control screens to be easily slid into place.
- B. Material:
 1. Support Framing: Fabricate out of stainless steel pipe conforming to ASTM A312, Alloy
 2. Plates for member connections and for attachments to the concrete diversion structures shall conform to ASTM A276, Alloy 304.
 3. Fasteners: Type 316 stainless steel bolts and nuts.
 4. Adhesive Anchors:
 - a. Anchor Rods: Type 316 stainless steel.

- b. Adhesive: Two-component system conforming to ASTM C 881, insensitive to moisture, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
5. Manufacturers and Products:
 - a. ITW Ramset/Red Head, Wood Dale, IL; Epcon Ceramic 6 Epoxy Anchor System.
 - b. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System (HIT HY-150).
 - c. Powers Fastening, Inc., New Rochelle, NY; Power-Fast Epoxy Anchor System.
- C. Deflection and Safety Factors:
 1. Deflection Criteria: Not to exceed $L/360$ under combined dead and hydrostatic loads.
 2. Safety Factor: Minimum ratio of ultimate stress to allowable service stress shall be 1.5.
- D. Design Loads:
 1. Dead Loads: Weight of floatables control screens plus self-weight of support framing.
 2. Hydrostatic Load: As previously defined for the floatables control screens design loads.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Install all items described in this Section in accordance with the manufacturer's recommendations.
- B. Furnish all fasteners and anchorages for complete installation.
- C. Accurately set and properly secure items in place. Where bolted connections are used, draw closely together and draw nuts tightly.

3.02 FLOATABLES CONTROL SCREENS:

- A. All exposed surfaces shall be smooth and true to form, free of imperfections.
- B. Anchor securely to the support framing to prevent displacement.
- C. Install the floatables control screens such that they are easily removable.
- D. All cut ends, holes, and abrasions of the fiberglass tie rods shall be sealed with resin to prevent intrusion of moisture.

3.03 SUPPORT FRAMING:

- A. Fabricate
 1. Fabricate true to shape, free of twists, kinks, warps, dents, and other imperfections.

2. Grind exposed edges and ends of metal smooth, with no sharp edges and with corners slightly rounded.
 3. Bolt holes shall be clean-cut without torn or ragged edges and all outside burrs shall be removed.
 4. Welds shall be shop welded. Field welding is not permitted.
- B. Installation shall be rigid, accurately fitted, free from distortion or defects, and neat in appearance.
- C. Adhesive Anchors:
1. Install in accordance with manufacturer's instructions.
 2. Begin installation only after concrete to receive anchors has attained design strength.
 3. Use only drill type and diameter recommended by anchor manufacturer. Clean hole of debris and dust with brush and compressed air.
 4. Do not install adhesive anchors when temperature of concrete is below 40 degrees F or above 100 degrees F.

END OF SECTION 06501

DIVISION 07

SECTION 07100

WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes requirements for providing all personnel, labor, materials, tools, and equipment for installing waterproofing as indicated on the Drawings.

1.02 RELATED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractors responsibility to perform all the work required by the Contract Documents.

1. Section 01300 – Submittals
2. Section 02607 – Precast Concrete Manholes and Structures
3. Section 03300 – Cast-in Place Concrete

1.03 REFERENCES

- A. The following Codes and Standards shall apply to the design, construction quality control, and safety of all the Work performed for this Section. Where redundant or conflicting information exists, the most stringent requirement shall govern.

1. ASTM International Standards (ASTM)
 - a. ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
 - b. ASTM D 624, Die C Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
 - c. ASTM D 903 mod. Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - d. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - e. ASTM D 2240 Standard Test Method for Rubber Property—Durometer Hardness
 - f. ASTM D 3776 Standard Test Methods or Mass Per Unit Area (Weight) of Fabric
 - g. ASTM D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - h. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

- i. ASTM D 5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
- j. ASTM D 5385 mod. Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
- k. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials

1.04 DEFINITIONS (NOT USED)

1.05 QUALITY ASSURANCE

- A. All Work shall be conducted in accordance with all applicable codes, standards, and permits.
- B. Qualifications
 - 1. The manufacturer of the waterproofing systems shall have a minimum of ten (10) years of experience in the fabrication of waterproofing systems for underground applications on at least three (3) recent projects of similar type and complexity.
 - 2. The installation of the waterproofing system shall be under the supervision of a Superintendent(s) certified by the manufacturer having not less than five (5) years of experience and have successful projects of similar type and complexity for installation of waterproofing systems in braced excavation applications.
 - 3. The installers of the waterproofing system shall be certified by the manufacturer and having not less than two (2) years of experience in the installation of welded geomembrane water retention systems.

1.06 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Shop Drawings
 - 1. Indicative of placement and sequencing.
- C. Working Drawings and Methods Statement
 - 1. Working Drawings showing orientation of membrane rolls, membrane seams, prefabricated elements and membrane bends, flexible seals at joints, and spacing of affixing locations.
 - 2. A narrative method statement describing the proposed construction means and methods, sequencing, equipment, products, and other materials for the installation of the waterproofing systems.
 - 3. Procedures for preparing surfaces to receive waterproofing membrane.
 - 4. Method for controlling expansion, contraction and wrinkling of the membrane with ambient temperature fluctuations.
 - 5. Methods for welds for membrane and prefabricated elements.

6. Construction schedule, list of equipment, methods and procedures to be used, and proposed construction sequence.

D. Quality Control Submittals

1. Submit qualifications and experience records for personnel as specified herein.
2. Manufacturers' product data, certificates, and manufacturers' test data for any manufactured materials incorporated.
3. Quality Control Field Reports daily during construction to include where applicable, the following:
 - a. Date and time.
 - b. Name of Superintendent.
 - c. Installation progress.
 - d. Quantity of materials placed.
 - e. Installation Acceptance Forms for areas where quality control tests, such as weld testing was performed.
 - f. Repairs or other remedial work.
 - g. Observations during application.
 - h. Description of any special conditions or problems.

1.07 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Perform the work to achieve the minimum required clearances for installation of permanent elements as shown on the Drawings.
- B. Tolerances as specified by the manufacturer.

1.08 PROJECT CONDITIONS

- A. Pre-Construction Meeting: The Contractor shall coordinate and schedule a pre-construction meeting with the PM/CM and the Contractor's Engineer to discuss the design, construction means, methods, procedures, sequence, and schedule for the work.
- B. Project Site Information: A Geotechnical Data Report (GDR) and an Environmental Data Report (EDR) have been prepared for the Project. The GDR and EDR have been included as part of the Contract Documents.
- C. The Contractor shall review the GDR and make a determination as to the need to perform additional test borings and conduct other exploratory operations necessary for the work. The Contractor will be responsible for conducting these additional investigations including associated costs.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in accordance with manufacturer's recommendations.
- B. Store materials and equipment to prevent corrosion, damage from equipment, environment, or other pertinent manmade or natural hazards.

PART 2 PRODUCTS

2.01 GENERAL

- A. The Contractor shall furnish all installation tools, materials, and miscellaneous components.

2.02 MATERIALS

A. Exterior Cast-in-Place Structures

- 1. CETCO VOLTEX DS bentonite geotextile waterproofing membrane with integrated polyethylene liner or accepted equivalent. Shall conform to the following:
 - a. A roll of interlocked geotextiles encapsulating sodium bentonite. Composite shall consist of woven polypropylene geotextile, interlocked using a needle-punching process that produces interlocks over the entire area of the product.

Table 1 Voltex Performance Properties

PROPERTY	TEST METHOD	TYPICAL VALUE
Bentonite Mass per Unit Area	ASTM 3776 mod.	1.0 lb/sqft
Peel Adhesion to Concrete	ASTM D 903 mod.	15 lbs /in (2.6 kN/m)
Hydrostatic Pressure Resistance	ASTM D 5385 mod.	231 ft (71 m)
Permeability	ASTM D 5084	1 x 10 ⁻¹⁰ cm/sec
Grab Tensile Strength	ASTM D 4632	120 lbs (530 N)
Puncture Resistance	ASTM D 4833	140 lbs (620 N)
Low Temperature Flexibility	ASTM D 1970	Unaffected at -25°F (-32°C)
Water Vapor Transmission Rate	ASTM E 96	0.03 grains per hour/sqft

- 2. All accessory waterproofing materials shall be provided by the waterproofing manufacturer or shall have manufacturer's written approval for substitution.

B. Precast Manholes and Structures

- 1. Sikalastic 320 SG single component, sprayable, liquid applied, bitumen modified, coal tar free, moisture cured polyurethane waterproofing membrane, or accepted equivalent. Shall conform to the following:

Table 2 Sikalastic 320 SG Performance Properties

PROPERTY	TEST METHOD	TYPICAL VALUE
Shore Hardness	ASTM D 2240	30 ± 5
Tensile Strength	ASTM D 412	450 ± psi
Elongation at Break	ASTM D 412	450 ± 50%
Tear Strength	ASTM D 624, Die C	100 ± 15 psi
Permeability to Water Vapor	ASTM E 96	1 ± 0.2 Perms
Service Temperature	none	-25 to 200 °F

PART 3 EXECUTION

3.01 GENERAL

- A. Commence installation of waterproofing only after submittals have been reviewed and accepted by the PM/CM.

- B. Conduct all work within the construction limits established for the project.
- C. Methods of construction shall be such as to ensure the safety of the Contractor's employees, the Owner's employees and inspectors, the public, and adjacent property owners.
- D. Maintain a sufficient quantity of materials throughout the conduct of the work for installation of waterproofing.

3.02 EXTERIOR CAST-IN-PLACE STRUCTURES

A. Preparation

- 1. General substrate conditions acceptable for the waterproofing installation are listed below. For conditions not covered, contact the waterproofing manufacturer for guidance.
 - a. Working concrete mud slabs should have a float finish to provide a planar surface; without sharp angular depressions, voids or raised features.
 - b. The natural finished sub-grade surface shall be well-leveled, uniform, free of debris and standing water or ice. If substrate consists of large aggregate, place a high-strength geotextile layer over the aggregate and then provide several inches of compacted soil or sand for uniform support and containment of waterproofing sheets.
 - c. Wood lagging shoring should extend to the lowest level of the waterproofing installation with any voids or cavities exterior of the lagging timbers filled with compacted soil or cementitious grout. Interior surface of lagging boards should be planar and tight together with gaps less than 1 inch. Gaps in excess 1 inch should be filled with cementitious grout, compacted soil, wood, extruded polystyrene (20 psi min.) or CETCO approved polyurethane spray foam. Do not use plywood or other surface treatment over large lagging gaps that leave the cavity void. All lagging board nails and other mechanical projections shall be removed or pounded flush. Install a protection material over all soldier piles with raised lagging hanger bolts, form tie rods, or other irregular surface
 - d. Mechanical, structural, or architectural materials that will pass through the plane of the waterproofing membrane shall be properly installed and secured in their final position prior to installation of the waterproofing system.
 - e. Concrete to be waterproofed shall be properly placed and consolidated with a smooth finish, free of debris, oil, grease, laitance, dirt, dust, or other foreign matter which will impair the performance of the waterproofing system and which do not comply with manufacturer's warranty requirements. Honeycombing, aggregate pockets, tie-rod holes and other voids shall be completely filled with non-shrink cementitious grout and level with monolithic concrete surface.

B. Installation

- 1. Property Line Walls, install Voltex membrane with the dark gray woven geotextile side in the direction to receive concrete pour; white geotextile side outward against retaining wall. Overlap Voltex membrane edges minimum 4 inches.

2. Underslab, install Voltex with the dark gray woven geotextile side up; white geotextile side facing down. Overlap Voltex membrane edges minimum 4 inches.
3. Backfilled walls and roofs of earth covered structures, install Voltex with the white geotextile side outward, away from the concrete, facing the installer; dark gray geotextile against concrete. For backfilled walls overlap Voltex membrane edges a minimum 4 inches.
4. Expansion Joints, Voltex waterproofing is not an expansion joint filler or sealant, but can be incorporated with the CETCO CXJ Expansion Joint to create a warranty eligible, solution for waterproofing the below grade expansion joint.

3.03 PRECAST MANHOLES AND STRUCTURES

A. Preparation

1. Surfaces may be dry or damp, but must be sound and free of standing water, dust, laitance, grease, curing compounds, impregnations, waxes, and any other contaminants.
2. Substrate temperatures should be greater than 40 °F and less than 110 °F. In cold weather conditions, use pail warmers or preconditioning to assist in workability.
3. Scratch and remove sheen for metal surfaces before applying primer. Scratch marine grade and high density plywood with sandpaper before applying primer.
4. Mix thoroughly using a mechanical mixer and jiffy style paddle at slow speed for two (2) minutes minimum to ensure a homogeneous material. Take care not to allow entrapment of air into the material. Do not mix in an up and down motion.

B. Application

1. Applied with an airless sprayer. Apply up to 90 mils vertically and 120 mils horizontally per coat. Mix with water to reduce the chance of pinhole formation from concrete out-gassing and improve cure rate.
2. Use primers in accordance with the manufacturer's instructions.
3. For all cracks up to 1/16 inch width, apply a 4 inch wide, 30 mil stripe coat centered over the crack. Refer to the manufacturers recommendations for cracks greater than 1/16 inch width.
4. Cure each coat for 16 to 24 hours minimum. When using water as a catalyst, cure for a minimum of 2 to 4 hours before proceeding to subsequent coats. If more than 48 hours pass between coats, wipe and prime the surface in accordance with the manufacturers recommendations.

END OF SECTION 07100

DIVISION 09

SECTION 09907

GEOPOLYMER LINING SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. This specification covers work, materials and equipment required for the preparation and installation of a Geopolymer Lining System providing a minimum 50-year service life for internal protection of new reinforced concrete consolidation conduit and reinforced concrete combined sewer overflow pipe and associated structures.
- B. The protective lining works shall include activities associated with the protective lining system, not limited to the following:
 - 1. Design of approved continuous protection liners to the internal surface of the host infrastructure (pipe, manholes, structures, etc.),
 - 2. Pre-construction inspection and surface preparation of host infrastructure prior to application of protective lining system,
 - 3. Installation of approved continuous protection liners to the internal surface of the host infrastructure,
 - 4. Quality Control Measures,
 - 5. Post-construction inspection, repairs and testing.
- C. RELATED SECTIONS
 - 1. Section 01300 – Submittals
 - 2. Section 02149 – Maintaining Existing Flow
 - 3. Section 02763 – Pipeline Cleaning
 - 4. Section 02764 – Television Inspection

1.02 REFERENCES

- A. Unless revised herein, the Licensed Applicator shall follow the latest revision of the practices and standards of the following American Society for Testing and Materials (ASTM) and American Concrete Institute (ACI) Standards, which are made part of this specification:

American Society for Testing and Materials (ASTM):

 - 1. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. ASTM C 39 / C 109 – Compressive Strength Hydraulic Cement Mortars
 - 3. ASTM C 78 – Flexural Strength of Concrete
 - 4. ASTM C 138 / C 642 – Standard Test Method for Density
 - 5. ASTM C 267 – Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes
 - 6. ASTM C 469 – Static Modulus of Elasticity & Poisson’s Ratio of Concrete Compression
 - 7. ASTM C 496 – Splitting Tensile Strength of Cylindrical Concrete Specimens
 - 8. ASTM C 666 – Freeze Thaw Durability
 - 9. ASTM C 807 – Set Time of Hydraulic Cement Mortar

10. ASTM C 882 – Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
11. ASTM C 1090 – Shrinkage Test
12. ASTM C 1138 - Standard Test Method for Abrasion Resistance of Concrete (Underwater Method)
13. ASTM C 1202 – Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration
14. ASTM F 2414 – Practice for Sealing Sewer Manhole Using Chemical Grouting
15. ASTM F 2551 – Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes

American Concrete Institute (ACI):

1. ACI Certified Concrete Field Testing Technician, Level 1

1.03 SUBMITTALS

A. The following items shall be submitted:

1. Manufacturer-certified copies of all test reports on each product used, including:
 - a. ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications. Test reports shall be performed at the Licensed Applicator’s expense and shall be carried out by an approved independent third-party testing laboratory or by a reputable independent testing body. As a minimum, the test reports should include all those listed in **Table 2** of this Section.
 - b. XRF test results indicating the product confirms to the requirements as found in **Table 1** of this Section.
2. Detailed Minimum Liner Thickness Calculations as required and as discussed further in **Paragraph 2.05** of this Section, along with proposed plan for ensuring that the installed Geopolymer Liner meets the minimum thickness requirements.
3. Licensed Applicator Qualifications
 - a. Manufacturer Certification that Licensed Applicator (as defined in **Paragraph 1.04C**) has been trained and approved in the handling, mixing and application of the products to be used.
 - b. Manufacturer Certification that the equipment to be used for applying the products has been manufactured or approved by the Manufacturer and Licensed Applicator personnel have been trained and certified for proper use of the equipment by the Manufacturer.
 - c. Proof of any required permits or licenses necessary for the project.
4. Pre-construction CCTV Video
5. Post-construction CCTV Video

1.04 QUALITY ASSURANCE

- A. Liner material shall be resistant to on site contaminants. Contaminants include concentrations of arsenic, lead, polynuclear aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), cyanide, total petroleum hydrocarbons (TPH), and polychlorinated biphenyls (PCBs) in soil. Data is included in Appendix B
- B. Product Manufacturer: Company specializing in manufacturing quality Geopolymer Liner products with minimum 10-years’ experience in the manufacture and distribution of a geopolymer product. Geopolymer product shall have a track record of use within sanitary sewer and/or storm infrastructure of at least 10-years.

- C. Licensed Applicator: Company pre-approved by the Product Manufacturer and who meets the following conditions:
1. Horizontal Infrastructure:
 - a. At least 5-years' experience specializing in the application of spray on lining systems including the installation of at least 35,000 LF in horizontal infrastructure using the specific material(s) being proposed for the subject project, OR
 - b. Provide supplemental installation expertise in the form of a product expert, provided by the Product Manufacturer, who meets the Superintendent requirements found in **Item D**, below.
 - a. In addition, product expert provided by the Product Manufacturer must be additionally insured with a liability umbrella up to \$5 million dollars.
 2. Vertical Infrastructure:
 - a. At least 3-years' experience specializing in the application of spray on lining systems including the installation of at least 10,000 VF in vertical infrastructure using Geopolymer, Cementitious or Mortar Liner products in vertical infrastructure applications similar to those being proposed for the subject project, OR
 - b. Provide supplemental installation expertise in the form of a product expert, provided by the Manufacturer, who meets the Superintendent requirements found in **Item D**, below.
 - a. In addition, product expert provided by the Product Manufacturer must be additionally insured with a liability umbrella up to \$5 million dollars.
- D. Manufacturer Certified Superintendent: Individual specialized in the application of Geopolymer Liner products, pre-approved by the Product Manufacturer for the application of spray on lining systems, who, meets the following minimum requirements:
1. 5-years' experience in the industry actively involved in field services related to the lining of pipes, manholes or other sanitary sewer and/or storm infrastructure,
 2. For Horizontal Infrastructure, installation of 5,000 LF using the specific Geopolymer Liner product proposed OR installation of 15,000 LF of Geopolymer, Cementitious or Mortar Liner products in horizontal infrastructure applications similar to those being proposed for the subject project.
 3. For Vertical Infrastructure, Superintendent shall be certified by the Product Manufacturer.
- E. Single Source Responsibility: Geopolymer Liner and all products used with the Geopolymer Lining System, to include but not limited to Infiltration Control, shall be approved by and/or supplied through the Product Manufacturer. Use only products approved by Product Manufacturer and used only within recommended limits.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in original containers with seals unbroken and labels intact and free of moisture.
- B. Receipt Process: Materials must be inspected by Licensed Applicator upon receipt and the Bill of Lading reviewed to confirm it properly documents amount(s) and type(s) of material(s) received, date and time of delivery as well as the shipping company delivering the material. Completed/signed Bill of Lading and material batch numbers

shall be logged by the Licensed Applicator upon receipt of the material(s) and stored in project files for possible future reference.

- C. Storage: Geopolymer Lining System products are to be kept dry, protected from weather and stored under cover within the temperature ranges recommended by the Manufacturer. Products are to be stored and handled according to their SDSs or appropriate classification. Damaged or unsuitable products shall be promptly removed from the job site and shall be replaced with suitable materials. Do not store kerosene, gasoline or other flammable liquids in this space. Remove oily rags at the end of each day's work. Regardless of storage location,

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Licensed Applicator shall conform with all local, state and federal regulations including those set forth by OSHA and the EPA and any other applicable authorities. Confined space entry requirements shall be followed.
- B. Monitor and maintain the temperature inside the host infrastructure prior to, during and immediately following installation. Temperature conditions shall be maintained per Manufacturers' recommendations.
- C. Provide continuous ventilation and if necessary cooling and heating facilities to maintain surface and ambient temperatures before, during, and following application of finishes, within specified temperature range and for duration as directed by Manufacturer.
- D. Protection: Provide sufficient shielding to fully protect adjacent finished work.

1.07 QUALITY CONTROL

- A. Confirmation of a Geopolymer
 - 1. Material shall be confirmed as a Geopolymer as determined by XRF testing. Testing shall be carried out as detailed here. Testing shall be completed on the proposed Geopolymer Liner material and results submitted at the following stages:
 - a. Submittal documentation.
 - b. During application, XRF field testing shall be carried out as follows:
 - a. Sieve the unmodified/unground Geopolymer Liner material with #200 mesh, removing the fibers and aggregate.
 - b. XRF testing to be run on the precursor that remains.
 - c. Representative testing information. Based upon the size of the project, as determined by the amount of Geopolymer Liner material that is to be used, field testing shall be carried out based upon the following:
 - a. For projects utilizing less than 100,000 lbs. | 45,000 kg of Geopolymer Liner material, no testing of the installed product is required.
 - b. For projects utilizing 100,000 lbs | 45,000 kg of Geopolymer Liner material to equal to or less than 250,000 lbs. | 113,000 kg of Geopolymer Liner material, one randomly sampled batch of material. Random sample shall be as directed by Owner/Engineer.
 - c. For projects utilizing more than 250,000 lbs. | 113,000 kg of Geopolymer Liner material, first, last and one randomly sampled batch throughout the project life. Random sample shall be as directed by Owner/Engineer.

- B. Quality Control, Sampling and Testing
1. During application, Licensed Applicator shall regularly perform Geopolymer Liner thickness readings with a method approved by Manufacturer.
 2. Sample and make nine (9) three (3) by six (6) inch | 75 x 150 mm test cylinders (for Vertical or Horizontal Infrastructure) or nine (9) two (2) by two (2) by two (2) inch | 50x50x50mm cubes (for Vertical Infrastructure) per ASTM C 31. Label each sample with the date, location sample was taken, project, and product batch numbers. The product batch numbers are located on each Geopolymer material bag. Samples should be prepared by the Licensed Applicator or independent third-party laboratory (for Vertical Infrastructure) or by independent third-party laboratory under the guidance of the Licensed Applicator (for Horizontal Infrastructure). Prepare samples to test compressive strength at intervals of the lesser of each project or 42,000 lbs. | 19,000 kg of material (for Vertical Infrastructure) or every 42,000 lbs. | 19,000 kg of material (for Horizontal Infrastructure). The samples must be undisturbed for a period of at least 24 hours before they can be transported. The independent third-party laboratory shall transport the samples to their lab to be tested/analyzed in accordance with ASTM C 39 (for Vertical or Horizontal Infrastructure), or ASTM C 109 (for Vertical Infrastructure), or as specified by contract documents. Test the Geopolymer Liner material for compressive strength at 7 days (3 cylinders) and 28 days (3 cylinders) and leave remaining (3 cylinders) for retainage to be tested/analyzed as directed by Licensed Applicator.
 - a. Performance and Material Testing – Vertical Infrastructure (Manholes, Boxes, Structures, etc.)
 - a. Performance testing as directed in ASTM F 2551.
 - b. Submit the following information to the Owner/Engineer: Product data, including Manufacturer and brand name along with independent third-party laboratory test results to verify 28-day compressive strength in accordance with ASTM C 39, ASTM C 109 or as specified by contract documents. The project superintendent will require that samples of applied material be collected and tested. Samples may be obtained from the pump, immediately before the discharge into the hose, from a section of hose, or at the spin caster/nozzle, if feasible. The sample location should be identified in laboratory reporting. The material thickness may be determined by using depth gauges during the spraying process. Permanent depth gauges may either be attached to the host infrastructure prior to Geopolymer Liner application or a handheld depth gauge may be used by the installer during installation. Photos shall be taken of the infrastructure prior to and following final installation and submitted to the Owner/Engineer with final application for payment.
 - b. Performance and Material Testing – Horizontal Infrastructure (Pipes, Culverts, Tunnels, etc.)
 - a. Submit the following information to the Owner/Engineer: Product data, including Manufacturer and brand name along with independent third-party laboratory test results to verify 28-day compressive strength in accordance with ASTM C 39. The project superintendent will require that samples of the applied material will be collected and tested. Samples may be obtained from the pump immediately before discharge into the hose, from a section of hose, or at the spin caster/nozzle, if feasible. The sample location should be identified in laboratory reporting. The material thickness may be determined by using depth gauges during the spraying process. Permanent depth gauges may either be attached to the host infrastructure prior to Geopolymer Liner

application or a handheld depth gauge may be used by the installer during installation. The depth measurements should be made in at least three locations within the infrastructure being lined to include both ends and the middle of the infrastructure. A digital video showing the prepared pipe with depth gauges installed and digital video of the completed lining will be submitted to the Owner/Engineer with final application for payment.

C. Daily Activity Logs

1. Logs will be maintained onsite or electronically and will be available for viewing but will not be submitted.
2. Horizontal and Vertical Infrastructure
 - a. A Daily Activity Log will be kept detailing the daily activities on a project site. Information to be recorded may include such information as dates and times work was completed, personnel present or absent from the job site and hours worked, reference to material deliveries Bill of Lading, record of materials used, and surface preparations made, special conditions encountered and additional information as deemed appropriate by the Superintendent.

D. Daily Application Logs

1. Logs will be maintained onsite or electronically and will be available for viewing but will not be submitted.
2. Horizontal Infrastructure
 - a. A Daily Application Log will be filled out completely anytime a work crew is on site and Geopolymer Liner material is being applied.
 - b. Important spray data including the Job location, name and identification number, identifying asset information for infrastructure being lined, the Geopolymer Liner materials used (Bag and Batch No.), water addition rate, times Geopolymer Liner material was applied, Length of Hose, equipment motor speed and pressure observed, retrieval device speed, application method and under which atmospheric conditions to include the ambient air temperature, the dry powder temperature, the mixing water temperature, the wet product temperature and the temperature inside the infrastructure prior to, during and following lining are all recorded on the Daily Application Log.
 - c. The operating conditions are also to be recorded. These measurements include the water addition rate taken at the water metering device, the retrieval speed of the retraction system and the pump motor speed recorded at the pump.
3. Vertical Infrastructure
 - a. A Daily Application Log will be filled out completely anytime a work crew is on site and Geopolymer Liner material is being applied. This log includes listing the surface preparations made, the repair materials used, and weather conditions observed during application.

1.08 WARRANTY

- A. Manufacturer shall warrant all work against defects in materials and Licensed Applicator shall warrant all work against defects in workmanship for a period of one (1) year, from the date of acceptance of the lining work. Manufacturer / Licensed Applicator shall repair defects in materials or workmanship, as applicable, which may develop during said one (1) year period, at Licensed Applicators expense and without cost to the Owner.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Existing infrastructure may consist of RCP, brick, stone, corrugated metal, HDPE and others as allowed by Manufacturer.

2.02 ACCEPTABLE MATERIALS

- A. When more than one product is used in composite with other(s), all materials shall be supplied by the same Manufacturer.
- B. Approved Geopolymer Lining System materials include:
 1. Geopolymer Liner – GeoKrete[®] as manufactured by Quadex[®] (A Vortex Company), GeoSpray[®] as manufactured by GeoTree Solutions, or approved equal.
 2. Infiltration Control (Mild to Moderate) – Quadex[®] Quad-Plug[®] or approved equal
 3. Infiltration Control (Heavy) – I&I Guard[®] – PRF or approved equal.
 4. Manhole Chimney Treatment – Chimney Guard[™] or approved equal.

2.03 GEOPOLYMER – CHARACTERIZATION TECHNIQUES

- A. Provide oxide composition and phase composition testing results, using X-Ray Fluorescence (XRF).
 1. Prior to testing, the aggregate and reinforcing fibers shall be removed from the product using a #200 mesh, the resulting material that passes through the mesh is referred to as the Geopolymer precursor powder. The material run through the mesh shall be unmodified and unground/undissolved accurately representing the Geopolymer Liner material as it will be provided out of the product packaging in the field.
 2. Results shall meet the requirements as identified in **Table 1**

2.04 GEOPOLYMER – PHYSICAL PROPERTIES

- A. The Geopolymer Liner material may be Centrifugally Cast, Manually Sprayed or Hand Troweled.
- B. The Geopolymer Liner material shall be a factory blended, one-component (just add water), eco-friendly, micro-fiber reinforced ultra-dense geopolymer mortar synthesized from reactive SiO₂ and Al₂O from industrial byproducts, enhanced with monocrySTALLINE quartz aggregate.
- C. The Geopolymer Liner shall be formulated to produce a liner with improved compressive and flexural strength, high adhesion to damp surfaces, lower permeability and increased resistance to aggressive chemical attack.
- D. The fiber reinforced formula shall be developed to: improve chemical resistance, improve hydraulic abrasion resistance, provide dimensional stability and protect against penetration by substances such as fats, oils, grease, gases and chloride ions.
- E. The finished infrastructure must be such that once the Geopolymer Liner sets, the total liner thickness will be homogeneous and monolithic.

The Geopolymer Liner material shall conform to the minimum requirements as presented in **Table 1**.

Table 1

Physical Properties	ASTM Reference	Requirements
Set Time	ASTM C 807	Min. Initial 60 mins Max. Final 240 mins
Compressive Strength	ASTM C 39 / C 109	Min. 8,000 psi 55.15 MPa @ 28 days
Flexural Strength	ASTM C 78 / C 293	Min. 800 psi 5.51 MPa @ 28 days
Density	ASTM C 138 / C 642	Dry 90–110 lb/ft ³ 1,441–1,762 kg/m ³ Wet 135–145 lb/ft ³ 2,162–2,323 kg/m ³
Chemical Resistance	DIN 19573	XWW4 - Pass
Modulus of Elasticity	ASTM C 469	Min. 3.9x10 ⁶ psi 27.6 GPa @ 28 days
Split Tensile Strength	ASTM C 496	Min. 700 psi 4.8 MPa @ 28 days
Freeze Thaw Durability	ASTM C 666	Max 0.5% Loss @ 300 cycles
Bond Strength to Concrete	ASTM C 882	Min. 2,500 psi 17 MPa @ 28 days
Shrinkage Test	ASTM C 1090	Max 0.02% @ 28 days
XRF (X-Ray Fluorescence)	ASTM C 114	70% minimum composed of SiO ₂ , MgO, Al ₂ O ₃ , or Fe ₂ O ₃
Abrasion Resistance	ASTM C 1138	Max 18.31 in ³ 0.0006 m ³ Total Volume Loss @ 6 cycles on 28 day
Rapid Chloride Ion Permeability	ASTM C 1202	Very Low @ 28 days

2.05 GEOPOLYMER – LINER THICKNESS DESIGN

- A. General Liner Thickness Guidelines - The design thickness of the centrifugally cast, manually sprayed or hand troweled liner shall be determined by a Qualified Engineer retained by the Manufacturer.
- B. Signed and sealed designs shall be prepared and submitted by a Qualified Engineer, licensed in either the state of liner application or in the state in which the headquarters of the liner Manufacturer is located.
- C. The thickness calculations shall be site specific and involve a careful consideration of loading conditions that are applicable to those for the construction phase and long-term service of the infrastructure in question. A Qualified Engineer, experienced in infrastructure liner design, shall provide a stamped design thickness report, showing the assumptions made, input data used, design principles employed and the results of the calculations that would meet the standard of care, expected of professionals practicing in the same region and time period.
- D. The Licensed Applicator/Contractor shall submit Manufacturer’s minimum recommended thicknesses or liner thickness calculations to the Owner/Engineer for review. Thickness or calculations shall substantiate sufficient liner thickness to achieve desired 50-year service life.

1. Regardless of design, installation thickness of 1.0-inch | 25.4mm minimum shall be achieved unless approved in writing from liner manufacturer prior to Bid.
- E. The Licensed Applicator/Contractor shall submit their proposal based upon the appropriate length, size, design life and host infrastructure parameters designated in the Project Plans and Specifications.
- F. The Design Parameters shall be as presented in **Table 2**:

Table 2

Design Parameter	Requirements	Requirements
Shape / Size	48-inch	34-inch
Pipe Material	Reinforced Concrete Pipe (48")	Brick (34")
Length	Total: 1,100 feet (48") Reach Ranges: 50 feet to 571 feet	20 feet
Bury Depth	As noted on the Contract Drawings – Approximate Range (15 feet to 36 feet)	As noted on the Contract Drawings – Approximate Depth = 12 feet
Level of Deterioration	Partially Deteriorated Condition	Fully Deteriorated Condition
Ovality	<2%	2% to 8%
Live Loading Conditions	AASHTO HS-20	AASHTO HS-20
Soil Density	135 pcf	135 pcf
Ground Water Elevation	Assume at ground surface level	Assume at ground surface level

2.06 INFILTRATION CONTROL

A. Heavy Infiltration

1. Injection grouting material shall be used to address heavy infiltration following Manufacturer's instructions.
2. Heavy infiltration means infiltration that meets the definition of a "runner" or "gusher", as defined by NASSCO's Pipeline Assessment Certification Program.

B. Mild to Moderate Infiltration

1. All fast setting materials furnished shall be formulated to be applied in dry powder form, with no prior mixing of water, directly to active leaks under hydrostatic pressure in pipes, manholes or related structures. Materials shall consist of rapid setting cements, siliceous aggregates, and various accelerating agents.

2.07 GEOPOLYMER LINER APPLICATION EQUIPMENT

A. Horizontal Infrastructure

1. The following outlines the equipment that is to be used on application to Horizontal Infrastructure. Such equipment may also be used on Vertical Infrastructure at the installer's discretion.
2. Major equipment components consist of a generator, an air compressor, a high-pressure washer, a high shear mixer, a high output pump, a spray nozzle or gyroscopic high-speed spin cast delivery assembly with an electronic retraction system capable of +/- 5% repeatability, and high-pressure hoses and couplings.

3. Application equipment shall include a high shear mixer and high output swing tube pump with appropriate sensors and monitors to gauge material ratios and material consistencies.
4. Application equipment shall have visible display for the rate of water addition.
5. Application equipment shall measure the back pressure on the discharge side of the pump.
6. Optional spinner head shall be attached to a gyroscopic mechanism to layer the materials.

B. Vertical Infrastructure

1. Manufacturer approved equipment shall be used in the application of the specified Geopolymer Liner. The following outlines the equipment that is to be used on application to Vertical Infrastructure.
2. Major equipment components consist of a generator, an air compressor, a pressure washer, a mortar mixer, a material pump, a spray nozzle or spinner head and material hose all to be trailer or skid/truck mounted and contained within a single platform.
3. Application equipment shall include a vertical shaft, horizontal blade mixer with at least a 45-gallon capacity and three stage progressive cavity material pump.
4. Application equipment shall have a water metering system to monitor the rate of water addition.
5. Application equipment shall include sufficiently sized water transfer pump so as to provide continuous delivery of water to all components.
6. Application equipment shall include either a manual spray nozzle, or a spinner head. Spinner head shall be attached to an electric winch mounted on a tripod allowing for control of vertical movement at a consistent rate.

2.08 EQUIPMENT MAINTENANCE

- A. All equipment shall be in clean and good working conditions.
- B. Maintenance and service shall be performed on the equipment at Manufacturers' recommended intervals.
- C. Spare parts or extra equipment should be kept on site to ensure rapid redeployment in the event of equipment failure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Licensed Applicator shall verify that surfaces and substrate conditions are ready to receive work. Generally, this can be described as a substrate that is free of dirt, grease, oils and foreign materials as removed by 3,500 psi | 241 bar pressure wash throughout which all active infiltration has been stopped or controlled so as to allow for lining. For lining of new infrastructure 5,000 psi | 345 bar or greater pressure wash will be required.
- B. Licensed Applicator shall examine surfaces scheduled to be lined prior to commencement of work. Report to Owner/Engineer any condition that may potentially affect proper application.
- C. Appropriate actions shall be taken to comply with regulatory and other applicable agencies with regard to environment, health and safety.

- D. Any active flows shall be dammed, plugged or bypassed as required to ensure that the conveyed flow is maintained away from the surfaces to be lined. Flows should be totally plugged and/or diverted when lining the invert and during required dry/cure periods. All extraneous flows into the host infrastructure at or above the area lined shall be plugged and/or diverted until the Geopolymer Liner has cured per Manufacturer recommendations.
- E. Installation of the Geopolymer liner shall not commence until the host infrastructure has been properly cleaned and repaired.
- F. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the infrastructure being lined unless otherwise instructed by the material Manufacturer.

3.02 BYPASS PUMPING

- A. Maintain sanitary sewer service during the installation process, as required for acceptable completion of the work and / or to avoid damages due to sewer spills or overflows.
- B. Install and operate bypass pumping equipment to maintain sewage flow around, and in some cases through, the host infrastructure being rehabilitated, and to prevent backup or overflow in compliance with Owner/Engineer requirements.
- C. Coordinate with Owner/Engineer regarding potential upstream diversion strategies which could potentially reduce influent flow from upstream system.
- D. Install all bypass and isolation material and equipment so as to not affect flow in upstream or downstream structures. The pump and bypass lines shall be of adequate capacity and size to at minimum handle the anticipated daily peak flow, as provided by Owner/Engineer at time of advertisement. Where required by Owner/Engineer, in project documents, bypass may be sized to address anticipated peak wet weather flows. Bypassing of sanitary sewer into the storm system will not be permitted. For all bypass pumping, pump noise shall be kept to a minimum.

3.03 SURFACE PREPARATION AND LIGHT CLEANING

- A. Excessive debris, sediment, root intrusion or other foreign materials which may impact the effectiveness of the surface preparation process shall be removed prior to the commencement thereof.
- B. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be addressed per Manufacturers' recommendations.
- C. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and the required cleanliness and profile of the prepared surface to receive the repair and/or lining product.
- D. Surface preparation method, or combination of methods, that may be used include high-pressure water cleaning (minimum 3,500 psi | 241 bar), water jetting, abrasive blasting,

grinding or scarifying. When grease or oil are present within the host infrastructure, steam, heated water (up to 200°F | 93.3°C) or a detergent approved by Owner/downstream treatment facility owner/operator may be added to the water may be used integrally with the high-pressure water cleaning and other methods as referenced in industry accepted standards such as:

1. ASTM-F-2551 Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes.
- E. Loose debris materials resulting from the cleaning of the structure shall be removed prior to application of the Geopolymer Liner material.
- F. Loose or defective brick, concrete, grout, ledges, and all steps shall be removed to provide an even surface prior to application of Geopolymer Liner material.

3.04 PRE-CONSTRUCTION INSPECTIONS

- A. Prior to work, the Licensed Applicator's will provide pre-construction videos of the complete limits of the infrastructure to be rehabilitated as well as the project site utilizing color video inspection equipment.

3.05 SEALING ACTIVE LEAKS

- A. The work consists of hand applying a dry quick-setting cementitious mix or, for heavy leaks, chemical grout formulated to instantly stop running water or seepage in all types of concrete, metal and masonry pipes, manholes and structures.
1. The area to be repaired must be clean and free of debris to the extent the repair material will bond to the surface of the affected area.
 2. For quick-setting mortar, with gloved hand, place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 60 seconds, repeat until leak is stopped.
 3. Proper application should not require any special mixing of product or special curing requirements after application.
- B. Materials, additives, mixture ratios, and procedures utilized for the grouting process shall be in accordance with Manufacturer's recommendations and shall be appropriate for the application.

3.06 MIXING OF THE GEOPOLYMER LINER MATERIAL

- A. Licensed Applicator shall add the Geopolymer Liner material to the batch water following the Manufacturers' water/material ratio precisely.
- B. The lining material shall be mixed in a high shear mixer, or similar, to ensure thorough and uniform mix of water with the material prior to pumping.
- C. The mixing operations must be performed so that the minimum of dust is released into the surrounding environment.
- D. The batch style mixing, precise metering of water and pump rate eliminates wet/dry and thick/thin variations resulting in a uniform structure liner regardless of the pumping distance.

- E. Multiple application nozzles should be onsite at all times to address any application issues or failure of the nozzle.

3.07 APPLICATION OF GEOPOLYMER LINER MATERIAL

- A. The work consists of spray applying and/or centrifugally spin-casting the specified Geopolymer Liner material to the inside of an existing structure.
- B. Application on all pre-cast/poured-in-place manholes shall occur after preparing surfaces. Material shall be applied to the bench and invert area in such a manner as to provide for proper drainage without ponding and to compensate for abrasion. Material must be applied only when surfaces are damp, saturated surface-dry (SSD), but with no visible active infiltration.
- C. Hand Troweled Application
 1. In locations where equipment access is limited, or work scope is such that mobilization of equipment is not justifiable, material may be hand troweled into place.
 2. Proper mixing should be achieved with a portable mixing unit of sufficient strength to thoroughly mix product to Manufacturers recommended consistency.
 3. Application of material shall be performed in a manner such that material is applied evenly and consistently throughout the entirety of the structure.
 4. Material shall be applied to a specified uniform minimum thickness no less than 1-inch | 25.4mm, unless otherwise approved in writing by Manufacturer prior to bid.
 5. Material shall be applied to the bench/invert area in such a manner as to provide for proper drainage without ponding and accounting for anticipated abrasion.
 6. Troweling of materials shall begin immediately following the mixing of the product. Initial troweling shall be in a motion, to compress the material into any voids within the structure walls. Precautions should be taken not to over trowel.
 7. In vertical installation applications, once troweling has been completed, the applied liner should be brushed or sponged to remove trowel marks and to break up the latent surface brought about by troweling. Brushing/sponging should be in the horizontal plane and as with troweling do not over work the lining material. In horizontal applications, brushing/sponging should be performed if specifically required in the project plans and/or specifications.
- D. Hand Spray Application
 1. Material hose shall be coupled to a low-velocity spray application nozzle. Pumping of the material shall commence and the mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.
 2. Spraying shall be performed in a manner such that material is applied evenly and consistently throughout the entirety of the structure.
 3. Material shall be applied to a specified uniform minimum thickness no less than 1-inch | 25.4mm, unless otherwise approved in writing by Manufacturer prior to bid.
 4. Material shall be applied to the bench/invert area in such a manner as to provide for proper drainage without ponding and accounting for anticipated abrasion.
 5. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in a motion, to compress the material into any voids within the structure walls. Precautions should be taken not to over trowel.
 6. In vertical installation applications, once troweling has been completed, the applied liner should be brushed or sponged to remove trowel marks and to break up the latent surface brought about by troweling. Brushing/sponging should be in the horizontal

plane and as with troweling do not over work the lining material. In horizontal applications, applied material should be troweled smooth. Brushing/sponging should be performed if specifically required in the project plans and/or specifications.

- E. Centrifugal Application - Spin-cast unit shall be approved by the material Manufacturer. Mechanical insertion/extraction equipment and retraction speeds shall be calibrated to the structure diameter to ensure uniform application to specified thickness. Material hose shall be coupled to the spin-cast unit. The spin-cast unit shall then be positioned within the center of the horizontal or vertical structure or as appropriate for uniform application and coverage.
1. Vertical Structures/Manholes
 - a. Initially locate the spinner at either the top of the manhole chimney or the lowest point corresponding to the junction of the manhole bench and walls.
 - b. The spin-cast unit shall then be initialized and pumping of the material shall commence.
 - c. As the mortar begins to be centrifugally cast evenly around the interior of the structure, the rotating applicator head may be cycled up and down in multiple passes. When installing in rough, non-uniform vertical structures, a controlled retrieval speed conducive to providing a uniform material thickness on the structure walls shall be maintained.
 2. Horizontal Structures/Pipes
 - a. The Geopolymer Liner material delivery hose shall be coupled to a medium-velocity spray application nozzle.
 - b. Pumping of the material shall commence and the material shall be spin-cast onto the pipe surface.
 - c. A gyroscopic head that has a speed adjustment for making multiple position changes per minute is required. The gyroscopic head allows the spin cast mechanism and the associated selected nozzle to make multiple passes on the pipe wall in a single pass of the sled assembly.
 - d. Spraying of a pipe shall be performed in a manner such that material is applied evenly and consistently throughout the entirety of the structure/pipe.
 - e. Geopolymer Liner shall be applied to a specified uniform minimum thickness no less than 1-inch | 25.4mm, unless otherwise approved in writing by Manufacturer prior to bid.
 - f. The Geopolymer Liner delivery hose shall be coupled to a gyroscopic applicator device. The gyroscopic applicator shall then be positioned within the center, or as required to achieve uniform coverage as dictated by the diameter, size and shape of the pipe.
 - g. As the material begins to be gyroscopically cast evenly around the interior of the cavity, the rotating applicator head shall produce a uniform material thickness to the repair surface.
 - h. Controlled multiple passes shall then be made, if necessary, until the specified minimum finished thickness is attained. If the procedure is interrupted for any reason, the operator shall arrest the longitudinal transition of the applicator head until flows are recommenced.
 - i. Material thickness may be verified at any point with an approved depth gauge. If additional material is required at any level, the gyroscopic applicator head shall be placed at the location and application shall recommence until that area meets the required thickness.
 - j. The lining material shall be applied to a damp surface, with no free water.

- k. The medium-velocity spray nozzle and the gyroscopic spin casting head may be used in conjunction to facilitate uniform application of the material to irregularities in the contour of the pipe walls.
- l. Proper steps shall be taken to ensure the material is cured in a moist and moderate climate as directed by the Manufacturer. General underground conditions are usually adequate to meet this curing requirement.

3.08 CURING OF THE GEOPOLYMER LINER MATERIAL

- A. The Manufacturer's recommended cure schedule must be strictly adhered to at all times.
- B. The use of curing compounds is not recommended for Geopolymer Liner material.

3.09 TERMINATION AND SEALING AT MANHOLES, JUNCTIONS, BENDS, INLETS, OUTLETS, SHAFTS AND OTHER STRUCTURES

- A. Termination of the Geopolymer Liner at the end of a pipe or manhole shall be completed by hand applying the liner to the outer surface of the pipe or into the interior of the manhole.
- B. Unless specifically directed otherwise in the project plans/specification, all starter/intermediate/terminal manholes/junctions/bends/other structures which are directly impacted by rehabilitation activities will also receive an application of Geopolymer Liner.
- C. Unless specifically directed otherwise in the project plans/specifications, all manholes which have been lined with Geopolymer Liner material will receive an application of Chimney Guard chimney treatment. Material is to be installed from the bottom of the cover extending down the shaft a minimum of 12-inches | 300mm and maximum of 18-inches | 450mm as measured vertically into the MH shaft. The surface is to be prepared as follows:
 1. Steel is to be prepared by grinding meeting SSPC-SP 11 followed by cleaning meeting SSPC-SP 1 as a final preparation, resulting in a final minimum surface profile of 1 mil.
 2. Freshly installed mortars, which have been brush finished, are to be prepared by pressure washing at 3,500 psi | 241 bar sufficiently to remove loose dust and debris, following chimney treatment manufacture instructions for durations between product installations.
 3. If installing to a previously mortar lined MH, prepare surface by 5,000 psi | 345 bar pressure wash sufficient to both score the surface and remove loose dust and debris.
 4. If installing to a previously polymeric lined MH, prepare surface by abrading the material with 80-100 grit sandpaper followed by cleaning meeting SSPC-SP 1 as a final preparation to a surface profile of 3mils.
 5. If installing to a new precast or cast-in-place MH, abrasive blast or 7,000 psi | 483 bar pressure wash to a finish between ICRI-CSP 3 to ICRI-CSP 5.

3.10 END OF SHIFT EQUIPMENT CLEAN UP PROCEDURES

- A. All equipment and materials used during the days/shifts operations shall be properly cleaned/covered and stored.
- B. All hoses, fittings, pumps, mixers, spray head equipment, retraction equipment will be cleaned both inside and out.

- C. All mixed Geopolymer and support materials not used in application shall be captured and disposed of properly.

3.11 FINAL INSPECTION

- A. A visual inspection should be made by the Inspector and Licensed Applicator periodically throughout the progression of construction, prior to the completion of a lining stage. Any deficiencies in the finished lining shall be marked and repaired by the Licensed Applicator according to the procedures set forth herein.
- B. While infrequent, small points of infiltration and/or surface cracking may occur in newly lined infrastructure. As with other trenchless repair technologies, repair methods are available to address the areas of concern and restore the infrastructure to its intended condition. To address the observed conditions, the following activities are to be performed:
 - 1. Points of Infiltration – The area will be cleaned and treated with either a topical application of patching material or in more severe cases will be drilled and chemical grout will be injected to permanently stop infiltration.
 - 2. Surface Cracks – The area around the crack will be cleaned and the crack opened using a small wire brush. The crack will then be rinsed and filled with GeoKrete, Manufacturer approved additive or a mixture of the two. The treated area will be blended to match the surrounding surface creating a permanent solution.
- C. At the completion of a lining stage of the infrastructure and once all repairs have been made and accepted, the inspector should indicate acceptance of the work and general conformance with the plans and specifications by signing a Project Sign-off Form provided by the Licensed Applicator/Contractor. Once signed, the Licensed Applicator should document a final inspection video (1 copy) of the completed line segments. This inspection shall be performed by a color video inspection system.

END OF SECTION

DIVISION 11

SECTION 11285

FLEXIBLE FLAP GATE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish install and Flexible Flap Gates, complete with frames, and other appurtenances, as indicated on the Drawings, and as described herein.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
2. A193, Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
3. A240, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
4. A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
5. B209, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
6. B308, Standard Specification for Aluminum-Alloy 6061-T6
7. Standard Structural Shapes.

B. American Water Works Association (AWWA): C501, Cast Iron Sluice Gates.

1.03 SUBMITTALS

A. Submit in accordance with Section 01300. Provide the following information to confirm compliance with the specification.

1. Make, model, weight, of each equipment assembly.
2. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction including the material thickness of all components of the frame and flap.
3. Installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations. Detailed structural and mechanical drawings showing the equipment fabrications and interface with other items. Include dimensions, size, and locations of connections to other work, and weights of associated equipment associated therewith.
4. Maximum bending stress and deflection of the flap under the maximum design head (seating head).

5. The location of the company headquarters and the location of the principle manufacturing facility. Provide the name of the company that manufactures the equipment if the supplier utilizes an outside source.
6. Listing of recommended spare parts.
7. In addition, supply all information requested by the Engineer whether it is explicitly described in these specifications or not.

B. Quality Control Submittals

1. Manufacturer's Certificate of Compliance.
2. Special shipping, storage and protection, and handling instructions.
3. Manufacturer's written/printed installation instructions.
4. Routine maintenance requirements prior to plant startup.
5. Manufacturer's Certificate of Proper Installation.
6. Operation and maintenance manual.

C. Contract Closeout Submittals: Service records for maintenance performed during construction.

1.04 EXTRA MATERIALS:

- A. Furnish, tag, and box for shipment and storage special tools required to maintain or dismantle One complete set**

1.05 QUALITY ASSURANCE

A. Manufacturers Experience

1. Data on service history and operation of submitted equipment under water and/or wastewater treatment type conditions shall be available to the Engineer, if requested, for his use in determining that the equipment offered meets the intent of this Contract and requirements of these specifications.

B. Workmanship

1. Work performed in accordance with the best modern practice for the manufacture of high-grade machinery. Parts shall have accurately machined mounting and bearing surfaces so that they can be assembled without fitting, chipping or remachining. Parts shall conform accurately to the design dimensions and shall be free of all defects in workmanship or material that will impair their service.
2. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years experience designing and manufacturing water control gates.

C. Manufacturers and Products:

1. The specification is based on the Series 452 Aluminum Flap Gate as manufactured by Whipps, Inc. of Athol, Massachusetts. Acceptable manufacturers include: Rodney Hunt Co. HydroGate Corp. or equal.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Extreme care should be used in the handling and storage of this equipment to prevent damage or distortion to the equipment and to insure proper performance.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Type 316 stainless steel frame, minimum 1-1/4-inch thick reinforced neoprene cover, 50 to 65 durometer, neoprene lip seal. All materials shall be suitable for use in sewage and saltwater.
- B. Quantity and Size: Provide flap gates for locations and wall opening sizes shown on the Drawings. Where indicated on the Drawings, provide flap gate assemblies in multiple sections, with sections sized according to requirements indicated on the Drawings.

Components

Frame
Flap
Flap Stiffeners and Flap Retainer
Fasteners, Nuts and Bolts

Materials

Stainless Steel, Type 316L, ASTM A240
Neoprene ASTM D2000
Stainless Steel, Type 316L, ASTM A240
Stainless Steel, Type 316, ASTM A276

2.02 FRAME

- A. The frame shall be constructed of formed stainless steel plate with a minimum thickness of 6.25 mm.
1. Frame design shall be of the flanged back type suitable for mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a pipe flange with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
 2. Where the opening exceeds 1 meter in width or if multiple openings are required, horizontal and/or vertical members shall be incorporated within the opening of the frame.
 3. The frame shall be outfitted with a continuous, resilient seal around the entire perimeter of the opening. Stainless steel retainers and attachment bolts shall hold the seal in place.
 4. All frame members shall be designed to handle a full seating head condition with the flap in the closed position.
 5. The angle of the flap when seated against the frame shall be between 3 degrees and 7 degrees from the vertical.
 6. Lifting lugs shall be provided on the top of the frame to facilitate installation.
 7. All welds shall be performed by welders with AWS certification or equivalent.
 8. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale.

2.03 FLAP

- A. The flap shall be constructed of 31.75 mm minimum thickness rubber with a durometer between 50 and 65. The reinforcing stiffeners shall be constructed of stainless steel plate with a minimum thickness of 6.25 mm.
 - 1. Reinforcing stiffeners shall be bolted to the flap and mounted horizontally.
 - 2. The flap shall be attached to the frame with a 6.25 mm thick stainless steel retainer bar and stainless steel attachment hardware.
 - 3. The reinforcing stiffeners on the flap shall not deflect more than 6 mm of the span under the maximum seating head.
 - 4. A lifting handle shall be welded to the center of the bottom reinforcing stiffener on each flap. The lifting handle shall be constructed of 12 mm diameter stainless steel rod.
 - 5. Leakage shall not exceed 0.1 gpm/ft of wetted seal perimeter in seating head condition.

2.04 ANCHOR BOLTS

- A. Anchor bolts shall be provided by the flap gate manufacturer for mounting the gates when shown on the Contract Drawings.
 - 1. Quantity and location shall be determined by the gate manufacturer.
 - 2. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
 - 3. Anchor bolts shall have a minimum diameter of 12 mm minimum.

PART 3 EXECUTION

3.01 GENERAL

- A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
- B. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.
- C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
- D. The CONTRACTOR shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations.

3.02 FIELD TESTING

- A. After installation, all gates shall be field tested in the presence of the PM/CM and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate shall be visually inspected to confirm that the flap seats against the frame properly.

3.03 MANUFACTURER'S SERVICES:

- A. A. Manufacturer's Representative: Present at site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:
 - 1. 1 person-day for installation assistance and inspection.
 - 2. 1 person-day for field testing and completion of Manufacturer's Certificate of Proper Installation.

END OF SECTION

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SECTION 11292

SLIDE GATES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Requirements to furnish install and test slide gates, complete with operating stems, frames, stops, and hydraulic actuators and other appurtenances, as indicated on the Drawings, and as described herein.
2. Requirements for wall thimbles and anchor bolts required under this section.

B. Related Sections

1. Division 16 – Electrical

C. The gates and appurtenances shall be supplied in accordance with the latest edition of AWWA C561 Standard for Fabricated Stainless Steel Slide Gates as modified herein. The allowable leakage rate for the stainless steel gates in this specification is 1/2 the allowable leakage listed in the latest revision of AWWA C561.

1.02 REFERENCES

A. ANSI/AWWA C561, Standard for Fabricated Stainless Steel Slide Gates

B. American Society for Testing and Materials (ASTM)

1. A36, Standard Specification for Carbon Structural Steel.
2. A48, Standard Specification for Gray Iron Castings.
3. A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
4. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
5. A240, Standard Specification for Stainless Steel
6. A276, Standard Specification for Steel Bars and Shapes.
7. A434, Standard Specification for Steel Bars, Alloy, Hot-Wrought or Cold-Finished, Quenched and Tempered.
8. A435, Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates.
9. B26, Standard Specification for Aluminum-Alloy Sand Castings.
10. B98, Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes.
11. B148, Standard Specification for Aluminum-Bronze Sand castings.
12. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
13. F138 Standard Specification for Stainless Steel Bars

1.03 SUBMITTALS

A. Submit in accordance with Section 01300.

1. Shop Drawings

- a. Submit detailed, dimensioned shop drawings and data for the stainless steel slide gate, including the material thickness of all structural components of the frame and

- slide, shall be submitted to the Engineer for approved before fabrication, shipment or work specified under this section begins.
- b. Submit shop drawings for the electro-hydraulic actuators and control panels, which indicate physical dimensions, details, control panel configuration, cut-away views of the cone valves clearly identifying all component parts, and all other pertinent items of information.
2. Submit installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations.
 3. Submit maximum bending stress and deflection of the slide under the maximum design head.
 4. Submit catalog cuts for the stainless steel slide gate, electro-hydraulic actuators and control panels, which indicate performance and materials of construction.
 5. Submit working drawings, which indicate construction details, base plate and mounting details, location and orientation of installation, wiring diagrams (with wire and terminal numbers) for each actuator and related electrical control equipment.
 6. The Contractor shall provide calculations used for actuator sizing for each Gate to demonstrate that the actuator and hydraulic unit supplied will meet the operating conditions specified. The Contractor shall also provide sequence of operation including all time delays involved.
 7. In addition, supply all information requested by the Engineer whether it is explicitly described in these specifications or not.
 8. Operations and Maintenance Manuals
 - a. Operation and maintenance instructions which reflect "as-built" modifications and conform to the requirements of Section 01700.
 - b. Data shall clearly define maintenance requirements peculiar to the system along with special calibration and test procedures.

1.04 QUALITY ASSURANCE

A. Manufacturers Experience

1. Data on service history and operation of submitted equipment under water and/or wastewater treatment type conditions shall be available to the Engineer, if requested, for his use in determining that the equipment offered meets the intent of this Contract and requirements of these specifications.

B. Workmanship

1. Work performed in accordance with the best modern practice for the manufacture of high-grade machinery. Parts shall have accurately machined mounting and bearing surfaces so that they can be assembled without fitting, chipping or remachining. Parts shall conform accurately to the design dimensions and shall be free of all defects in workmanship or material that will impair their service.
2. Slide gates shall be completely shop-assembled to insure the proper fit and adjustment of all parts.
3. All welds shall be performed by welders with AWS certification.

C. Leakage

1. The slide gates shall be substantially watertight under the design head conditions. The leakage shall not exceed 0.05 gallons per minute per foot of periphery in seating head and unseating head conditions.

D. Shop Testing

1. The completely assembled gate will be shop inspected for proper seating. Seat facings shall be machined and wedges adjusted to exclude a 0.004" thickness gauge between the frame and disc seating surfaces. The gate disc shall be fully opened and closed in its guide system to insure that it operates freely.
2. Floorstands and benchstands shall be shop operated to insure proper assembly and operation.
3. Slide gates having areas of 4 sq. ft. or larger shall be shop tested for leakage. All gates shall be tested under unseating heads, therefore all gates shall be full wedge. Certified shop test shall be required on at least one (1) out of four (4) of same size gates. Where there is less than a quantity of four (4) of a size, each gate shall be tested. Should the specified leakage be exceeded, all gates of the same size shall be tested. Certified test reports shall be made available to Engineer.
4. At the discretion of the Engineer, these tests may be witnessed. The engineer shall be given two (2) weeks advance notice when testing is to occur.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Extreme care should be used in the handling and storage of this equipment to prevent damage or distortion to the equipment and to insure proper performance.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Slide gates shall be manufactured by Whipps, Inc. of Athol. Providing that strict compliance to the detailed specifications is maintained in all respects, equipment manufactured by Waterman Industries, Inc. of Exeter, CA. or others will be deemed an acceptable equivalent product. All slide gates shall be products of the same manufacturer.
- B. Floorstands shall be provided by the gate manufacturer.
- C. Hydraulic actuators shall be manufactured by Trident or an acceptable equivalent product.

2.02 MATERIALS

- A. All materials used in the construction of the gates and appurtenances shall be stainless steel and shall conform to the following specifications:
 1. Frame Guides, Yoke, Invert and Retainers: Stainless Steel, Type 316L, ASTM A-240
 2. Slide and Stiffeners: Stainless Steel, Type 316L, ASTM A-240
 3. Stem: Stainless Steel, Type 316, ASTM A-276
 4. Fasteners, Nuts and Bolts: Stainless Steel, Type 316, ASTM F-593 & 594
 5. Invert Seal (Upward Opening Gates Only): Neoprene ASTM D-2000
 6. Seats/Seals and Facing: Ultra-High Molecular Weight Polyethylene ASTM D4020

7. Lift Nuts: Bronze ASTM B584
 8. Pedestals and Wall Brackets: Stainless Steel, Type 304L, ASTM A-276
 9. Operator Housing: Cast aluminum or cast iron
 10. Finish: Mill finish on Stainless Steel. Weld shall be sandblasted to remove weld burns and scale. All cast iron and steel components shall be properly prepared and shop coated with a primer.
- B. All materials used in the construction of the Electro-Hydraulic Actuators shall be the best suited for the application and shall conform to the following specifications:
1. Base plate, Enclosure & Supports: Stainless Steel, Type 304L
 2. Actuator: Linear cylinder, NFPA Tie rod cylinder
 3. Cylinder Rod: Stainless Steel, Type 17-4 pH Hard Chrome Plated
 4. Reservoir: Steel, ASTM A36
 5. Hydraulic Tubing: Stainless Steel, Type 316
 6. Fittings: Stainless Steel, Type 316, No leak SAE J1453 O-Ring Face Seal Sil-brazed
 7. Assembly Fasteners: Stainless Steel, Type 316, ASTM F593 and F594. Bolts to be secure by elastic stop nuts or double nutting
 8. Manual Hand Pump (Min. Displacement of 1.17 Cu. In.) And Directional Control Valve: Carbon Steel Stainless Steel, Type 316

2.03 SLIDE GATES

- A. The gate shall utilize self-adjusting seals. Due to the difficulty to access the gates when they are in service, gates that utilize adjustable wedges or wedging devices are not acceptable.
- B. Structural components of the frame and slide shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- C. All welds shall be performed by welders with AWS certification.
- D. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All cast iron and steel components shall be properly prepared and shop coated with a primer.
- E. Slide gates shall conform to the requirements of ANSI/AWWA C561 and this specification.
- F. Bolts, nuts, studs and gaskets to attach the slide gate to the thimble, and anchor bolts to attach the slide gate to the wall, shall be furnished by the gate manufacturer.
- G. Stem guide brackets shall be fabricated of stainless steel and shall be outfitted with UHMW or bronze bushings.
- H. All gates shall be provided with a self-adjusting UHMW-PE seal system to restrict leakage in accordance with the requirements listed in this specification.

2.04 COMPONENTS

- A. Frame
1. The frame guides, invert member and yoke members shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
 2. Frame design shall allow for embedded mounting, mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a wall thimble with stainless steel

mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.

3. The portion of the guides that incorporate the seats/seals shall be formed into a one-piece shape for rigidity. Guides consisting of separate bolted plates or angles are not acceptable.
4. The guides shall extend to accommodate the entire height of the slide when the slide is in the fully closed or fully opened position.
5. On self-contained gates, a yoke shall be provided across the top of the frame guides. The yoke shall be formed by two structural members affixed to the top of the guides to provide a one-piece rigid frame. The yoke shall be designed to allow removal of the slide.
6. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flushbottom type on upward opening gates.
7. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.

B. Slide

1. The slide and reinforcing stiffeners shall be constructed of Stainless Steel plate with a minimum thickness of 1/4-inch.
2. The slide shall not deflect more than 1/360 of the span under the maximum design head.
3. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Two vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement.

C. Stem Guides

1. Stem guide shall be provided when necessary to ensure that the maximum L/R ratio for the unsupported part of the stem is 200 or less.
2. Stem guide brackets shall be fabricated of stainless steel and shall be outfitted with UHMW or bronze bushings.
3. Adjustable in two directions.

D. Wall Thimbles

1. Wall thimbles shall be provided when shown on the Contract Drawings.
2. The wall thimble depth shall be equal to the thickness of the concrete wall in which the thimble is to be mounted.
3. Wall thimbles shall be fabricated stainless steel construction of adequate section to withstand all operational and reasonable installation stresses.
4. Wall thimbles shall be constructed of 1/4-inch minimum thickness stainless steel and the front face shall have a minimum thickness of 1/4-inch.
5. The fabrication process shall ensure that the wall thimble is square and plumb and the front face is sufficient flat to provide a proper mounting surface for the gate frame.
6. The face of the wall thimble shall only be machined if recommended by the gate manufacturer. If the wall thimble is to be machined, the front face shall have a minimum thickness of 1/4-inch after machining.
7. A water stop shall be welded around the periphery of the thimble. Wall thimbles shall be designed to allow thorough and uniform concrete placement during installation.
8. Studs and nuts shall be stainless steel.
9. A suitable gasket or mastic shall be provided to seal between the gate frame and the wall thimble.

E. Stems

1. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. On rising stem gates, the threaded portion shall engage the operating nut in the manual operator or hydraulic actuator. On non-rising stem gates, the threaded portion shall engage the nut on the slide.
2. The stem shall have a minimum diameter of 1-1/2 inches.
3. The stem shall be constructed of solid stainless steel bar for the entire length, the metal having a tensile strength of not less than 90,000 psi for stems that are 3 inches or less in diameter. Stems that are in excess of 3 inches in diameter shall have a tensile strength of 85,000 psi.
4. Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.
5. The stem shall withstand in compression at least two times the rated output of the operator with a 40 lb effort on the crank or handwheel.
6. The stem shall have sufficient diameter at the root of the thread to lift the weight of the slide, offset the resistance of the slide to the maximum unbalanced head and allow for load in closing position and opening position.
7. The threaded portion of the stem shall have rolled threads of the full Acme type with a 16 microinch finish or better.
8. Stems of more than one section shall be joined by stainless steel couplings. The coupling shall be threaded, pinned and bolted to the stems.
9. Stems, on manually operated gates, shall be provided with adjustable stop collars to prevent over closing of the slide.

F. Seals

1. The gate shall utilize self-adjusting seals. Due to the difficulty to access the gates when they are in service, gates that utilize adjustable wedges or wedging devices are not acceptable.
2. All gates shall be equipped with UHMW polyethylene seats / seals to restrict leakage and to prevent metal to metal contact between the frame and slide.
3. The seats / seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
4. All upward opening gates shall be provided with a neoprene seal to seal the bottom portion of the gate. The seal shall be attached to the invert member of the frame or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.
5. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
6. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit and/or held in place with adhesives are unacceptable.
7. The seals shall be mounted so as not to obstruct the water way opening.
8. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
9. The seal system shall have been factory tested to 100,000 open-close cycles while maintaining a leakage rate of 0.05 gpm per linear foot of seal or less. Documentation must be provided during the submittal process. t.

G. Anchor Bolts

1. Anchor bolts shall be provided by the gate manufacturer for mounting the gates and appurtenances.
2. Quantity and location shall be determined by the gate manufacturer.
3. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.

4. Anchor bolts shall have a minimum diameter of 1/2-inch.

2.05 ELECTRO-HYDRAULIC ACTUATORS

- A. Each slide gate shall be controlled with an independent submersible, fail-safe split system electro-hydraulic actuator. The system will consist of a power unit, a piston hydraulic accumulator, a hydraulic cylinder with a position system and a hydraulic control panel. The fail-safe electro-hydraulic actuators shall be the product of the Trident Actuators Inc., or approved equivalent
- B. Actuators shall be provided complete with control panels, supports, base plate, and appurtenances.
- C. Equipment furnished and installed under this section shall be fabricated, assembled, and delivered in proper operating condition. Equipment shall be in full conformity with drawings, specifications, engineering data, and instructions. The Contractor shall supply all required dimensions to the valve and actuator manufacturers.
- D. Actuators will be used with slide gates. Actuators shall be capable of operating under all conditions of the environment including total submergence during flood conditions. The actuators shall be designed for submersible service and installation.
- E. The electro-hydraulic fail-safe actuators shall be designed for slide gate operation. Nominal operating time shall be factory set at 24"/min. Actuators shall be furnished with a totally sealed hydraulic oil reservoir, hydraulic pump, electric motor, mounting frames, adjustable fail-safe speed controls, adjustable pressure controls, no leak check valves, manual hand pump system, local and remote controls with control panel. Pressure switches, solenoid valves, manual and motor driven pilot-operated check valves and flow control valves shall be piped from a single hydraulic manifold. Internal piping shall have a maximum of 12 hydraulic connections. Each actuator shall be designed to perform satisfactorily over an ambient air temperature range from 20°F to 110°F.
- F. The actuators shall close the valves in case of emergency or power failure in an adjustable range of 30 to 300 seconds. The fail-safe hydraulic system shall include an accumulator, three electric solenoid valves, and an electrical pressure switch. The control of the fail-safe system shall be from the actuator controller. The accumulator shall deliver fluid to the actuator to return it to its fail-safe position upon loss of electrical power. The pressure switch shall signal the controller when the accumulator has been fully charged again with fluid, wherein fluid from the reservoir cannot be delivered to the cylinder until the accumulator has been fully charged. The hydraulic system shall be designed to allow for discharge of all hydraulic fluid from the accumulator when the system is shut down for maintenance. Accumulator shall conform to Boiler and Pressure Vessel Code for Unfired Vessels, ASME Code Section 8, Division 1. Accumulators shall be made of non-welded seamless steel. Outlet shall be SAE straight thread; dry nitrogen gas shall be used.
- G. Power supply shall be as shown on the electrical drawings.

- H. The hydraulic pump package shall consist of a gear pump, a reservoir, check valves, relief valves, flow control valves, and additional components as specified, or as required, to provide a complete packaged pump unit. The pump package shall be totally sealed from the atmosphere. Changing position of the cylinder shall not introduce air into the system.
- I. Motors provided shall be rated for continuous duty and designed in accordance with NEMA Standards to operate successfully at any voltage within ten (10) percent above or below the rated voltage. Motor bearings shall be permanently lubricated. The motor shall be mounted vertically above the hydraulic reservoir.
- J. Hydraulic cylinder shall be tie rod construction rated for a nominal 3,000 psi. Piston rod shall be Type 17-4 stainless steel, hard chrome plated. Rod cartridge retainer and hardware shall be Type 316 stainless steel. The rod cartridge bushing shall be bronze. Cylinder shall be equipped with piston seals, rod seals, a rod wiper, and tube seals. Hydraulic ports shall conform to SAE J1926 specification. Each actuator shall be equipped with a continuous position feedback linear transducer integrally mounted in the actuator cylinder. The transducer will be protected by a Type 316 stainless steel tie rod enclosure rated for hazardous locations and submergence.
- K. The Hydraulic Reservoir shall be a sealed reservoir. The reservoir shall be manufactured of welded steel and provided with O-Ring fittings to provide a zero-leak installation and a non-vented fill plug. Provide and submit a non-intrusive means to monitor hydraulic fluid level and loss of nitrogen in the accumulator.
- L. Actuator shall include a manual hand pump and directional control valve to allow for manual operation. Mounting shall be external to actuator base plate.
- M. The manufacturer shall certify the electro-hydraulic actuators fully operational and capable of complete submergence in water at pressures equivalent to 20 feet for a 10-day period of time. Actuator manufacturer shall pre-wire the actuator with a sufficient length of continuous submersible power and control cable to allow for power and control termination in the local control panel. Cable entrances into the actuator housing and motor shall be completely sealed and capable of submergence to the specified pressures.
- N. Actuator power unit will be contained inside a protective cover. The cover will be designed to be of a size and weight that can be manually lifted for removal.
- O. The following spare parts shall be provided:
 - (2) Coils for fail-safe solenoid valves
 - (1) Directional control valves
 - (1) each type relay

2.06 CONTROLS

- A. The Contractor shall furnish and install one (1) NEMA 4 main control panel for each slide gate actuator. Location of the control panels shall be as shown on the contract drawings, or as directed by the Engineer. All controls shall be supplied by the electro-hydraulic actuator

manufacturer. Each actuator shall have its own independent control system, housed in the main control panel. The main control panel shall be completely factory assembled, wired and tested with its associated actuator. The door shall be equipped with a hasp for padlocking. All buttons, switches, and indicators shall be labeled as to function and shall carry a NEMA rating equal to the control panel. The main control panel shall include selector switches/push buttons as follows, typical of one:

1. Local -AUTO Selector Switch
 2. Open-Off-Close Selector Switch
 3. HMI Color Touch Screen
- B. A self-regulating space heater element shall be continuously energized for prevention of condensation within the controller enclosure.
- C. Control panel shall have a panel mounted disconnect. Each disconnect handle shall be pad lockable in the open position.
- D. User Interface: A panel mounted color “touch only” interface shall be provided and programmed by the actuator manufacturer to display valve status and alarms as follows:
1. Status:
 - a. Valve Closed
 - b. Valve Open
 - c. Valve Jammed
 - d. VFD Fault
 - e. Valve Fail-Safe Ready
 - f. Valve position 0% open -100% open
 - g. Hydraulic pressure 0-3000 PSI
 2. Dry Remote Contacts: Digital inputs and outputs
 - a. Refer to Contract P&ID drawing
- E. The site-specific control strategy can assign each gate as primary or secondary. The operator can designate the upstream or downstream slide gate as the primary isolation gate and the other as standby isolation gate. During normal operation, all gates are in open position. When the water level in the tunnel reaches defined maximum operating elevation, closing of the primary isolation gate will be initiated until it is fully closed. The standby isolation gate can remain open. During man-entry maintenance of GSS, both gates will be closed. During loss of power, both gates will be automatically closed via the hydraulic actuator. Hydraulic actuators shall be equipped with an accumulator to provide fail safe operation.

2.07 STEM COUPLING

- A. For applications which require coupling to a shaft and key, a steel drive bushing properly bored and keyed shall be supplied. Stem coupling (for threaded stem applications) shall be accomplished by means of a top entry, high tensile, manganese bronze stem nut. The nut shall be of the 2-piece design, permitting installation and removal without disassembly of the

actuator, uncoupling of the actuator from the gate, or removal of the external power and control wiring conduit.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to placing any slide gates onto existing wall thimbles, the Contractor shall assist the Engineer in inspecting the existing wall thimbles to verify that they are in good condition.

3.02 INSTALLATION

A. SLIDE GATES

1. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
2. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.
3. The gate assemblies shall be installed in a true vertical plane, square and plumb.
4. The CONTRACTOR shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations.
5. The CONTRACTOR shall add a mastic gasket between the gate frame and wall thimble (when applicable) in accordance with the manufacturer's recommendations.

3.03 ELECTRICAL WIRING

- A. The actuators and control equipment, when required for the gates, shall be furnished and installed under this Section. All external wiring and connections to floor stands will be furnished and installed under Division 16. The manufacturer, under this section, however, shall furnish all special wiring diagrams and information for the wiring and installation of the control equipment.

3.04 PAINTING

- A. Field painting shall be as specified under Section 09900.

3.05 FIELD QUALITY CONTROL

A. Calibration and Testing

1. After field installation of all gates and operators and the connection of all power supplies, each gate operator shall, under the supervision of a qualified manufacturer's representative, be adjusted and tested under the operating conditions shown in the gate schedule. No gate shall be accepted unless it operates smoothly, and unless it meets the AWWA standard for leakage, during field testing, of less than one-tenth (0.1) gallons per minute per foot of wetted gate periphery of gates under seating head and two-tenths (0.2) for gates under unseating head conditions.

2. The Contractor shall repair or replace any gates failing to meet test requirements.

3.06 SCHEDULE OF SLIDE GATES

A. Slide gate locations, type and other pertinent data are shown in the schedule included in the Drawings.

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DIVISION 13

SECTION 13340

FABRICATED PRE-ENGINEERED PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 GENERAL PROVISIONS

- A. Contractor shall furnish a precast concrete transportable building. Building to be delivered and placed on concrete slab foundation in accordance with manufacturer's recommendations. Precast building to be 12'x16' exterior dimensions. Building shall be provided by manufacturer with all necessary openings as specified and in conformance with manufacturer's structural requirements.

1.02 RELATED WORK

- A. Section 01000 - General Specifications
- B. Section 01010 - Summary of Work
- C. Section 01300 - Submittals
- D. Division 16

1.03 REFERENCES

- A. ACI-318-02: Building Code Requirements for Reinforced Concrete
- B. ANSI/ASCE 7-02: Minimum Design Loads for Buildings and Other Structures
- C. IBC 2012: International Building Code
- D. PCI Design Handbook, 7th Edition
- E. Concrete Reinforcing Institute, Manual of Standard Practice
- F. UL-752 (Test Method level 5) for bullet resistance certified by a military approved laboratory.

1.04 SYSTEM DESCRIPTION / DESIGN REQUIREMENTS

- A. Building Dimensions:
- Exterior: 12'-0" x 16'-0" x 10'-1"
 - Interior: 11'-4" x 15'-4" x 9'-0"
- B. Design Loads

1. Seismic Design Category 'B', Risk Design Category III
 2. Roof Live Load – 50 PSF
 3. Roof Snow Load – 30 PSF
 4. Floor Live Load – 100 PSF
 5. Wind Loading – 120 MPH
- C. Roof: Roof panel shall have a peak in the center of 12-foot direction and shall slope ½” to each side. The roof shall extend a minimum of 2” beyond the wall panel on each side and have a turndown design which extends ½” below the top edge of the wall panels to prevent water migration into the building along top of wall panels. Roof shall also have an integral architectural ribbed edge.
- D. Roof, floor, and wall panels shall be single component monolithic panels. Wall panels shall be set on top of floor panel. Roof, floor, or vertical wall joints are not acceptable, except at corners and along perimeter.
- E. Floor panel must have ½” step-down around the entire perimeter to prevent water migration into the building along the bottom of wall panels.

1.05 SUBMITTALS

- A. Submit in accordance with 01300.
1. Shop Drawings
 - a. Submit detailed, dimensioned shop drawings and data for the prefabricated building and appurtenances, including structural components, door frame, door, hinges and locks, roofing material, water proofing, shall be submitted to the Engineer for approval before fabrication, shipment or work specified under this section begins.
 - b. Engineering calculations that are designed and sealed by a professional engineer, licensed to practice in the state where the project is located, shall be submitted for approval.
 - c. Manufacturers' product literature shall be provided for any plumbing, electrical, and miscellaneous installed fixtures demonstrating compliance with these specifications. The Contractor shall coordinate and cooperate with the public water supplier and local fire department to maintain water distribution and fire protection capability.

1.06 QUALITY ASSURANCE

- A. The precast concrete building producer shall be a plant-certified member of either the National Precast Concrete Association (NPCA), The Precast/Prestressed Concrete Institute (PCI), or equal.
- B. The precast concrete building producer shall demonstrate product knowledge and must have a minimum of 5 years experience manufacturing and setting precast concrete.

- C. Design is based on United Concrete Products Inc. Precast Building as manufactured by a licensed producer of United Concrete Products Inc., or approved equivalent.

PART 2 PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete: Steel-reinforced, 5000 PSI minimum 28-day compressive strength, air-entrained (ASTM C260).
- B. Reinforcing Steel: ASTM A615, grade 60 unless otherwise specified.
- C. Welded Wire Fabric: ASTM 185, Grade 65
- D. Post-tensioning Strand: 41K Polystrand CP50, ½” 270 KSI Seven-Wire strand, enclosed within a greased plastic sheath (ASTM A416). Roof and floor each shall be post-tensioned by a proprietary, second generation design using a single, continuous tendon. Said tendon is placed in the concrete slab to form a perimeter loop starting from one corner of the slab to a point where the cable entered the slab. The tendon then turns 90 degrees and follows the cable member(s) in the periphery to a point midway along the “X” axis of the concrete building panel and then turns 90 degrees along the “Y” axis of the concrete building panel. This bisects the concrete building panel and crosses the opposite parallel portion of the cable member and exits from an adjacent side of the concrete building panel. This creates a cable pattern with no less than 2.5 parallel cables in any direction. To ensure a watertight design, no alternate methods shall be substituted for the post-tensioning.
- E. Sealant: All joints between panels shall be caulked on the exterior and interior surface of the joints. Caulking shall be SIKAFLEX-1A elastic sealant or equal. Exterior caulk reveal to be 3/8”x 3/4” deep so that sides of the joint are parallel for proper caulk adhesion. Back of the joint to be taped with bond breaking tape to ensure adhesion of caulk to parallel sides of joint and not the back.
- F. Vents: Two screened aluminum vents to be cast in rear wall. Vents shall be SUNVENT INDUSTRIES Model FL-164 or equal.
- G. Panel Connections: All panels shall be securely fastened together with 3/8” thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A36 and hot dipped galvanized after fabrication. All fasteners to be ½” diameter bolts complying with ASTM A325 for carbon steel bolts. Cast-in anchors used for panel connections to be Dayton-Superior F-63 coil inserts, or equal. All inserts for corner connections must be secured directly to form before casting panels. No floating-in of connection inserts shall be allowed. Option: panels may be fastened together by welding.

2.02 ACCESSORIES

- A. **Doors and Frames:** Doors shall be made of fiberglass reinforced plastic (FRP) using chemically proven resins resistant to contaminants typically found in the environment for which these specifications are written. Doors shall be 1 ¾ inch thick and of flush construction, having no seams or cracks. All doors up to 4' 0 x 8' 0 shall have equal diagonal measurements with a maximum tolerance of +/- 1/32 inch.
- B. Door Plates shall be 1/8 inch thick, molded in one continuous piece, starting with a 25 gelcoat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass mat and one layer of 16 ounce per square yard unidirectional roving. This will yield a plate weight of 0.97 lbs per square foot at a ratio of 30/70 glass to resin.
- C. Stiles and Rails shall be constructed starting from the outside toward the inside, of a 25 mil gel coat of the color specified followed by a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. In this manner there will be no miter joints or disparate materials used to form the one-piece stile and rail.
- D. Core material shall be 2 expanded polyurethane foam, kraft honeycomb, or mineral core, per owners specifications, which completely fills all voids between the door plates.
- E. Internal Reinforcement shall be firestop of sufficient amount to adequately support required hardware and function of the same.
- F. Finish of the door and frame shall be identical in color and texture. At time of manufacture, 25 mil of resin-rich gelcoat must be integrally molded into both the door and frame. Secondary painting to achieve color is not acceptable.
- G. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Fiberglass retainers which hold the glazing in place shall be resin transfer molded with a profile that drains away from glazing. The retainers must match the color, texture and finish of the door plates. Glass shall be furnished and installed by door and frame manufacturer.
- H. Louver openings shall be sealed in the same manner as the window openings. Louvers are to be solid fiberglass inverted "V" vanes and shall match the color, texture and finish of the door plates.
- I. Transoms shall be identical to the doors in construction, materials, thickness and reinforcement.
- J. Frames shall be fiberglass and manufactured using the resin transfer method in closed rigid molds to assure uniformity in color and size. Beginning with a minimum 25 mil gel coat and a maximum of two layers continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles up to ¾ inch will be solid fiberglass. All frame profiles greater than ¾ inch shall have a core material of 2 psf polyurethane foam. Metal frames or pultruded fiberglass frames will not be accepted.

- K. Finish of frame shall be identical in color and texture to the door. 25 mil resin rich gel coat will be integrally molded into the frame at the time of manufacture. Secondary painting to achieve color is not acceptable.
- L. Jamb/Header connection shall be coped by CNC for tight fit.
- M. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Material shall be completely non-organic with a minimum hinge screw holding value of 656 lbs. Frame screw holding value to accommodate screw shall be a minimum of 1,000 lbs per screw. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.
- N. Mortises for hardware shall be accurately machined by CNC to hold dimensions to +/- 0.010 inch in all three axis.
- O. Hinge pockets shall be accurately machined by CNC to facilitate heavy duty hinges at all hinge locations, using spacers when standard weight hinges are used.
- P. Door Hardware:
1. **Pull Handle:** Shall meet requirements of ANSI A156.2. Shall be thru bolt attached and constructed of a minimum 3/4" diameter stainless pull handle sized 8" center to center with a stainless backer plate, minimum 0.053" on both sides.
 2. **Hinges:** Shall comply with ANSI A156.1 and be of the ball bearing, non-removable pin type (3 per door minimum). Hinges shall be 4 1/2" x 4 1/2" US26D (652) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.
 3. **Deadbolt:** Commercial Grade Deadbolt conforming to ANSI 156.5 furnished with a 2 1/4" face plate and a 1" projecting deadbolt with hardened steel pins. Dead bolts shall be UL and ADA approved. Finish shall be US26D (626) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.
 4. **Surface Bolt:** 8" Surface bolt UL listed. Finish US26D (626) brushed chrome finish. (2 per inactive leaf).
 5. **Threshold:** Bumper Seal type threshold with a maximum 1" rise to prevent water intrusion. Thresholds shall be approved for UL 10B suitable for use with fire doors rated up to three hours.
 6. **Overhead Door Holder:** Heavy duty surface mounted hold open device with hold open/stop angle of 85 to 110 degrees. Construction shall be stainless steel. Finish US32D (630) satin stainless steel finish.
 7. **Drip Cap:** Aluminum drip cap with minimum projection of 2 1/2" shall be furnished.
 8. **Door Stop:** ANSI 156.16 approved wall mounted door stop with keeper constructed of a corrosion resistant cast brass material. Finish US26D (626) brushed chrome finish.

2.03 FINISHES

- A. Interior of Building: Smooth form finish on all interior panel surfaces unless exterior finish is produced using a form liner, then smooth hand-troweled finish. Interior Walls and Ceilings will receive two coats of penetrating concrete stain: Sherwin Williams (H&C concrete stain) or equal. Floor to remain natural concrete.
- B. Exterior of Building: brick pattern stucco finish. Finished brick size shall be 2 3/8" x 7 5/8" with vertical steel float or light broom finish. Joints between each brick must be 3/8" wide x 3/8" deep. Back of joint shall be concave to simulate a hand-tooled joint. Each brick face shall be coated with the following water-based acrylic, water repellent penetrating concrete stain: 1) Canyon Tone stain by United Coatings, 2) Sherwin Williams (H&C concrete stain) or equal. Stain shall be applied per manufacturer's recommendation. Joints shall be kept substantially free of stain to maintain a gray concrete color. Stain color shall be BRICK RED unless specified otherwise.
- C. Standing Seam Metal Roof: Sheet metal shall be 0.027 in zinc-copper-titanium alloy "Microzinc 80" as supplied by W. P. Hickman Company, Asheville, NC 28804, or equal. Pan lengths shall be standard as selected by the Engineer.
1. Solder shall be of best grade composed of 50% pig lead and 50% block tin conforming to ASTM B32 (latest addition).
 2. Flux shall be cut muriatic acid, J.W. Harris Co., Inc., Sta-Clean or equivalent non-corrosive flux designed for use in soldering. All residual flux must immediately be removed after soldering and neutralized by flushing with a water/bicarbonate of soda solution.
 3. Sealant compound shall be non-hardening with heat and/or cold and shall be chemically neutral. Color shall be dark gray. Sealants containing asphalt are not recommended. G. E. Silicone, Silpruf; Dow Corning 795 Silicone or its equivalent is approved for use. Sealant must not be used in transverse seams of roofing systems.
 4. Nails for fastening sheet metal cleats and edge strips shall be made of hot dipped galvanized steel and shall be the stronghold type with large flat heads and needle sharp points. Nails shall be of sufficient lengths to penetrate wood framing or sheathing a minimum of 7/8". Cadmium plated screws may be used to secure galvanized steel components.
 5. Pop Rivets shall be stainless steel 1/8" x 1/4" pop rivets minimum.
 6. Ice and Water Shield: Equal to product by W.R. Grace & Co. 40 mils minimum thickness, 250 psi minimum tensile strength (ASTM D 412), rubberized asphalt adhesive-backed flashing material.
 7. Soffits shall be made of 0.019" gauge (min.) aluminum vented V-groove panels with baked enamel finish (color to be selected from full range of samples), by ALCOA or equal.
 8. CLEATS

- a. Transverse seam and valley nailing cleats shall be a minimum of 2 in. wide and be made of 0.027 in. minimum thickness zinc-copper-titanium alloy. The length shall be sufficient for a minimum fold of ½ in. to be locked into the seam of the folded edge of the roofing sheets and the other end folded back over the nail heads.
 - b. Solderless continuous lock cleats shall be used in transverse seam on all roofs with less than 6 in. in 12 in. pitch (1 in 2). These cleats shall be formed from zinc-copper-titanium alloy thick. The cleat shall run one inch less than the entire length of the transverse seam and be no less than 4 in. in width.
 - c. All other cleats shall be fabricated from hot dipped galvanized steel.
9. Cap Flashing shall be 0.027 in. zinc-copper-titanium alloy cap flashing at the top of base flashings, as indicated.
10. Fascia shall be 0.027 in zinc-copper-titanium alloy fascia.
11. Coping Covers shall be 0.027 in. zinc-copper-titanium alloy coping covers.

D. HANGING GUTTERS, DOWNSPOUTS

1. Provide 0.027 in. zinc-copper-titanium alloy gutters, downspouts and straps.

PART 3 EXECUTION

3.01 SITE PREPARATION

- A. Work under this section relates to placement of the precast concrete building.
 1. Construct stone base and concrete slab
 2. Provide positive drainage for the fill, pad or slab as required.
 3. Coordinate site access requirements with manufacturer.

3.02 ROOF INSTALLATION

- A. Protect products and accessories against damage and discoloration. Store materials inside in a dry area to prevent condensation from forming between sheets and components. Do not permit material storage or excessive traffic on completed roof surfaces.
- B. Standing seam metal roofing and flashing shall be installed in accordance with the manufacturer's recommendations.
- C. Clean all exposed sheet metal of roofing materials, mortar, hand marks, and any other foreign materials using a cleaning solution approved by the manufacturer.

3.03 CAP FLASHING

- A. Form in 10 foot lengths, caulk and lap end joints 3 inches. Do not solder, nail, pop rivet or weld lap joints.
- B. Stagger cap and base flashing joints. Cap flashing to overlap base flashing 4 inches minimum. Fold back bottom edge 12 inch or underside.
- C. Extend cap flashing into walls not less than ½ inch on underside.
- D. Extend cap flashing into walls not less than ½ inch. Where cap flashing terminates in raked joints or reglets, fasten with lead wedges 12 inches on center. Fill reglets with sealant.
- E. Provide snap-lock flange at upper edge of cap flashing to engage reglet receiver where pre-fabricated cap flashing-reglet system is used.

3.04 BASE FLASHING

- A. Provide where roofs abut vertical surfaces.
- B. Provide loose locked joints not more than 8 feet from corners. Allow for expansion, fill joints with sealant of type specified hereinbefore.

3.05 FASCIA

- A. Form in 10 foot lengths; caulk and lap end joints 4 inches with back member taper cut. Provide 4 inches to 6 inches wide cover plates at all joints. Do not solder, nail, pop rivet or welt joints.
- B. Form to allow back edge to extend onto roof 4 inches minimum. Punch ¼ inch holes at 18 inch centers for fastening to nailer with hot dipped galvanized nails. Provide full bed of roof mastic between roof and back edge flange.

3.06 COPING COVERS

- A. Form in 10 foot lengths; caulk and lap end joints 3 inches. Provide 6 inch wide cover plates at all joints. Do not solder, nail, pop rivet or weld joints.
- B. Provide continuous cleat strip at both lead edges of coping cover.
- C. All corners shall be mitered, seamed and sealed.

3.07 HANGING GUTTERS, DOWNSPOUTS

- A. Gutter backs $\frac{1}{2}$ in. minimum higher than fronts. Provide minimum fall of $\frac{1}{2}$ in. 3-foot (2%). Gutter single lengths not to exceed 30 feet.
- B. Allow for 34 in. in 30 feet expansion (0.2%). Support gutter and galvanized straps at 30 inch centers in addition to the straps, provide underside support brackets at 30 inch alternating centers. Brackets, straps installed to allow for gutter movement.
- C. Mount downspouts to allow for thermal expansion. Include approved basket strainers at each downspout.
- D. Joined lengths of downspout shall extend $1\frac{3}{4}$ in. minimum into lower pipe. Provide 3 inch sliding socket for entry into drain pipe.
- E. Provide strap fasteners for downspouts at 10 foot centers.

END OF SECTION

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DIVISION 15

SECTION 15050

PIPE PENETRATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for furnishing and installing pipe penetration assemblies. This Section covers materials for various pipe penetration configurations. Refer to the Contract Drawings for details of assembly and for location.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A53, Standard Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. American National Std. Institute (ANSI)/American Water Works Assoc. (AWWA)
 - 1. ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids

1.03 SUBMITTALS

- A. Submit to in accordance with SECTION 01300, manufacturers' literature on all items to be furnished, installation instructions, and where applicable, fire rating and certified test results of the various components.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Unless otherwise shown all pipe sleeves shall be Schedule 40 galvanized steel pipe conforming to ASTM A53. Provide a 2-in minimum circumferential water stop welded to exterior of sleeve at its midpoint. Ends of sleeves shall be cut, ground smooth, and shall be flush with the wall or ceiling and extend 2-in above finished floors. Sleeves required to be sealed by caulking shall be sized as required. Sleeves required to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations, and shall be a single seal for wall thicknesses up to and including 12-in; two mechanical seals shall be provided for wall thicknesses greater than 12-in. Sleeves for insulated piping shall be sized to accommodate the approved insulation.

2.02 WALL CASTINGS

- A. Unless otherwise shown, wall castings shall be ductile iron conforming to ANSI/AWWA C151/A21.51, 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 an intermediate ½-in thick by 2-in minimum circumferential flange/waterstop, integrally cast with or welded to the casting, located such that it falls 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 head or 20 psig. Mechanical seals shall be Link-Seal, manufactured by Thunderline Corp., Wayne, MI., or equal.
- B. Caulking for iron, steel and copper piping shall consist of braided oakum packing followed by poured molten soft virgin lead. Minimum length of lead segment shall be one half of pipe diameter, or six inches, whichever is less. Lead shall be flush with end of sleeve. Cooled lead shall be expanded with a caulking iron to form a water seal.
- C. Sealant shall be a two part foamed silicone elastomer as manufactured 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 Corporation. Packing shall be a fire retardant pliable material, Fig. 310 by Sealtite Co., White Oakum W.S.-600 by American Manufacturing Co., or equal. 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 Corporation, equal by Euclid Chemical Corporation; Master Buildings Company or equal.
- B. Non-shrink grout shall be Masterflow 713 by Master Builders Company, Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or equal.
- C. Galvanized escutcheon plates shall be provided for all exterior sleeved wall penetrations above finished grade.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Assemble and install components of pipe penetration assemblies as detailed in the Contract Documents.

END OF SECTION

SECTION 15101

MOTORIZED DAMPER

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing and installing of a motorized damper and actuator as specified herein and as shown on the drawings.
- B. The motorized damper and actuator shall be furnished and installed in the 36 inch diameter vent risers off the Gate and Screening Structure Channel Vents. These dampers are shown on BETA/Stantec drawing M-1 titled "MECHANICAL OF 210/213/214 FACILITIES GATE & SCREENING STRUCTURE – HYDRAULIC ACTUATOR AND GATE PLAN AND SECTION.
- C. Motorized dampers and actuators shall be furnished and installed at the following Drop Shaft locations:
 - 1. Drop Shaft DS – UBVI.
 - 2. Drop Shaft DS – 205.
 - 3. Drop Shaft DS – 213
 - 4. Drop Shaft DS – 218

Refer to project plans for drop shaft locations.

1.2 WORK OF OTHER TRADES

- A. Electrical power and control wiring.
- B. Instrumentation including flow sensors and SCADA connection and programming.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Motorized damper.
 - 2. Damper actuator.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.5 DESIGN CRITERIA

- A. Dampers and actuators shall be suitable for installation outdoors in a maritime climate; shall remain operable at ambient air temperatures of -10 deg F, and shall be water proof against snow, hail and wind driven rain.

PART 2 PRODUCTS

2.1 MATERIALS

A. Damper

1. Damper shall be 36-inch diameter control/relief damper. Damper shall be lug style body with flanges drilled for bolted joint connection to duct flanges fabricated in accordance with SMACNA Duct Construction Standards.
2. Damper body, disc and flange construction shall be 316 stainless steel or 304 stainless steel with a corrosion resistant coating suitable for marine environments. Valve seat shall be equal to "Tadpole Seat" with flexible gasket and rated for ¼ of 1% leakage.
3. Damper shall be equal to Model 2100 series Butterfly Control Valve by Elite Industrial Controls of Berlin Heights Ohio.

B. Actuator

1. Damper actuator shall consist of a 120 VAC motor in a NEMA enclosure. **Enclosure shall be capable of operation even if encrusted in ice and must be explosion proof.** Actuator shall be spring return type which shall be arranged to fail open upon loss of power. Actuator shall have dry contact limit switches to provide feedback to indicate damper full open and full closed conditions.
2. Actuator shall have a pressure relief capability as follows: Damper shall fail open at a pressure of 10 lb/sf or 1.92 inches of water column.
3. Actuator shall be supplied by the same manufacturer of the Damper.

C. Fasteners

1. Fasteners shall be 316 stainless steel hex head bolts, nuts and lock washers.

D. Gasketing

1. Damper flange gasketing shall be PTFE or other material suitable for marine exposure.

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION

- A. Damper actuators shall be connected to the SCADA system and local drop shaft sensors. Upon detection of flow in the tunnels associated with a drop shaft, the damper actuator shall

cycle to the open position. If the flow signal stops and does not reoccur for an hour, the actuator shall cycle the damper to the fully closed position. The limit switches shall be arranged to provide feedback of the full open and full closed condition of the dampers.

- B. In the event of a power failure, the actuator shall fail in the open position.
- C. If the damper is in the closed position and a pressure of 10 lb/sf or 1.92 inches of water column builds up in the vent shaft, the actuator shall allow the damper to open as a pressure relief venting to atmosphere.

3.2 INSTALLATION

- A. This Contractor shall receive and store the damper and actuator in a safe weathertight location until the equipment is ready for installation.
- B. Before installation, Contractor shall review the site and the drop shaft ducts to verify they are ready for the duct and actuator installation. Notify the Engineer of any outstanding issues that would interfere with the proper installation of the equipment.
- C. After installation, Contractor shall verify proper operation of the damper and actuator. Provide 1 hour of training for the Owners operating personnel, including demonstration of the damper opening and closing cycles.
- D. Contractor shall furnish Operating and Maintenance Manuals to the Owner.

END OF VENT DAMPER AND ACTUATOR

SECTION 15140

PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Furnish all labor, materials, equipment and incidentals required to install, and make completely ready for operation, pipe hangers, supports, concrete inserts, and anchor bolts including, metallic hanging and supporting devices as specified herein and as shown on the Drawings.

B. Related work

1. Section 03300 – Cast-In-Place Concrete
2. Section 09900 – Painting

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME)

1. ASME B31.1, Power Piping

B. Manufacturers Standardization Society Standard Practice (MSS-SP)

1. MSS-SP-58, Pipe Hangers and Supports, Materials, Design and Manufacture.
2. MSS-SP-69, Pipe Hangers and Supports, Selection and Application.

1.03 REQUIREMENTS

A. Design Requirements

1. The equipment specified herein is intended to support the various types of pipe and piping systems required for the Work.
2. The details shown on the Drawings are intended to indicate the generally desired methods of support under normal conditions.
3. All supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces, and all probable external forces such as equipment, pipe, and personnel contact through 360 degrees in all three dimensions.
4. It shall be the responsibility of the Contractor to provide a Professional Mechanical Engineer licensed in the **State of Rhode Island**, with a minimum of 5 years of demonstrated experience in the design of supports and connections, to design the supports and connections for all equipment for all weights and applied pressures as indicated on the Drawings.
5. In the design of hangers, supports and anchors, pipe pressures shall be taken as the maximum rated pressure specified for pipe lines carrying gases and air and twice the maximum rated pressure specified for pipe lines carrying liquids.

6. Payment for such design services shall be included in the Prices bid for furnishing and installing pipe lines.
7. Hangers and supports shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions.
8. All supporting equipment, with the exception of springs, shall be designed with a minimum working factor of safety of five based on the ultimate tensile strength of the material.
9. Where additional structural members are required, they shall be designed for the specific loads they are to support in accordance with the requirements of **Rhode Island Building Code**.

B. Performance Requirements

1. All hangers, supports and appurtenances shall conform to the latest requirements of the following listed references except as supplemented or modified by the requirements of this Specification.
 - a. ANSI B 31.1.
 - b. MSS-SP-58.
 - c. MSS-SP-69.

1.04 SUBMITTALS

A. In accordance with SECTION 01300.

1. Representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers are not suitable, submit detailed drawings showing materials and details of construction for each type.
2. Complete piping drawings indicating type of hanger, location, and magnitude of load transmitted to the structure. Submittals shall use detail numbers as shown on the Drawings to indicate type of support proposed wherever possible.

- B. Design computations shall not be submitted for review. Any design computations submitted shall be returned without comment. A design certificate shall be submitted prior to installation of any piping.**

1.05 DELIVERY, STORAGE AND HANDLING

- A. All supports and hangers shall be crated, delivered and uncrated so as to protect against any damage.**
- B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.**
- C. Finished iron or steel surfaces not galvanized or painted shall be properly protected to prevent rust and corrosion.**

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Unless otherwise specified herein, pipe hangers and supports shall be as manufactured by the following:
1. Grinnell Corp., Providence, Rhode Island.
 2. Carpenter & Patterson, Inc., Woburn, Massachusetts.
 3. F&S Central, Brooklyn, New York.
 4. Elcen Metal Products Co., Franklin Park, Illinois.
 5. Unistrut Northeast, Woburn, Massachusetts
- B. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary. Any item comparable in type, style, quality, design and performance shall be considered as equal.
- C. The Drawings and Specifications indicate general and specific methods and details of supporting the various piping systems. Any changes to the support details shown shall be submitted to the Engineer for review.
- D. All uninsulated non-metallic piping such as PVC, fiberglass, etc. shall be protected from local stress concentrations, at each support point by galvanized steel protection shields or other method as approved by the Engineer where pipes are bottom supported 180 degree arc shields shall be furnished. Where 360 degree arc support is required, such as U Bolts, protection shields shall have a 50 mils minimum thickness, not be less than 12 inches in length and be securely fastened to pipe with stainless steel or galvanized metal straps not less than 1/2 inch wide.
- E. All insulated pipe shall be furnished with a rigid foam insulating saddle at each pipe support location as specified under insulation. Provide galvanized protection shields as specified in Paragraph 2.01D above at each location.
- F. Where pipe hangers and supports come in contact with copper piping provide protection from galvanic corrosion by the following:
1. Wrap pipe with 60 mils thick neoprene sheet material and galvanized protection shield.
 2. Provide isolators similar to Elcen figure number 228.
 3. Provide copper plated or PVC coated hangers and supports.
- G. Pipe supports shall be provided as follows:
1. Cast iron soil pipe: maximum support spacing of 5.0 feet with a minimum of one support per pipe section at the joints.
 2. Steel pipe: maximum support spacing of 10 feet with a minimum of one support per pipe section at the joints.
 3. Fiberglass pipe: as recommended by the manufacturer except that support spacing shall not exceed 5 feet.
 4. PVC pipe: as recommended by the manufacturer except that support spacing shall not exceed 3 feet. For pipe equal to or less than 1 inch in diameter and 5 feet for all other pipe sizes.

5. Support spacing for steel pipe 2 inches and smaller and copper tubing shall not exceed 5 feet.
6. Ductile iron pipe: maximum support spacing of 10 feet with a minimum of one support per pipe section at the joints.
7. All vertical pipe shall be supported at each floor or at intervals of not more than 12 feet by approved pipe collars, clamps, brackets, or wall rests, and at all points necessary to insure rigid construction.
8. Pipe supports shall not induce point loadings but shall distribute pipe loads evenly along the pipe circumference.
9. Effects of thermal expansion and contraction of the pipe shall be accounted for in the pipe support selection and installation.

2.02 SINGLE PIPE HANGERS

- A. Single pipes shall be supported by hangers suspended by galvanized steel rods from structural steel members, concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets.
- B. Hanger rods shall be hot rolled steel, machine threaded and galvanized after fabrication. The strength of the rod shall be based on its root diameter.
- C. Except as otherwise specified herein, pipe hangers shall be adjustable clevis type similar to Grinnell Figure Numbers 65, 260, and 590 as required. Hangers shall be carbon steel with a galvanized finish.
- D. Hanger rods shall be attached to concrete structures using concrete inserts similar to F&S Figures 180, 571 or 150. Inserts shall be malleable iron, or steel with galvanized finish. Beam damps, C clamps or welded beam attachments shall be used for attaching hanger rods to structural steel members. Where necessary and approved by the Engineer double expansion shields shall be used for attaching to concrete structures.
- E. Where pipes are near walls, beams, columns, etc. and located an excessive distance from ceilings or underside of beams, welded steel wall brackets similar to Carpenter and Patterson Figure numbers 69-68, 84 or 139 shall be used for hanging pipe. Brackets shall be galvanized. Where single pipes rest on top of bracket pipe supports, attachments shall meet requirements as specified under multiple pipe hangers.

2.03 MULTIPLE PIPE HANGERS

- A. Suspended multiple pipes, running parallel in the same horizontal plane, which are adjacent to each other shall be suspended by trapeze type hangers or wall brackets. Trapeze hangers shall consist of galvanized structural steel channel supported from galvanized threaded rod or attached to concrete walls, columns or structural steel support members as required to meet the intent of this specification. Channel shall be similar to F&S Figure 710, rods, concrete inserts, "C" Clamps, beam clamps, welded beam attachments, and expansion shields shall be as specified in 2.02 Single Pipe Hangers.
- B. Except as otherwise specified herein pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchor or pipe chair similar to F&S Figures 158, 419,

160A, 160B as required. Materials of construction shall be galvanized steel. Chair "U" bolts shall be tightened to allow freedom of movement for normal expansion and contraction except when pipe must be anchored to control direction of movement or act as a thrust anchor.

2.04 SINGLE AND MULTIPLE PIPE SUPPORTS

- A. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods specified herein or as shown on the Drawings.
- B. Pipes 3-inch diameter and larger shall be supported by adjustable stanchions similar to F&S Figure 427, constructed of galvanized steel. Stanchions shall provide at least 4-inch adjustment and be flange mounted to floor,
- C. Pipes less than 3-inches in diameter shall be held in position by supports fabricated from steel "C" channel, welded post base similar to Unistrut Figure P2072A and pipe clamps similar to Unistrut Figures P1109 thru P1126. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected together by horizontal member of sufficient load capacity to support pipe. Wherever possible supports shall be fastened to nearby walls or other structural member to provide horizontal rigidity. More than one pipe may be supported from a common fabricated support. All supports unless specified elsewhere shall be galvanized.
- D. Where required, pipe shall be supported using concrete anchor posts constructed in accordance with SECTION 03300. Pipe shall be securely fastened to concrete anchor posts using suitable metal straps as required and approved by the Engineer.

2.05 WALL SUPPORTED PIPES

- A. Single or multiple pipes located adjacent to walls, columns or other structural members shall whenever deemed necessary shall be supported using welded steel wall brackets similar to Carpenter and Patterson Figure numbers 69-78, 84, or 134; or "C" Channel with steel brackets similar to Unistrut pipe clamps. All members shall be securely fastened to wall, column, etc. using double expansion shields or other method as approved by the Engineer.
- B. Pipe shall be attached to supports using methods hereinbefore specified to meet the intent of this Specification.
- C. All supports shall be galvanized.

2.06 BASE ANCHOR SUPPORT

- A. Where pipes change direction from horizontal to vertical via a bend, a welded or cast base anchor support shall be installed at the bend to carry the load. The bend anchor shall be fastened to the floor with double expansion shields or other method as approved by the Engineer.

- B. Where shown on the Drawings, pipe bends shall be supported using concrete anchor posts. Pipes shall be securely fastened to concrete supports with suitable metal bands as required and approved by the Engineer.

2.07 VERTICAL PIPE SUPPORTS

- A. Where vertical pipes are not supported by a Unistrut system as specified in Paragraph 2.08, they shall be supported in one of the following methods.
 1. For pipes 1/4-inch to 2-inch in diameter, an extension hanger ring shall be provided with an extension rod and hanger flange. The rod diameter shall be as recommended by the manufacturer for the type of pipe to be supported. The hanger ring shall be galvanized steel or PVC clad depending on the supported pipe. The hanger ring shall be equal to Carpenter & Peterson Figure number 81 or 81CT. The anchor flange shall be galvanized malleable iron similar to Carpenter & Patterson Figure number 85.
 2. For pipes equal to or greater than 1/2-inch in diameter extended pipe clamps similar to Carpenter and Patterson Figure number 267 may be used. The hanger shall be attached to concrete structures using double expansion shields, or to steel support members using welding lugs similar to Carpenter & Patterson Figure number 220.
 3. Pipe riser clamps shall be used to support all vertical pipes extending through floor slabs. Riser clamps shall be galvanized steel similar to Carpenter & Patterson Figure number 126. Copper clad or PVC coated clamps shall be used on copper pipes. Insulation shall be removed from insulated pipes prior to installing riser clamps.
 4. Unless otherwise specified, shown, or specifically approved by the Engineer, vertical runs exceeding 11 feet, pipes shall be supported by approved pipe collars, clamps, brackets or wall rests at all points required to insure a rigid installation.

2.08 SPECIAL SUPPORTS

- A. Pipe supports shall be provided for closely spaced vertical piping systems as shown on the Drawings or as otherwise required to provide a rigid installation. The support system shall consist of a framework suitably anchored to floors, ceilings and walls and be as manufactured by the Unistrut Corporation, Globe-Strut as manufactured by the Metal Products Division of U.S. Gypsum, or equal.
- B. Vertical and horizontal supporting members shall be U shaped channels similar to Unistrut Series P1000. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps equal to Unistrut series P1100M and series P2558. All components shall be of mild steel.
- C. The assemblies shall be furnished complete with all nuts, bolts, and fittings required for a complete assembly including end caps for all members.
- D. The design of each individual framing system shall be the responsibility of the Contractor. Shop drawings, as specified above shall be submitted and shall show all details of the installation, including dimensions and types of supports. In all instances the completed frame shall be adequately braced to provide a complete rigid structure when all the piping has been attached.

- E. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes in accordance with AISC Specifications, have anchor hardware similar to items previously specified herein, shall meet the minimum requirements listed below and be subject to the approval of the Engineer.
 - 1. Pipe support systems shall meet all requirements of this Section and all related Sections of the Specification.
 - 2. Complete design details of the entire pipe support systems shall be provided, for review by the Engineer.
 - 3. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure is designed.

2.09 SURFACE PREPARATION AND SHOP PAINTING

- A. All surfaces shall be prepared and shop painted as part of the work of this Section. Surface preparation and shop painting shall be as specified in SECTION 09900.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping system.
- B. Pipe and tubing shall be supported as required to prevent damaging stresses in the pipe or tubing material, valves and fittings, and to support and secure the pipe in the intended position and alignment. Supports shall be sufficiently close together such that the sag of the pipe is within limits that will permit drainage and avoid excessive bending stresses from concentrated loads between supports.
- C. Pipes, horizontal and vertical, requiring rigid support shall be supported from the building structure by approved methods. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or specific herein. No piping shall be supported from metal stairs, ladders and walkways unless specifically directed or authorized by the engineer.
- D. Where flexible couplings are required at equipment, tanks, etc. the end Opposite to the piece of equipment, tank, etc. shall be rigidly supported.
- E. Pipe supports shall be installed to minimize, lateral forces through valves, both sides of split type couplings and sleeve type couplings, and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connection pipes.

END OF SECTION

CERTIFICATE OF DESIGN FOR PIPE HANGERS AND SUPPORTS

(Owner)

Contract Reference: _____

_____, dated _____.

In accordance with the provisions of the above referenced Contract, as the designated Contractor,

(Contractor's Name and Address)

hereby certifies that _____

(Contractor's Name and Address)

- (1) Is properly licensed and currently registered as a Professional Engineer in the State (or Commonwealth) of _____;
- (2) Is fully qualified to design and supervise the _____

(Item of work and location)

In accordance with the provision specified under the appropriate Section and/or Subsections of the Contract Documents:

- (3) Has successfully designed and supervised _____

(Item of work)

before and demonstrates a minimum of ten (10) documented years of proven experience in such field;

- (4) Has personally examined the type(s) and locations(s) of the Work required under this Contract, and the overall conditions associated therewith, to the extent necessary to fully satisfy his or her professional responsibilities for designing and supervising the above referenced work;

- (5) Has prepared the attached design in full compliance with the applications and requirements of the Contract Documents, sound engineering practice, modern accepted principles of construction, and all applicable federal, state and local laws, regulations, rules and codes having jurisdiction over the Work;
- (6) Will provide sufficient supervision and technical guidance to the Contractor throughout the Work to ensure compliance with the design and all quality assurances necessary to successfully complete the Work;
- (7) Hereby indemnifies and holds harmless the _____
_____ and BETA Group, Inc.,
(name of owner)
and their agents, employees and representatives, from and against any and all claims, whether directly or indirectly, arising out of, relating to or in connection with the Work; and
- (8) This "Certificate of Design" together with all applicable designs, drawings, details, specifications on other related documents necessary to complete the Work as specified, have been signed and sealed pursuant to applicable state law.

In recognition and observance of the above referenced statements, the undersigned parties hereby acknowledge and accept the responsibilities and obligations associated therewith.

CONTRACTOR:CONTRACTOR'S ENGINEER

(Contractor's Name)

(Engineer's Name)

By: _____

By: _____

(Name and Title)

(Name and Title)

Date: _____
(SEAL)

Date: _____
(P.E. STAMP)

(Note: Contractor to fully reference all attachments below)

END OF SECTION

DIVISION 16

SECTION 16000

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes all labor, materials, tools, equipment, and accessory items and performing all operations necessary to furnish and install the complete electrical work in accordance with this section of these specifications, the drawings and the standards of the applicable codes listed herein.
- B. The work shall include, but not be limited to, furnishing and installation of equipment and items listed below and installation only of items furnished under other sections of these specifications.
 - 1. Complete electrical service as hereinafter specified.
 - 2. Conduit, wire and electrical connections are required on certain items specified in sections of these specifications other than the electrical section. This Contractor shall examine all sections of these specifications to determine the complete scope of the electrical work.
 - 3. Raceways and fittings
 - 4. Wires and cables
 - 6. Miscellaneous equipment
 - 7. Panelboards
 - 8. Lighting systems
 - 10. Grounding systems
 - 11. Underground system
 - 12. Security Alarm system
- C. Mount and wire operator's stations, and power conversion equipment for all variable speed drive systems furnished under other Divisions of these Specifications.
- D. Install and make all field connections to variable frequency drives, process instrument panels and other control panels furnished under other Divisions of these Specifications.
- E. Mount and wire instruments and control cabinets furnished under other Divisions of these Specifications. Furnish and install all conduit, wire and interconnections between process instrumentation primary elements, transmitters, local indicators and receivers. Mount and wire all lightning and surge protection equipment at process instrumentation transmitters and receivers.

- F.
- G. Mount and make field connections to “packaged” equipment furnished under other Divisions of these Specifications.
- H. Provide conduit and power/control wiring for all HVAC (Heating, Ventilation and Air Conditioning) and Plumbing equipment furnished under other Divisions of these Specifications.
- I. Documents Applicable to the Work of this Section
 - 1. Division 0 of the Contract Documents (Contract Forms and Requirements).
 - 2. Division 1 of the Technical Specifications.
 - 3. Technical Specifications: Section 16000 - Basic Electrical Requirements, and the following sub-sections:
 - a. Section 16060 – GROUNDING SYSTEM
 - b. Section 16080 – UNDERGROUND SYSTEMS
 - c. Section 16085 – MISCELLANEOUS EQUIPMENT
 - d. Section 16120 – WIRE AND CABLES
 - e. Section 16130 – RACEWAYS AND FITTINGS
 - f. Section 16442 – PANELBOARDS
 - g. Section 16500 – LIGHTING SYSTEM
 - h. Section 16720 – SECURITY ALARM SYSTEMS
- J. Drawings: Work specifically required under this Section includes all Electrical work shown on or required by Contract Drawings GE-1, GE-2, E-1, E2, E3, E4, E5, E6, & E-7.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01650 and as specified herein:
 - 1. Panelboards
 - 2. Lighting fixtures
 - 3. Disconnect switches
 - 4. Control stations
 - 5. Miscellaneous equipment
 - 6. Security Alarm System
- B. The manufacturer's data sheets with product designation or catalog numbers shall be submitted for the following material:
 - 1. Wire
 - 2. Conduit
 - 3. Receptacles
 - 4. Boxes and fittings
- C. Submit all other data as specified herein.

- D. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section 16000.
- E. No material shall be ordered or shop work started until the Engineer's approval of shop drawings has been given.
- F. Prior to submitting shop drawings for lighting fixtures, verify the type of ceiling suspension systems being installed. Notify Engineer of any discrepancies between fixture type specified and suspension system. Additional cost rising from failure to notify the Engineer will be the responsibility of the Contractor.
- G. Operation and Maintenance Manuals - Prepare manuals in accordance with Section 01730.
- H. Record Drawings - Prepare as specified in Part 1 of this Section.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 and as specified herein.
- B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If stored for more than two weeks, the equipment shall receive all maintenance considerations required by the manufacturer for the proper storage of equipment. Proper storage in this context shall include the provision of heaters and dehumidifiers to keep the equipment dry at all times. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the Owner. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, or shall be replaced at no additional cost to the Owner.

1.4 DESIGN CRITERIA

- A. Service Characteristics:

Primary Utility Voltage: 13.8KV

Secondary Voltage: 120/208V, 3-Phase

All equipment and wiring shall be suitable for the applied voltage.

- B. Service and Metering

1. The power company serving this project is National Grid.
2. A new service that will be obtained at 120/208Volts, 3-phase, 4-wire from an existing utility manhole.
3. Furnish and install the secondary service conduit, wire and connectors.
4. The power company will provide the meter, the contractor shall provide the meter socket in

accordance to the utility company requirements.

5. All work and material for the electrical service shall be in accordance with the requirements of each utility company.
6. Make all arrangements with the power utility company for obtaining the service and furnish all labor and material for the service. Submit any utility fee invoice(s) associated with the service replacement to the Owner. The Owner shall make direct payment(s) for the fee(s) to National Grid.

C. Requirements of the Regulatory Agencies

1. The final, complete installation shall comply with all state and local statutory requirements having jurisdiction. The Contractor shall arrange for all necessary permits, pay all fees and arrange for all required inspections by local authorities. In general, all work shall comply with the requirements of the National Electrical Code, all state codes and the codes and ordinances of the city or town in which the work is to be done.

D. Tests and Settings

1. Test all systems furnished under DIVISION 16 - ELECTRICAL and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the system.
2. Make all circuit breaker and motor circuit protector settings based on the connected equipment manufacture's recommendations.
3. The following minimum tests and checks shall be made prior to the energizing of electrical equipment. A certified test report shall be submitted stating that the equipment meets and operates in accordance with manufacturer's and job specifications, and that equipment and installation conforms to all applicable standards and specifications.
 - a. Testing of protective relays, static devices, transfer switches, circuit breakers and motor circuit protectors for calibration and proper operation and settings.
 - b. Over potential, high potential, insulation resistance and shield continuity tests for cables.
 - c. Mechanical inspection of switches, transfer switches and circuit breakers.
4. The Engineer shall be immediately notified of any unfavorable test results or indication of faulty equipment. No piece of equipment shall be energized until the test data is evaluated and the equipment is proven acceptable.
5. If the test and inspection data submitted should indicate deficiencies in the operation of the electrical apparatus or in the manufacturer thereof, the Contractor shall promptly implement the necessary adjustments, corrections, modifications and/or replacements necessary to be made to meet the specified requirements.

1.5 RELATED WORK NOT INCLUDED

- A. Excavation and backfilling, including gravel or sand bedding for underground electrical work is included under DIVISION 2 - SITE WORK of these Specifications.
- B. Concrete work, including concrete electrical duct encasement, is included under DIVISION 3 - CONCRETE of these Specifications.

1.6 SLEEVES AND FORMS FOR OPENINGS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions etc. When located in formed concrete walls locate all necessary slots for electrical work and form before concrete is poured.
- B. Provide waterproof sealing for the penetrations through exterior walls, etc.
- C. Provide fireproof sealing for penetrations through fireproof walls, etc.
- D. Foam type fire and water proofing is not allowed.

1.7 CUTTING AND PATCHING

- A. All openings required by the work of these Sections shall be planned for in advance. Any cutting and patching required by the lack of such planning shall be done by the General Contractor at the expense of this Contractor. It will be the responsibility of this Contractor to keep the General Contractor informed of all required openings.

1.8 CORING

- A. Provide all coring for conduits penetrating floors, walls, partitions etc.
- B. Provide waterproof sealing for the penetrations through exterior walls, etc.
- C. Provide fireproof sealing for penetrations through fireproof walls, etc.
- D. Foam type fire and water proofing is not allowed.

1.9 ELECTRICAL HAZZARDOUS CLASSIFCATION AND NEMA RATINGS FOR ELECTRICAL INSTALATION AND ENCLOSURES

- A. Unclassified, NEMA Type 12 for Building interior.
- B. Unclassified, NEMA Type 4X for Building exterior.
- C. Class 1, Division I, NEMA Type 7 for within the Diversion Structure and Tunnel.

1.10 INTERPRETATION OF DRAWINGS

- A. The Drawings are not intended to show exact routing of conduit runs or terminations. Contractor shall determine exact location of conduit terminations by examinations of approved shop drawings.

The Contractor shall not reduce the size or number of conduit runs indicated on the drawings.

- B. The final routing of raceways shall be determined by structural conditions, interferences with other trades and by terminal locations on apparatus. The Engineer reserves the right of a reasonable amount of shifting at no extra cost up until time of roughing in the work.
- C. Locate pull boxes, panelboards, control pushbuttons, terminal cabinets, safety switches and such other apparatus as may require periodic maintenance, operation, or inspection, so that they are easily accessible. If such items are shown on the drawings in locations which are found to be inaccessible, advise the Engineer of the situation before work is advanced to the point where extra costs will be involved.
- D. Each three-phase circuit shall be run in a separate conduit unless otherwise shown on the drawings.
- E. Unless otherwise approved by the Engineer conduits shown exposed shall be installed exposed; conduits shown concealed shall be installed concealed.
- F. Where circuits are shown as “home-runs” all necessary fittings and boxes shall be provided for a complete raceway installation.
- G. In general, wiring and raceway systems for lighting, receptacles, fire alarm, telephone and intercommunications systems are not indicated on the drawings but shall be furnished and installed under this section.
- H. Each branch circuit shall have its own neutral, dedicated to that circuit. A common neutral for more than one single phase circuit is not allowed.
- I. Verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
- J. Any work installed contrary to drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- K. The locations of equipment, fixtures, outlets, and similar devices shown on the drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- L. Circuits on three phase panelboards shall be field connected to result in evenly balanced loads on each phase.
- M. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.
- N. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical system shown. Additional circuits shall be wherever needed to conform to the specific requirements of the equipment.

- O. All connections to equipment shall be made as required, and in accordance with the approved shop and setting drawings.
- P. Schematic diagrams shown on the drawings indicate the required functions only. Standard circuits of the particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic drawings shown. Additional wiring or conduit required for such deviations shall be furnished at Contractor's expense. Contractor must ensure that all components necessary to accomplish the required function are provided.

1.11 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the structure.
- B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitable, to insure that the tilting does not impair the functional integrity of the equipment.

1.12 TEMPORARY POWER AND LIGHTING

- A. The Electrical Subcontractor shall furnish and install feeders of sufficient size from the utility company for the electric light and power requirements for the project while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, and stairwells. Minimum sized lamp used shall be 1500 lumens. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified lumens shall be increased to provide these increased intensities.
- B. All necessary transformers, meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.
- C. The Electrical Subcontractor shall provide and maintain in each area of the building and the building exterior, a feeder or feeders of sufficient capacity for the requirements of the entire floor and he shall provide a sufficient number of outlets, located at convenient points, so that extension cords of not over 50 ft. in length will reach all work requiring temporary light or power.
- D. The Electrical Subcontractor shall install and maintain the wiring and accessories for the portable trailer office of the General Contractor.
- E. All temporary electrical work shall meet the requirements of the National Electrical Code Article 305 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.
- F. All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.
- G. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his

Subcontractors, unless otherwise indicated.

- H. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 2 hour before and 2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

1.14 RECORD DRAWINGS

- A. Record drawings shall be provided under this Section in accordance with Section 01780 and as specified herein.
- B. As work progresses and for the duration of the Contract, maintain a complete and separate set of prints of Contract Drawings at the job site at all times. On a daily basis, record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design such as change orders, instructions issued by the Engineer, or conditions encountered in the field.
- C. Drawings shall show record condition of details, sections, and riser diagrams, and control changes. Schedules shall show actual manufacturer and make and model numbers of final equipment installation. Remove all superseded data to show the completed work. Accurately indicate the location, size, type, and elevation of new utilities and their relationship to other utilities.
- D. The Record Drawings will be used as a guide for determining the progress of the Work installed. They shall be inspected on a regular basis and shall be corrected immediately if found inaccurate or incomplete. Requisitions for payment will not be approved until the Drawings are accurate and up-to-date.
- E. At completion of Work prepare a complete set of Record Drawings showing all systems as actually installed. The Contract Drawing electronic CAD files will be made available for this Contractor's copying, at his expense, into reproducibles to serve as backgrounds for the Record Drawings. Provide all drawings necessary to show the required as-built information. Submit three sets of prints to the Engineer for comments as to compliance with this Section. Make all modifications so noted by the Engineer.
- F. Certify the accuracy of the record drawings. Record Drawings shall become the property of the Owner.
- G. When required by jurisdiction, submit the record set for approval by the Authority Having Jurisdiction in a form acceptable to the jurisdiction.

1.15 COMPONENT INTERCONNECTIONS

- A. Components of equipment furnished under this Specification will not be furnished as integrated systems.

- B. Analyze all systems components and their shop drawings; identify all terminals and prepare drawings or wiring tables necessary for component interconnection. Furnish two copies of interconnection wiring diagrams and tables to the Owner as part of the record drawings.
- C. Furnish and install all component interconnections.

1.16 MANUFACTURER'S SERVICES

- A. Provide manufacturer's services for testing, training and start-up of the following equipment:
 - 1. Security Alarm System.

1.17 MATERIALS

- A. Materials and equipment used shall be Underwriters Laboratories, Inc. listed wherever standards have been established by that agency. Written approval by the Engineer and local inspecting authority is required wherever UL Listed approval is not available.
- B. Manufacturer of Principal Equipment
 - 1. All lighting and power panelboards shall be made by one manufacturer.
 - 2. All conduit of a given type shall be made by one manufacturer.
 - 3. All wire and cables of a given type shall be made by one manufacturer.
 - 4. All three phase magnetic motor starters furnished shall be made by one manufacturer.

1.18 WARRANTY

- A. Provide warranty and guarantee on all equipment furnished and work performed for a period of one (1) year from the date of substantial completion.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF BASIC ELECTRICAL REQUIREMENTS

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SECTION 16060

GROUNDING SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing and installing of a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as specified herein and as shown on the drawings.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Conduit
 - 2. Wire
 - 3. Ground rods
 - 4. Ground bus bars

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

PART 2 PRODUCTS

2.1 CONDUIT

- A. Conduit shall be as specified under Section 16130 (Raceways and Fittings).

2.2 WIRE

- A. Wire shall be as specified under Section 16120 (Wire and Cables).

2.3 GROUND RODS

- A. Ground rods shall be copper clad steel 3/4 inch in diameter and 10 feet in length unless otherwise shown on the drawings. Rods shall one 10 foot length rod. Ground rods shall be Copperweld, equal by A.B. Chance Co., or equal.

2.4 GROUNDING BUS BARS

- A. Provide a grounding bus bar next to or below the main distribution board or main disconnect, ground bus bar to be approximately 8" above finished floor.

- B. Grounding bus bars shall be copper, not less than ¼ inch by 2 inch by 24 inch.
- C. All lugs, bolts and nuts shall be silicon bronze.
- D. Buses shall be mounted to the room wall with standoff isolators, standoff brackets, and mounting bolts.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Grounding electrode conductors shall be run in rigid steel conduits. Protecting conduits shall be bonded to the grounding electrode conductors at both ends.
- B. Grounding conductors shall be run with feeders where shown on the drawings or hereinafter specified.
- C. Liquid tight flexible metal conduit in sizes 1 inch and larger shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled) and fastened with plastic tie wraps. Tie wraps shall be installed 12 inches apart and not more than 6 inches from ends.
- D. Connect the following equipment by separate wire or cable directly to the grounding grid system:
 - 1. Service entrance circuit breaker
 - 2. Ground buses
 - 3. Metal Fencing
 - 4. Door frames and railings.
- E. Connect the following equipment by separate wire or cable to the ground bus in the distribution equipment servicing the equipment:
 - 1. Panelboards
 - 2. Control panels
 - 3. All feeders and branch circuits
 - 4. Receptacle circuits
- F. The following equipment shall be grounded through the metallic raceway systems with permanent and effective ground connections:
 - 1. All metal cases and support frames
 - 2. Lighting system
 - 3. 120 Volt motors
- G. Bond the following N.E.C. approved electrodes together to form a ground grid system:
 - 1. Building steel frame
 - 2. Building steel reinforcing rods within concrete at 4 ft. intervals.
 - 3. Grounding rods and buses
 - 4. Buried bare copper conductors

- H. Grounding electrodes shall be driven where shown on the drawings. Spacing between electrodes shall be twice the length of the electrodes.
- I. All grounding connections shall be made by means of approved bronze clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A, or equal.
- J. All buried connections shall be made by a thermic welding process equal to Cadweld. Molds used for the welding process shall be new having no prior usage. Molds shall be the specific type for the connection to be made.
- K. Light fixture bases shall be furnished with a grounding point.
- L. All buried conductors shall be laid slack in trenches. The earth surrounding the cables shall be void of sharp objects which may injure the cables. Backfill material shall be natural earth. Where cables are exposed to mechanical injury they shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard. Connections shall be made as hereinbefore specified.
- M. Do not allow water main connection to be painted. If the connections are painted, they shall be disassembled and remade with new fittings.

3.2 TESTING

- A. The grounding system shall be tested under this section.
- B. The equipment grounding shall be checked to insure continuity of the ground return path.
- C. The ground grid systems shall be tested using the three terminal fall in potential method. A minimum of eight test points for each ground grid system shall be submitted for review by the Engineer. The test points shall be made along a straight line from the grid system to the reference terminal. The distance between the grid system and the reference terminal shall be consistent with normal practices for ground testing.
- D. All test equipment shall be furnished hereunder and shall be similar to Biddle Earth Tester No. 250220 or equal.
- E. These tests shall be performed during the dry season. Tests shall be performed before loaming and seeding or paving work has been performed.
- F. The Contractor shall notify the Engineer immediately if the ground grid system exceeds 5 ohms.

3.3 CLOSEOUT ACTIVITIES:

- A. Provide in accordance with Section 01700.

END OF GROUNDING SYSTEMS

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SECTION 16080
UNDERGROUND SYSTEMS

PART 1 GENERAL

1.1 SCOPE

- A. The work of this section includes furnishing and installing of a complete underground system of raceways, handholes, and frames and covers as specified herein and as shown on the drawings.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Raceways
 - 2. Handhole, Frames and Covers
 - 3. Warning Tape

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

PART 2 PRODUCTS

2.1 RACEWAYS

- A. Raceways shall be PVC schedule 40 conduit. Raceway materials shall be in accordance with Section 16130 (Raceways and Fittings).

2.2 HANDHOLES, FRAMES AND COVERS

- A. Electric Hand holes shall be either precast or cast in place steel reinforced concrete per details in contract drawings, concrete to have minimum strength of 5000 psi after 28 days.
- B. Hand holes frame and covers shall be steel and meet or exceed the Tier 20 load requirements set forth in the American National Standards Institute's ANSI/SCTE 77. The frame shall be securely bolted to handhole with stainless steel bolts and the cover be embedded with the following logs:
 - 1. "ELECTRICAL" logo for electrical power applications
 - 2. "COMMUNICATIONS" logo telecommunication applications.
 - 3. "CONTROL" logo low voltage applications.

2.3 POLYETHYLENE WARNING TAPE

- A. Warning tape shall be red polyethylene film, 6 inch minimum width, Type XB-720 by W.H. Brady Co., or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Raceways shall be installed to drain away from buildings. Raceways between handholes shall drain toward the handholes. Raceway slopes shall not be less than 3 inches per one hundred feet.
- B. Raceway banks shall be encased in concrete. Concrete shall be reinforced with steel rods.
- C. Plastic spacers shall be used to hold raceways in place. Spacers shall provide not less than two inch clearance between raceways.
- D. The minimum cover for raceway banks shall be 30 inches unless otherwise permitted by the Engineer.
- E. Raceway entrances to buildings and structures shall be made with steel conduit not less than ten feet long.
- F. Conduits in duct banks entering buildings and structures shall be spread to allow adequate room for conduit wall seals, pull and terminal boxes.
- G. Where bends in raceways are required, long radius elbows, sweeps and offsets shall be used. Sweeps at riser pole shall be rigid steel encased in concrete.
- H. All raceways shall be swabbed clean before cable installation.
- I. Spare raceways shall be plugged and sealed watertight at all buildings and structures.
- J. Raceways in use shall be sealed watertight at all buildings and structures.
- K. Rigid steel conduit shall be used for risers at the service pole and other locations shown on the drawings. Conduit sweep at pole base shall be rigid steel conduit.
- L. Raceway terminations at manholes shall be with end bells.
- M. Pulling-in irons shall be installed opposite all raceway entrances to manholes.
- N. All underground metallic conduit run underground in direct contact or concrete with earth shall be coated with asphaltum or bitumastic varnish or similar corrosion protection the entire length of the run.
- O. All underground raceways/ductbanks shall be marked with warning tape located approximately 12 inches below grade above the raceway/ductbank.

END OF UNDERGROUND SYSTEMS

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SECTION 16085

MISCELLANEOUS EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing and installing of all miscellaneous equipment as specified herein and as shown on the drawings.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Enclosure types
 - 2. Electrical Enclosure
 - 3. Surge Suppression Devices
 - 4. Power Monitoring Relay
 - 5. Nameplates
 - 6. Meter Socket
- B. Operation and Maintenance Manuals - Prepare manuals in accordance with Section 01730.
- C. Record Drawings - Prepare as specified in Section 16000.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.4 DESIGN CRITERIA

- A. All circuit breakers, magnetic motor starters, and fuses furnished under this section shall be of the same manufacturer for each type of equipment.

PART 2 PRODUCTS

2.1 ENCLOSURE TYPE

- A. NEMA Type 3R enclosure shall be general purpose sheet steel.
- B. NEMA Type 4X enclosures shall be cast iron or stainless steel.
- C. NEMA Type 7 shall be cast iron.

2.2 ELECTRICAL ENCLOSURE CABINET

- A. Provide a free standing heavy-duty stainless steel, NEMA 3R, vented, corrosion resistant custom fabricated electrical cabinet enclosure with sealed neoprene gasketing around all edges of the door. Cabinet enclosures shall be made of 14 gauge steel. The enclosure shall have the minimum dimensions as shown on the drawings. Actual sizes of the enclosures and lengths of the enclosures may be larger to incorporate all of the required equipment. The Contractor is responsible to properly size the control cabinet required at no additional cost to the owner. Submit cabinet layout drawing with all dimensions shown for all installed devices.
- B. Control Cabinet shall have a natural mill finish.
- C. Enclosures shall have a sidewall mounted venting louvers on the opposite sidewall and heights. Ventilation louvers shall be equipped with filters. Doors shall have vault type operating handles with three point catch. Doors shall be fully gasketed with opening of sufficient size to permit ready removal of any of the equipment installed in the compartments. Doors shall have provisions for pad locking.
- D. Heavy duty padlock with six sets of keys for each lock shall be furnished. Padlocks shall have forged brass case with brass shackle. Shackle shall be 5/16 inch diameter with 2½ inch clearance. Locks shall be No. 3841 as manufactured by Yale, or equal by Corbin.
- E. Pedestal roof shall slant to the rear of the enclosure. Drip shield shall extend over door opening. All exposed hardware shall be Type 316 stainless steel.
- F. Cabinet enclosures shall be bolted to a concrete pad on stainless steel or aluminum feet using Type 316 stainless steel hardware.
- G. In the cabinet enclosure provide a linear LED light with light switch, a dedicated 120V receptacle for owner provided heater, a dedicated 120V receptacle for the security alarm panel, ground bus, and a duplex 120 Volt weather-proof convenience outlet.
- I. Rigid steel conduits shall enter from below. All conduits routed from the NEMA 7 Diversion structure area shall have EYS fittings sealed with epoxy.

2.3 SURGE PROTECTION DEVICE (SPD)

- A. Electrical Service SPD
 - 1. Certify unit listed to UL 1449, 3rd Edition and UL 1283.
 - 2. SPD shall be UL labeled as Type 1, intended for use without need for external or supplemental overcurrent devices. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over-temperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
 - 3. SPD to be enclosed, surfaced mount and to include surge counter, audible alarm and dry contact for remote status.

4. Minimum surge current capability (single pulse rated) per phase shall be 200kA
5. Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
120/240	700V	700V	1000V	600V

6. Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
120/240	25%	150V

7. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.

2.4 POWER MONITORING RELAY

- A. Power monitoring relay shall be a undervoltage relay mounted in a 6"x 6" NEMA 3R enclosure within din rail mounting.
- B. Undervoltage Relay
 1. Din rail mounted single phase undervoltage relay with adjustable setting range, time delay, and output contacts.
 2. Input voltage: 0-300V, 1-phase.
 3. Adjustable range: Min: 5-95%, Max: 10-100%
 4. Adjustable response time delay: 0.1 – 10s
 5. Contacts: (2) PDT floating contacts,
- C. Undervoltage Relay shall be EDM-FL-V-300 or equal by others.

2.5 NAMEPLATES

- A. Nameplates shall be provided for all special purpose tumbler switches, disconnect switches, remote control stations, motor starters, time clocks, panelboards, terminal cabinet, etc. to designate the equipment controlled and function.
- B. Nameplates shall be black and white laminated, phenolic material having engraved letters approximately 1/4 inch high, extending through the black face into the white layer.
- C. Nameplates shall be attached to the panel by self-tapping stainless steel screws or rivets.

2.6 METER SOCKET

- A. Provide a meter socket in a NEMA 3R enclosure with HASP cover provision of the type approved

by the utility company.

- B. Meter Socket shall be 4 terminal, self-contained ringless type meter socket with a manual single handled bypass with locking jaw and safety arc shield.
- C. The main circuit breaker shall be molded case, two pole unless otherwise noted, with voltage rating as required and service entrance rated. Ampere rating shall be as shown on the drawings. The interrupting capacity shall be not less than 10,000 Amperes, RMS symmetrical at 240VAC.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All field mounted devices shall be mounted four feet-six inches above the finished floor or grade. Devices shall be adequately supported on walls, columns or other supports. The Contractor shall furnish and install channel iron imbedded in the ground or floor to support devices where necessary.
- B. All control equipment shall be identified as to the equipment it controls. Provide lamacoid nameplates at all equipment.

3.2 TESTS AND CHECKS

- A. The following minimum tests and checks shall be made before energizing the automatic transfer switch.
 - 1. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions. The Insulation resistance test voltages and minimum values to be in accordance with manufacturer's published data.
 - 2. Measure contact resistance in normal and alternate source position.
 - 3. Determine contact resistance in micro-ohms. Investigate any value exceeding 500 micro-ohms or any values which deviate from adjacent poles by more than fifty percent (50%).

END OF MISCELLANEOUS EQUIPMENT

SECTION 16120

WIRES AND CABLES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing, installing and testing of all wire, cable and appurtenances as specified herein and as shown on the drawings. All wiring of a given type shall be the product of one manufacturer.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Wire
 - 2. Cable
 - 3. Terminations
 - 4. Lugs
 - 5. Wire and Cable Markers

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.4 DESIGN CRITERIA

- A. Wire for single phase circuits shall be Type XHHW or THWN-THHN.
- B. Wire for service feeder shall be Type XHHW.
- C. Single conductor wire for control, indication and metering shall be Type THWN/THHN No. 12 or 14 AWG, stranded.
- D. Multi-conductor control cable shall be used for the underground system and shall be No. 12 or 14 AWG, stranded with an overall jacket.
- E. Wire for process instrumentation shall be twisted shielded pairs No. 16 AWG, stranded.
- F. Ground wires shall be Type THW, green. Bare ground wires shall be soft drawn copper, 98 percent conductivity.

1.5 MINIMUM SIZES

- A. Except for control and signal wiring, no wire smaller than number 12 AWG shall be used.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper.
- B. All conductors No. 8 AWG and larger sizes shall be stranded.

2.2 600 VOLT WIRE

- A. Type XHHW shall be cross-linked polyethylene, as manufactured by Prysmian Cable Corp., Collyer Insulated Wire Co., The Okonite Co. or equal.
- B. Type THWN/THHN shall be as manufactured by Prysmian Cable Corp., Collyer Insulated Wire Co., The Okonite Co. or equal.
- C. Multi-conductor control cable shall be stranded, 600 Volt, cross-linked polyethylene insulated, neoprene jacketed, as manufactured by Allied Wire and Cable, or equal.

2.3 INSTRUMENTATION CABLE

- A. Process instrumentation wire shall be twisted pair, 600 Volts, polyethylene insulated, aluminum tape, tinned copper braid shielded, polyvinyl chloride jacketed, as manufactured by Okonite Co., Belden Corp., or equal.

2.4 CONNECTORS AND TERMINAL LUGS

- A. Splices for No. 10 or No. 12 A.W.G. solid wires, such as for lighting branch circuits, shall be made with insulated wire connectors.
- B. Connectors and terminal lugs on wires No. 8 A.W.G. and larger shall be of the mechanical or clamp type.

2.5 WIRE AND CABLE MARKERS

- A. Wire and cable markers shall be "Omni-Grip" as manufactured by W.H. Brady Co., or equal.
- B. Wire and cables with diameters exceeding the capacity of the "Omni-Grip" shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by W.H. Brady Co., T&B Fasteners Inc., or equal.
- C. The "to" and "from" destinations shall be clearly identified on each cable at each termination and within manholes, pull boxes and junction boxes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All conductors shall be carefully handled to avoid kinks or damage to insulation.
- B. All wires, cables and each conductor of multi-conductor cables (except lighting and receptacle wiring) shall be uniquely identified at each end with wire and cable markers.
 - 1. Where wiring originates from a motor control center or process control panel the wire identification number shall incorporate the terminal numbers used in the control center or panel and a number to identify the motor control center or panel.
 - 2. Wires shall be identified at both ends and at intermediate junction boxes, terminal cabinets, etc. Wire identification numbers shall be unique.
 - 3. A typed list of the numbers used at each motor control center and control cabinet shall be submitted with the as built drawings.
- C. Lubrications shall be used to facilitate wire pulling. Lubricants shall be U.L. approved for use with the insulation specified.
- D. Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.
- E. Shielded instrumentation wire shall be installed in rigid steel conduit and pull boxes that contain only shielded instrumentation wire.
- F. Shielding on instrumentation wire shall be grounded at the transmitter end only.
- G. No more than three lighting circuits, each from a different phase, shall be connected to a common neutral.
- H. Cables penetrating fire rated floors, walls, etc. shall be fireproofed. Fireproofing material shall be U.L. classified for three hour fire rating. Fire-proofing system shall be as manufactured by 3M Co., Thomas & Betts, or equal.
- I. Power conductors (other than lighting & receptacle) shall be run continuous and splicing should be kept to a minimum. The Engineer should be informed of where splices will occur.

3.2 TESTS

- A. All 600 Volt wire insulation shall be tested with a megohm meter after installation. Tests shall be made at not less than 500 Volts. Submit a written test report of the results to the Engineer.

END OF WIRES AND CABLES

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SECTION 16130

RACEWAYS AND FITTINGS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing and installing of complete raceway systems as specified herein and as shown on the drawings.
- B. All raceway systems shall be complete with fittings, boxes or cabinets, and necessary connections to result in a complete system.
- C. Aluminum materials shall not be used.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Raceways.
 - 2. Boxes and Fittings.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.4 DESIGN CRITERIA

- A. Except where otherwise shown on the drawings, or hereinafter specified, all raceways installed exposed shall be rigid heavy wall galvanized steel conduit.
- B. Except where otherwise shown on the drawings, or hereinafter specified, all raceways installed within the Administration building shall be electrical metallic tubing.
- C. PVC coated galvanized rigid steel conduit shall be used within all Diversion Structures and Tunnels.
- D. PVC Schedule 40 conduit shall be used underground except as specified herein and where otherwise indicated on the drawings.
- E. When routing signal cables in raceways, maintain 12" spacing from power raceways and only cross at a 90 degree angle.
- F. Unless otherwise hereinafter specified or shown on the drawings, all boxes shall be metal.

- G. Exposed switch, outlet and control station boxes and fittings shall be cast or malleable iron.
- H. Concealed switch, outlet and control station boxes in dry-wall finished areas shall be pressed steel.
- I. Terminal boxes, cabinets, junction boxes, pull boxes and wireways used in areas designated as NEMA 4X shall be stainless steel 316, gasketed.
- J. Combination expansion-deflection fittings shall be used where conduits cross structure expansion joints. Refer to Structural drawings for expansion joint locations.
- K. Conduit wall seals shall be used where underground conduits penetrate walls or at other locations shown on the drawings.
- L. Fire stops shall be used where cables or conduits penetrate through fire resistant rated walls, floors, ceilings or partitions. All fire stopping shall be inspected by an owner hired special inspector.
- M. PVC coated rigid steel conduit sweeps shall be used where concealed PVC conduits rise up out of floor slabs.

PART 2 PRODUCTS

2.1 MATERIALS

A. Rigid Conduit

1. Rigid heavy wall steel conduit shall be hot-dipped galvanized as manufactured by the Youngstown Sheet and Tube Co., Allied Tube and Conduit Corp., Wheeling-Pittsburgh Steel Corp., or equal.
2. PVC conduit, up to 4 inch in diameter, where installed concealed in floor slabs, walls or underground shall be rigid polyvinyl chloride Schedule 40 as manufactured by Carlon, Phillips Petroleum Co., Triangle Pipe & Tube Co., Inc., or equal.
3. PVC conduit, 5 inch in diameter and larger, used underground and at other locations shown on the Drawings shall be rigid polyvinyl chloride schedule 40 as manufactured by Carlon, Phillips Petroleum Co., Triangle Pipe & Tube Co., Inc., or equal.
4. PVC coated rigid steel conduit shall have a 0.040 inch thick, polyvinyl chloride coating permanently bonded to hot-dipped galvanized steel conduit, as manufactured by Calbond, Ocal, Robroy Industries, or equal.

B. Electrical metallic tubing shall be hot-dipped galvanized steel as manufactured by Youngstown Sheet and Tube Co., Allied Tube and Conduit Corp., Wheatland Tube Co., or equal.

C. Liquidtight, Flexible Metal Conduit, Couplings and Fittings.

1. Liquidtight, flexible metal conduit shall be Sealtite, Type UA, as manufactured by Anaconda American Brass Co., or equal by American Flexible Conduit Co., Inc., or equal.
2. Fittings used with flexible conduit shall be of the screw-in type as manufactured by Thomas

and Betts Co., Crouse-Hinds Co., O.Z. Manufacturing Co., or equal.

- D. Flexible couplings shall be as manufactured by Crouse-Hinds Co., Appleton Electric Co., O.Z. Manufacturing Co., or equal.
- E. Boxes and Fittings
1. Pressed steel switch and outlet boxes shall be hot-dipped galvanized as manufactured by Raco Manufacturing Co., Adalet Co., O.Z. Manufacturing Co., or equal.
 2. All boxes including, but not limited to, terminal boxes, junction boxes and pull boxes shall be sheet steel unless otherwise shown on the drawings. Boxes shall be galvanized and have continuously welded seams. Welds shall be ground smooth and galvanized. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel screws. Boxes shall be as manufactured by Hoffman Engineering Co. or equal.
 3. All boxes and fittings used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal. The tensile strength of the bond shall be not less than 2,000 pounds.
 4. All boxes and fittings used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal, the same thickness as used on the coated steel conduit.
 5. Cast or malleable iron boxes and fittings shall be galvanized with cast galvanized covers and corrosion-proof screws as manufactured by the Crouse-Hinds Co., Appleton Electric Co., O.Z. Manufacturing Co., or equal.
 6. PVC fittings shall be as manufactured by Carlon, An Indian Head Co., O.Z. Manufacturing Co., or equal.
 7. EMT fittings shall be watertight compression type. Set-screw type fittings are not acceptable.
 8. Steel elbows and couplings shall be hot-dipped galvanized. Elbows and couplings used with PVC coated conduit shall be furnished with a PVC coating bonded to the steel, the same thickness as used on the coated steel conduit.
 9. Conduit hubs shall be as manufactured by Myers Electric Products, Inc., Raco Div., O.Z. Manufacturing Co., or equal.
 10. Conduit wall seals shall be Type WSK as manufactured by O.Z. Manufacturing, Co., or equal by Link Seal Co.
 11. Combination expansion-deflection fittings shall be Type XD as manufactured by Crouse-Hinds Co., or equal by Appleton Electric Co., O.Z. Manufacturing Co.
 12. Conduit seal bushings shall be Type CSB as manufactured by O.Z. Manufacturing Co., or equal by Crouse-Hinds Co.
 13. Fire stops shall be Type CFSF as manufactured by O.Z. Manufacturing Co., or equal by

Crouse-Hinds Co., Appleton Electric Co.

14. Explosion proof conduit seals shall be Type EYS as manufactured by O.Z. Manufacturing Co., or equal by Crouse-Hinds Co. and Appleton Electric Co.
- F. Conduit Mounting Equipment. Hangers, rods, backplates, beam clamps, fasteners, etc. shall be hot-dipped galvanized iron or steel for all areas except for the wet well. Mounting equipment shall be as manufactured by B Line Co., Thomas and Betts Co., Unistrut Corp., or equal.
- G. Conduit Mounting Equipment. Hangers, rods, backplates, beam clamps, fasteners, etc. shall be stainless steel for within the Diversion Structures and Tunnels. Mounting equipment shall be as manufactured by B Line Co., Thomas and Betts Co., Unistrut Corp., or equal.
- H. Corrosion Protection for Galvanized Conduit located exterior to buildings shall be provided. Corrosion protection for galvanized conduit shall be cold galvanized zinc based paint as manufactured by L.P.S. Co., Los Angeles, California, CRS Chemicals, Drecher, Pennsylvania, or equal.
- I. Watertight Silicone Type Sealant. Sealant shall be non slumping type silicone meeting UL water leakage test, W Rating and have excellent adhesion characteristics to most construction surfaces, including: concrete, gypsum, metal, plastic, wood and insulation

PART 3 EXECUTION

3.1 INSTALLATION

- A. No conduit smaller than 3/4 inch electrical trade size shall be used, nor shall any have more than three 90 degree bends in any one run. Approved factory elbows shall be used when sharper bends are necessary. Pull boxes shall be provided as required or directed.
- B. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.
- C. The ends of all conduits shall be tightly plugged to exclude dust and moisture while the buildings are under construction.
- D. Conduit supports shall be spaced at intervals of eight feet or less, as required to obtain rigid construction.
- E. Single conduits shall be supported by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the surface. Plastic "CLIC" system supports are not acceptable. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8 inch diameter. Wire hangers will not be accepted.
- F. Conduit hangers shall be attached to structural steel by means of beam or channel clamps. Where attached to concrete surfaces, concrete inserts of the spot type shall be provided.

- G. All conduits on exposed work and concealed above hung ceilings shall be run at right angles to or parallel with surrounding wall and shall conform to the form of the ceiling. Diagonal runs will not be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run perfectly straight and true.
- H. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.
- I. PVC conduits shall be installed using a fusing cement process. Conduits shall be water tight.
- J. Conduit terminating in gasketed enclosures shall be terminated with conduit hubs.
- K. Metallic heavy wall conduits shall be installed using threaded fittings. Threadless fittings may be used in isolated instances when approved by the Engineer.
- L. Liquidtight flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present.
- M. PVC coated rigid steel conduits shall extend a minimum of 12 inches above finished slabs. Conduits penetrating walls shall be caulked gas tight on both sides.
- N. When a conduit has to be cut in the field, it shall be cut square using a hand or power hacksaw cutter, or an approved pipe cutter using knives. The use of pipe cutter wheels will not be permitted. The cut ends of the field cut conduit shall be reamed to remove burrs and sharp edges. Where threads have to be cut on conduit, the threads shall have the same effective length and shall have the same thread dimensions and taper as specified for factory cut threads on conduits. Field cut threads shall be protected by a field applied cold galvanizing compound.
- O. Conduits entering buildings below grade shall be furnished with a conduit seal bushing.
- P. Concealed conduits in floor slabs and walls and encased in concrete envelope shall be run in direct line with bends of largest possible radius.
- Q. Ducts installed in concrete slabs shall be installed as specified in Section 03300 (Cast-In-Place Concrete). Ducts shall be arranged to minimize crossings.
- R. Ducts shall not be installed in slabs where the slab is below the highest known groundwater level.
- S. Where ducts terminate at panelboards, terminal cabinets, etc. panel of sufficient width and depth shall be provided to maintain the 2 inch spacing between ducts or wireways shall be provided below panels, cabinets, etc.
- T. A ground wire shall be run in all runs of electric metallic tubing and PVC conduit.
- U. All bends in PVC conduit shall be made using a hotbox and bending guide tool.
- V. Conduits run underground below the highest known ground water level shall not enter buildings below this groundwater level without first being run through a drain manhole, handhole, or exterior pull box.

END OF RACEWAYS AND FITTINGS

SECTION 16442

PANELBOARDS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing and installing of all panelboards as specified herein and as shown on the drawings. All panelboards shall be provided with the applicable NEMA enclosure in accordance with the 16000 Basic Electrical Requirements.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300
 - 1. Panelboards, including construction details and enclosures
 - 2. Terminals and lugs
 - 3. Trim
 - 4. Buses
 - 5. Circuit Breakers
 - 6. Groundfault Circuit Interrupter

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.4 DESIGN CRITERIA

- A. Panelboard ratings shall be as shown on the drawings. All panelboards shall be rated for the intended voltage.
- B. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

PART 2 PRODUCTS

2.1 PANELBOARD CONSTRUCTION

- A. Interiors
 - 1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, and buses. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and

all shall be suitable for copper wire of the sizes indicated.

2. Interiors shall be designed such that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be such that circuits may be changed without machining, drilling or tapping.
3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.
4. A factory provided label shall be provided listing panel type, number of circuit breakers and ratings.
5. The main breaker shall be at the top or bottom of the bus construction and not a branch breaker.

B. Buses

1. Main bus shall be copper. Full size neutral bars shall be included. Phase bussing shall be full height without reduction. Cross connectors shall be copper. All buses shall be tinned.
2. Main bus shall be distribution line sequence type configuration to allow installation of two pole circuit breakers at any location.
3. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
4. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.
5. Solderless main lugs or main circuit breakers shall be furnished as shown on the drawings.
6. Bus bracing to be at least equal to the interrupting rating of lowest rated circuit breaker installed in panel. Series rated breakers and panels shall not be acceptable.

C. Boxes

1. Boxes shall be made from galvanized code gauge steel having multiple knockouts unless otherwise noted. Surface mounted boxes shall be painted to match the trim. Boxes shall be of sufficient size to provide a minimum gutter space of four inches on all sides.
2. Surface mounted boxes shall have an internal and external finish as specified herein. Surface mounted boxes shall be field punched for conduit entrances.
3. At least four interior mounting studs shall be provided.
4. Panelboards shall be "door-in-door" construction.

D. Trim

1. Hinged door-in-door construction shall enclose all circuit breaker handles and shall be included in all panel trims.

2. Doors shall have semi flush type cylinder lock and catch, except that doors over 48 inch in height shall have a vault handle and three point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike. A directory frame and card having a transparent cover shall be furnished on each door.
3. Trims shall be fabricated from code gauge sheet steel.
4. All exterior and interior steel surfaces of NEMA 1, 1A, 3R and 12 panelboards shall be properly cleaned and finished with ANSI Z55.1, No. 61 light gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.
5. Trims for flush panels shall overlap the box by at least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

E. Manufacturer

1. 120/240 Volt, single phase, 3 wire, branch circuit panelboards rated for 225 Amps and less shall be Pow-R-Line 1X type as manufactured by Eaton, or equal by Square D and General Electrical.

2.2 CIRCUIT BREAKERS

- A. Panelboards shall be equipped with circuit breakers with frame size and trip settings as shown on the drawings. Circuit breaker mounting shall not exceed 78 inches above floor.
- B. Circuit breakers shall be molded case, bolt-in type.
- C. Circuit breakers installed in 120/240 Volt and 120/208 Volt panelboards shall have an interrupting capacity of not less than 10,000 Amperes, RMS symmetrical.
- D. Circuit breakers installed in 277/480 Volt panelboards shall have an interrupting capacity as shown on the Electrical Contract Drawings.
- E. Main circuit breaker shall be attached to the main vertical bus.

2.3 GROUND FAULT CIRCUIT INTERRUPTER (GFCI)

- A. GFCI shall be provided for circuits where indicated on the drawings. GFCI units shall be molded case, bolt-on breakers, incorporating a solid state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be U.L. listed Class A Group I device (5 milliamp sensitivity, 25 millisecond trip time), and an interrupting capacity matching the circuit breakers in the panelboards.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Boxes for surface mounted panelboards shall be mounted so there is at least ½ inch air space between the box and the wall.
- B. Circuit directories shall be typed identifying location and nature of load served.
- C. Panelboards installed in areas with finished walls shall be installed recessed into the wall with the front of the panel flush with the finished wall.

END OF PANELBOARDS

SECTION 16720

SECURITY ALARM SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The Work of this Section includes the furnishing and installing of complete a security alarm system as specified in the Contract Documents.
- B. The system shall include, but not be limited to, an alarm monitoring control panel, magnetic door switches, timed exit/entry delay control keypad, motion detectors, heat detectors, help call pushbuttons, conduit, fittings and wire.
- C. Provide all required coordination with door installations for proper installation of alarm devices and wiring.

1.2 SUBMITTALS

- A. Manufacturer's literature and brochures shall be submitted for all items to be furnished in accordance with the provisions of the SECTION 01300, SUBMITTALS.
- B. Submittals required under this section include, but are not limited to the following:
 - 1. Complete system wiring diagrams and elementary or control schematic.
 - 2. Data sheets and outline drawings showing details for mounting all control devices and panel.
 - 3. Battery system load calculations.
- 4. Standard preprinted sheets or drawings simply marked to indicate applicability to this contract will not be acceptable.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600.
- B. All materials shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance.

1.4 DESIGN CRITERIA

- A. The security alarm system shall be the standard product, as modified by these Specifications of the manufacturer stated for this type equipment. In addition, the manufacturer shall maintain a permanent service organization and a supply of spare parts as necessary to provide adequate service to this system within 24 hours from receipt of a request for service.

- B. The system shall be UL approved for commercial burglary alarm system type DSC by Johnson Controls, not equal as the city's has standardized this system in their other pump stations.
- C. The system design and installation shall conform to the following standards:
 - 1. All equipment shall be UL listed for its intended purpose.
 - 2. NFPA standards 70, 72, 90A, 92A, and 101.
 - 3. Current State Building Code.
 - 4. The Americans with Disabilities Act (ADA).
 - 5. All requirements of all local authorities having jurisdiction.
- D. System Provider Qualifications:
 - 1. Minimum 20 years experience in the manufacturing, integration and testing of security alarm systems.
 - 2. An experienced security alarm system equipment supplier who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

1.5 SYSTEM OPERATION

- A. The system shall be have the following alarm zones.
 - 1. Pump Station Fire (Heat Detectors)
 - 2. Intrusion
 - 3. Spare
 - 4. Spare
- B. Actuation of the door switch or heat detector when the system is armed shall
 - 1. Actuate discrete remote dry contact alarm for the associated zone to SCADA system.
 - 2. Actuate the respective zone alarm lamp at the system alarm key pad.
 - 3. Visually indicate the alarm initiating zone via the LCD display on the system alarm keypad.
- C. The system alarm key pad panel shall allow a timed exit/entry control to access the building without tripping the intrusion alarm. Authorized personnel entering the building will have up to five minutes to de-activate the alarm system prior to sending an alarm output.

- D. Opens, ground, or tampering, occurring on the zone monitor circuit shall cause a trouble signal and actuate a discrete remote dry contact alarm for the associated zone to SCADA system. To clear a trouble signal transmission, the trouble must be corrected and the system will automatically return to its normal state of operation. To restore the device actuating the alarm, the alarm must be secured to its normal position and the system reset switch operated. A trouble signal on an individual zone monitor circuit shall not interfere with the automatic transmission of an alarm signal on another zone monitor circuit occurring during the same period.

PART 2 PRODUCTS

2.1 SYSTEM CONFIGURATION

- A. Provide a complete security system consisting of the following major subsystems:
 - 1. Detection subsystem: Subsystem shall consist of sensors to detect alarm and trouble conditions.
 - 2. System Alarm Key Pad: Subsystem shall consist a speaker, annunciation lights, function keys, and LCD annunciation display to properly display and control all system functions and alarms.
 - 3. Communications subsystem: Subsystem shall consist of elements required to ensure that pertinent data is transferred from the point of origin to the point where appropriate actions can be taken.
 - 4. Assessment subsystem: Subsystem shall consist of electronic devices required to visually and audibly verify the validity of security system alarms.
 - 5. Alarm reporting subsystem: Subsystem shall consist of electronic devices to control, process, integrate, and annunciate security system data.
 - 6. Power subsystem: Subsystem shall consist of components required to ensure continuous operation of the entire security system.
- B. All system functions, alarms and annunciations shall be monitored and controlled at the system alarm key pad.
- C. The system shall have the capacity to collect date/time entry data in non-volatile memory and display the date/time entry when requested by an authorized user.
- D. The system shall have the capacity to collect, communicate, and display a minimum of 8 programmable sensor zone alarms and to enable control of one or more response devices in each of the sensor zones.
- E. A single alarm shall be annunciated at system alarm key panel within approximately 2 seconds after sensor transducer or other detection device activation.
- F. Provide the capability to detect when a critical component of the system experiences temporary or permanent loss of power and to declare an alarm at the system alarm keypad.

- G. Alarms shall not be generated by power switching; however, an indication of power switching and on-line source shall be provided at the system alarm keypad. Upon restoration of normal power, the system shall automatically switch back to the primary source. Low voltage condition of an on-line battery and battery charger circuit failure shall be detected and reported as a trouble condition.

2.2 SYSTEM CONTROL PANEL

- A. Provide micro-processor based modular components to make up a complete control system. The panel shall have a NEMA 3R rating with the following features:
 - 1. Alarm output relays.
 - 2. Zone modules, number as required for proper functionality for each system, access lamps, secure lamps, access/secure key switches for each.
 - 3. Earth detection module.
 - 4. Sealed lead acid battery standby power shall be supplied. It shall be under lock and key within this supervised cabinet to prevent deliberate tampering.
 - 5. Solid state battery charger.
 - 6. Alarm resound module.
 - 7. Total system supervision by a micro-processor which will supervise all wiring regardless whether or not the area of protection is bypassed or not.
 - 8. Quantity five normally open dry contacts which close on alarm conditions.
 - 9. Surge protector.
- B. Electrical power shall be obtained by the normal electrical distribution system. Power shall be continuously monitored and, if interrupted, automatic switching from primary to emergency backup source shall be accomplished without interruption or degradation of critical system function.
- C. Furnish 120 volt AC service, transformed through a two-winding isolation transformer and rectified to low-voltage DC for system operation. Obtain primary power at the 120V breaker as indicated in the Contract Documents.
- D. Provide lockable device at circuit breaker and label the circuit breaker in that panelboard: "Alarm System Do Not Turn Off."
- E. Provide backup power to the primary power by dedicated batteries in the Control Panel. Batteries shall be capable of operation in any position and shall be protected against venting caustic chemicals or fumes within an equipment cabinet. Batteries shall also be capable of continuous operation for up to 4 hours without recharge or replacement. If the sensors power requirements exceed the allowable UL rated capacity of the control communicator battery, provide the number of separate power supplies required to power the sensors. Provide each power supply with its own rechargeable battery and charger.

- F. Provide system components to facilitate modular subassembly and part replacement. Electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL 796. Circuitry shall not be so densely placed as to impede maintenance. Power-dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. Light duty relays and similar switching devices shall be solid-state or hermetically sealed electromechanical type.
- G. Provide only components in current manufacturing production. Components shall be manufactured to meet requirements specified herein and shall be free from characteristics and defects which affect appearance or serviceability or which render equipment unsuitable for the intended purpose. Provide components designed for continuous operation at specified conditions.
- H. Alarm detection, communication, and power circuits shall be protected against lightning and voltage transients. Surge suppression device shall conform to UL 1449, rated single pulse transient energy by metal oxide varistor (MOV). The protective device shall be automatic and resettable and shall be active at all times. Fuses shall not be permitted as protection devices.
- I. Provide control devices to ensure ease of operation of specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function. Controls, switches, visual signals, and indicating devices, input and output connectors, terminals, and test points shall be clearly marked or labeled on hardware to permit quick identification, intended use, and location. Terminal markings and labels shall be of a permanent and legible type and located to be visible when the associated system wiring is in place. Identification markings shall be associated with each adjustment device or item requiring periodic maintenance. Safety warning or cautions shall be marked in conspicuous red letters. Controls not required for operation of the system shall be inaccessible to the system operator.
- J. Cabinets, control communicators, wiring gutters, and other component housings, collectively referred to as enclosures, shall be formed and assembled to be sturdy and rigid. Metal thickness shall not be less than those in Tables 8.1, 8.2, and 8.3 of UL 1610 for alarm components, and NEMA ICS 2 and NEMA ICS 6 for other enclosures.
- K. Doors and covers shall be flanged. Where doors are mounted on hinges with exposed pins, hinges shall be of the tight-pin type, or ends of hinge pins shall be tack welded to prevent ready removal. Provide doors having a latch edge length of less than 24 inches with a single lock. Covers of junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws.
- L. Ventilation openings in enclosures and cabinets shall conform to the requirements of UL 1610. Sheet metal enclosures shall be designed for surface or recessed wall mounting with top hole slotted.
- M. Locks and key-lock-operated switches required to be installed on component enclosures shall be UL listed, round-key type with three dual, one mushroom, and three plain pin tumblers, or shall have a pick resistance equal to a lock having a combination of five cylinder pin and five-point three-position side bar in the same lock. Keys shall be stamped "DO NOT DUP". Key-lock-operated switches shall be keyed differently.

2.3 SYSTEM ALARM KEY PAD

- A. Provide control devices to ensure ease of operation of specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function. Controls, switches, visual signals, and indicating devices shall be clearly marked or labeled on hardware to permit quick identification, intended use, and location.
- B. Entry/Exit delay. Timer shall be adjustable from 0 to 5 minutes.
- C. Annunciators shall be liquid crystal displays (LCDs). Annunciators shall be so connected in the circuit that failure of the annunciator, socket, or protective circuitry shall not result in an improper or indeterminate signal. LCDs shall be compatible with standby power supplies.
- D. Common trouble signal, trouble silencing switch, power on lamp, reset switch, alarm acknowledge switch and common zone test.
- E. An alarm shall be annunciated to clearly identify any component experiencing power loss.

2.4 MAGNETIC DOOR SWITCHES

- A. The switch mechanism shall have a minimum gap of 0.8-inch without internal adjustment.
- B. The switch element shall be housed in a total enclosed aluminum NEMA 4X housing.
- C. Conductors running from the door switch to alarm circuits shall be integral with switch and housed within a flexible armored cord constructed from corrosion-resistant metal.
- D. Each end of the armored cord shall terminate in a junction box or other enclosure. Armored cord ends shall be mechanically secured to junction boxes by clamps or bushings. The conductors and the armored cord shall experience no mechanical strain as the door is removed from fully open to closed. The switch circuit shall initiate an alarm if a short circuit is applied to the door cord.
- E. The switch shall be type 2705AH by Edwards Signaling & Security System or equal by others.

2.5 HEAT DETECTORS

- A. Fixed temperature 135 degrees F, vapor-tight industrial grade units.

PART 3 EXECUTION

3.1 INSTALLATION

- A. No wire smaller than No. 14 AWG shall be installed. All wiring shall be color coded.
- B. Coordinate the installation of the door switches and wiring with the existing doors.
- C. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

3.2 FINAL TESTS / WARRANTY

- A. The system shall be fully tested by a UL certified testing company, in accordance with UL guidelines and NFPA standards. Each and every device shall be tested.
- B. A copy of the final test report shall be submitted indicating proper functioning of the system and conformance to the specifications. The test shall be performed by UL certified and factory-trained qualified technicians. Each and every device shall be tested, and standalone operation of remote panels shall be verified. Final testing [and UL certification] shall be performed by the same company that will hold and execute the Test and Inspection contract.
- C. The manufacturer shall guarantee all system equipment for a period of three (3) years from the date of final acceptance.
- D. The contractor shall guarantee all raceways and wiring to be free from inherent mechanical or electrical defects for one (1) year from the date of final acceptance of the system.

3.3 ADJUSTING

- A. Occupancy Adjustment. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide up to two visits for this purpose without additional cost.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to explain programming and operation of system and to train Owner's maintenance personnel on procedures and schedules for maintaining, programming, operating, adjusting, troubleshooting, and servicing system. Provide a minimum of four hours' training in operation and maintenance.

3.5 TRAINING

- A. The contractor shall provide the services of the manufacturer's representative for a period of 4 hours, during normal business hours, to instruct the owner's designated personnel on the operation of the system.

END OF SECURITY ALARM SYSTEM

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DIVISION 17

SECTION 17300

INSTRUMENTATION AND CONTROLS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes furnishing all labor, materials, tools and equipment required to furnish and install a complete Gate and Screenings Structure facility control panel.
- B. The work required by this section shall include all equipment and devices necessary to provide the control and monitoring control panel as shown and as specified. The particular requirements of this section are specific in that this control panel supplier must furnish and install a panel which will provide for hardwired remote monitoring interface to a SCADA control panel provided by others.
- C. The control panel shall be supplied by a Instrumentation and Control System supplier that shall carefully review all requirements of this section in order to fully understand the limit of responsibility and the extent of what must be done to complete the control panel. It shall be understood that this control panel supplier will provide for a complete and operational control panel that shall be completely documented and coordinated.
- D. The capacity and quality of equipment shall be provided such that they perform the function described in the herein, as shown on the Contract Drawings. It is the intent of this section of the specifications to specify a complete control panel system. Anything that is not shown on the drawings but is mentioned anywhere in the specifications or vice versa, or anything not expressly set forth in either but which is reasonably implied, shall be furnished and performed as though specified, shown and mentioned in both. If an item appears in one area of the contract documents but not in another, it shall be provided in its entirety. This control panel supplier shall obtain and review complete set of the specifications and drawings prior to submitting final costs for the work of this section and/or any related sections.
- E. Equipment under this section shall be furnished, installed, and placed in proper operating condition in full compliance with details, drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as approved by the Engineer.
- F. The Instrumentation and Control System supplier under this Section shall insure total compatibility where interfacing between equipment is required and shall initiate and maintain close communication and cooperation with the supplier of the equipment throughout the shop drawing and equipment start-up and testing phases of the work and insure total compatibility of all required interfacing at no extra cost to the Owner.
- H. Work specifically required under this Section includes all Instrumentation/Controls work shown on or required by Contract Drawings GI-1, GI-2, and I-1.
- I. The contractor undertaking the work of this section shall review the other specification sections for additional scope items that are included in or bear upon the work.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300 - Submittals:
 - 1. Manufacturer's data, order sheet or equivalent for each individual panel, equipment or device being supplied. The information shall include but not be limited to model number, exact chart, scale or calibration range, type of enclosure and mounting, input/output and power data and the instrument tag number. Sales literature will not be accepted.
 - 2. Scaled layout drawings for primary and supplemental control panels.
 - 3. The Instrumentation and Control System supplier shall clearly identify any exception to the specification or drawings. Failure to do this will be grounds for rejection of the submittal.
- B. For approval before release for manufacturing:
 - 1. All equipment to be furnished under this Section must be approved prior to any of this equipment being released for manufacturing unless otherwise noted by the Engineer.
- C. Shop drawings shall be submitted in accordance with Section 01300 - Submittals and include the following special conditions:
 - 1. All material submitted for review shall be contained in one submission. The material shall be furnished in bound volumes as required for a complete submittal. Loose material submitted will not be reviewed. Partial submittals unless agreed to by the Engineer will not be reviewed. Sales bulletins or other general publications are not acceptable as submittals.
 - 2. If more than two submittals (initial submittal and one re-submittal) are required for approval, the system supplier shall be liable for back charges for the Engineer's services to review additional submittals.
- D. Operation and Maintenance Manuals shall be submitted in accordance with the requirements of Section 01730 - Submittals.

1.3 RESPONSIBILITY FOR EQUIPMENT

- A. The Contractor shall be responsible for providing and placing in satisfactory operation all panels, and equipment necessary for a complete system. This shall include all piping, electrical connections, and system engineering as provided by a qualified Instrumentation and Control System Supplier, and accessories required by the Work of this Section or other related Work included under other Sections in the Contract Documents.
- B. The supply of the panels shall be by a single Instrumentation and Control System Supplier. The supplier shall be responsible to the Contractor for: (1) satisfactory detailed design of a complete and coordinated system (2), start-up and testing services.
- C. The Contractor shall not purchase separate equipment and attempt to assemble control panels. This Work is to be performed by a qualified Instrumentation and Control System Supplier as approved by the Engineer.

- D. The Instrumentation and Control System supplier shall furnish record drawings for the control panels. This shall include drawings for all locations with point to point wiring for the equipment. The drawings shall be complete and shall require on site verification and acceptance by the Engineer.

1.4 DESIGN CRITERIA

- A. Control panels shall meet or exceed I.S.A. Standards and Recommended Practices, ANSI, National Electrical Code, OSHA, and any other applicable code or local regulation. All panel instruments shall be of the same manufacturer and model type to provide uniform appearance.
- B. Control panel enclosures and components shall be Underwriters Laboratories (UL) recognized or listed, where such components are available. The complete control panel assembly shall be constructed by an accredited UL-508 fabrication and wiring assembly shop in accordance with UL-508 and related UL standards.
- C. The Work of this Section shall adhere to the requirements of the standards listed below as applicable. The latest edition in effect at the time of bid opening shall apply.
 - 1. American Petroleum Institute (API)
 - 2. The Instrumentation, Systems and Automation Society (ISA)
 - a. ISA RP60.3, Human Engineering for Control Centers
 - b. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers
 - 3. National Electrical Manufacturers Association (NEMA)
 - 4. National Fire Protection Agency (NFPA)
 - a. NFPA 70, National Electrical Code (NEC).
 - b. NFPA 79, Standard for Industrial Machinery.
 - 5. Underwriters Laboratories, Inc. (UL)
 - a. UL 508, Standard for Industrial Control Equipment.
 - b. UL 698A, Industrial Control Panels Relating to Hazardous (Classified) Locations.

1.5 INSTRUMENTATION AND CONTROL SYSTEM SUPPLIER

- A. The Instrumentation and Control System Supplier shall be one of the following pre-qualified Instrumentation and Control System Supplier's listed in alphabetical order.
 - 1. Electrical Installations, Inc.
Moultonboro, New Hampshire
603-253-4525

2. Harbor Controls
North Kingstown, RI
401-667-0930

3. R. E. Erickson Co., Inc.
Walpole, Massachusetts
508-668-9330

B. Only pre-qualified Instrumentation and Control System Suppliers shall be allowed.

PART 2 PRODUCTS

2.1 GENERAL

- A. All equipment shall be of the latest proven design. First generation equipment with less than three years general use shall have documentation on construction operation, field test and user list.
- B. All equipment shall be suitable for operation in the environment of the Project.
- C. Transmission to and from analog devices shall be 4-20 mA DC. Analog signals run from an instrument located outside than the signal destination shall be isolated at the panel end and shall have surge/lightning protection at both ends.
- D. All signal converters, power regulators, or power converters shall be the responsibility of the Instrumentation and Control System Supplier. The operation criteria descriptions herein do not specify all hardware required for complete system operation. It is the responsibility of the Instrumentation and Control System Supplier to provide all necessary equipment for complete systems.
- E. All equipment necessary to complete the functional requirements of this Section shall be supplied by the Instrumentation and Control System Supplier and be of the same manufacturer to the maximum practical extent unless otherwise specified.
- F. All necessary fuses or switches required by the Instrumentation and Control System Supplier for their equipment shall be provided with the equipment. All equipment requiring an external power supply shall have an internal ON-OFF switch.
- G. All receiving devices, when operating in a loop, shall be of a design such that a failure of an individual device shall not affect the operation and integrity of the remaining loop functions. All devices, either remote or panel mounted, shall have an individual internal ON-OFF switch.
- H. All shielded cable shall be grounded at the control panel end only. Shields shall be carried through junction boxes with the least possible resistance and kept isolated from ground at these points. The field end of the shield shall be insulated to prevent grounding.

2.2 FACILITY CONTROL PANEL (FCP)

- A. Provide a custom FCP pump control panel. The panel shall contain but not limited to a main power circuit breaker with through panel disconnect, relays, selector switches, indicating lights, and etc.
- B. A 120 volt, 1-phase, 20 amp power feed shall be provided to the control panel. Provide a lug for grounding connection of up to a No. 1 AWG conductor.
- C. A UPS shall be provided within the control panel
- D. Panel Enclosures
 - 1. Control panel shall be NEMA 4 constructed from 10 gauge steel. All seams shall be continuously welded and smooth. Doors shall have three point latching mechanism with vault type operating handle, continuous heavy duty hinges and provisions for pad locking. Door gaskets shall be neoprene attached with oil resistant adhesive. Panel dimensions shall not exceed 36" wide x 48" height x 12" depth.
 - 2. The panels shall be free of dents or other defects.
 - 3. The panels shall have an angle frame. The frame and shell shall be welded construction.
 - 4. Data storage pockets shall be provided on the inside of each panel and shall be of sufficient size to hold all of the prints required to service the equipment.
 - 5. Each panel shall be provided with a key lockable front handle. Provide gaskets as required to maintain the panel NEMA rating as specified herein.
 - 6. Provide a door stop kit for the panel to secure the door in the 90-degree open position.
- E. All wiring within the panel shall be grouped together in harnesses and secured to the structure. Terminal blocks shall be provided for all external connections to the control panel and for all connections between the component mounting plate and enclosure mounted components to allow for easy removal of the component mounting plate if required for service. Terminal blocks shall consist of individual snap together contact sections mounted on a common mounting channel. Terminal block sections shall have tubular screw contacts mounted in a nylon housing to resist breakage; phenolic or other rigid, brittle materials shall not be considered equal. Plan screw contacts requiring lugs to be installed on wires shall not be considered equal. All wire ends shall be identified at both ends with wire markers.
- F. A complete master wiring diagram and elementary or control schematic shall be furnished and submitted for approval prior to manufacturing. Diagram shall indicate at a minimum the power distribution circuit, pump power/control circuits, terminal and wire numbers, control devices, and pilot lights.
- G. Circuit breakers shall be molded case, single pole with voltage and ampere ratings as required. A through door handle distribution circuit breakers for each pump shall be provided. The interrupting capacity shall be not less than 10KA, RMS symmetrical.

- H. The following door mounted selector switches shall be provided and be three position maintained type of heavy duty oil-tight construction. Toggle switch types shall not be considered equal. Selector switch contacts shall be heavy duty, double-break, silver. Switches shall be mounted through the control panel enclosure. Provide Auto, Open, and Close relay circuitry to allow for local hand control and SCADA control panel Auto monitoring and Open/Close control via terminal block connections.
1. Gate #1 Hand-Off-Auto switch (HS-216A1)
 2. Gate #1 Open-Stop-Close switch (HS-216A2)
 3. Gate #2 Hand-Off-Auto switch (HS-216B1)
 4. Gate #2 Open-Stop-Close switch (HS-216B2)
 5. Vent Valve Hand-Off-Auto switch (HS-216C1)
 6. Vent Valve Open-Stop-Close switch (HS-216C2)
- I. The following door mounted indicating lights of field device signals shall be provided and be heavy duty, oil tight, LED type. Provide an interposing relay circuitry for each of field device signal to allow for the connection of both the indicating light and SCADA panel monitoring connections via terminal blocks.
1. Gate #1 Opened (ZIO-216A)
 2. Gate #1 Closed (ZIC-216A)
 3. Gate #1 Pressure High (PSH-216A)
 4. Gate #1 Pressure Low (PSL-216A)
 5. Gate #1 Tank Level High (LSH-216A1)
 6. Gate #1 Tank Level Low (LSL-216A)
 7. Gate #1 Tank Temperature High (TSH-216A)
 8. Gate #1 Tank Leak (LSH-216A2)
 9. Gate #1 Fault (YA-216A)
 10. Gate #2 Opened (ZIO-216B)
 11. Gate #2 Closed (ZIC-216B)
 12. Gate #2 Pressure High (PSH-216B)
 13. Gate #2 Pressure Low (PSL-216B)

14. Gate #2 Tank Level High (LSH-216B1)
 15. Gate #2 Tank Level Low (LSL-216B)
 16. Gate #2 Tank Temperature High (TSH-216B)
 17. Gate #2 Tank Leak (LSH-216B2)
 18. Gate #2 Fault (YA-216B)
 19. Vent Valve Open (ZIC-216O)
 20. Vent Valve Closed (ZIC-216C)
 21. Structure High Level (LSH-216)
 22. Loss of Utility Power (YA-216C)
 23. Utility Power Undervoltage (YA-216D)
- J. Provide a door mounted temperature indicating transmitter (TIT-216).
1. The temperature indicating transmitter shall provide a 4-20 mA output that is linear to the measured ambient temperature, with a temperature sensing range of 0 to 100 degrees Fahrenheit. Accuracy shall be 0.5% of the span. Temperature sensor shall have a local LED display of temperature. The temperature sensor shall be UL listed.
 2. Temperature indicating transmitter shall be loop powered, 13 to 40 vDC. The SCADA control panel provided by others shall provide the loop power, provide terminal blocks for SCADA control panel monitoring connections.
 3. Temperature indicating transmitter shall be Model RTTI as manufactured by Devar, Inc. or equal.
- K. Provide a door mounted data logging recorder with colored LCD display.
1. Type: Multiple input microprocessor-based circular data recorder with colored touchscreen LCD display, totalizer functions, and signal retransmission of each input.
 2. Operation: To accept a minimum (4) 4-20 mA DC input signals, display signals on LCD screen and data log the inputs signals within 64MB of internal flash memory.
 3. Functional:
 - a. Power – 120VAC \pm 10%, 50/60 Hz, maximum power consumption of 25 VA
 - b. Input - 4-20 mA DC into 250 ohms
 - c. Indication – 5.7 inch display with numeric and graphic displays of inputs.

- d. Physical: NEMA 4X panel mount enclosure with operating temperature range of -10 to 14 °F and operating humidity range of 5 to 95 %RH non-condensing.
 - e. Data Logging: The chart recorder shall be provided with a 64MB flash memory and removable 2GB SD card.
4. Data recorder shall record and indicate the following signals. Provide a signal splitter for each of field device signal to allow for the connection of both the data recorder and SCADA panel monitoring connections via terminal blocks.
- a. Gate #1 Position (ZI-216A)
 - b. Gate #2 Position (ZI-216B)
 - c. Structure Level (LI-216)
 - d. Structure Flow (FI-216)
5. Data recorder shall recorder shall be ABB SM500F or equal by others.
- L. The Instrumentation and Control System Supplier shall provide all devices necessary for proper control panel and interface operation. This shall include all signal conditioning, signal isolation, surge/lightning protection and operational equipment for the system.
- M. Control panel(s) shall be completely assembled and wired at the Instrumentation and Control System Supplier's factory. All panels shall be UL listed and labeled. Refer to the Contract Documents for exact location and layout of each of the panels.
- N. All control and alarm circuitry for shall be complete, including all necessary auxiliary relays and isolation so as to require only wiring and connections to the equipment control circuit. All contacts for control of motor-operated or electrically operated equipment shall be rated not less than 1200 VA (10 ampere at 120 volts) unless otherwise specified herein.
- O. Nameplates and Nametags
- 1. Nameplates shall be provided for all front mounted equipment. The nameplates shall be approximately 1 inch by 3 inch and shall be constructed of black and white laminated, phenolic material having engraved letters approximately 1/4 inch high extending through the black face into the white layer. Nameplates shall be attached to panels by self-tapping stainless steel screws or rivets. Nameplates shall be provided for each panel identifying the panel and shall be located at the top center of the panel. Size of the nameplate shall be as required for proper visual identification.
 - 2. Nametags shall be provided for all equipment located within the control panel. Each and every device shall be tagged with permanently attached nametags with identification reference that shall correspond to all drawings and wiring diagrams for the system. The nametags shall be neatly installed and shall be clearly visible for service and maintenance of the equipment.

- P. All panel equipment shall be pre-piped and/or pre-wired on or within the cabinet. All wiring shall comply with local and National Electrical Code requirements and shall be in open bundles wired to numbered terminals. Each cabinet shall have at least 25 percent spare additional terminals. A plug-in header with convenience outlets and flexible plug-in leads shall be supplied for each instrument power supply. An overhead, internal, gasketed fluorescent light shall be provided. Cabinet layouts shall be submitted to the Engineer for approval. Materials and equipment used shall be UL approved wherever such approved equipment and materials are available.
- Q. All equipment shall be designed and constructed so that, in the event of a power interruption, the equipment provided under this Section shall resume normal operation without manual resetting of alarms or power source when power is restored. Therefore, no alarm points shall be activated upon restoration of power after a normal power outage unless it is a true alarm condition. Provide all devices or programming required to maintain this requirement.
- R. Terminal blocks shall be provided for the purpose of connecting all control, power, signal, and SCADA control panel interface wiring. Provide separate terminal blocks for each in order to isolate the different wiring types (power, control, and signal). All terminal blocks shall be completely labeled and numbered throughout for each and every unit. Direct inter-wiring between equipment will not be allowed.
- S. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 3 inches of the side panel or 6 inches of adjacent terminal. Wiring troughs shall not be filled to more than 60 percent visible fill. Wiring trough covers shall be match marked to identify placement. If component identification is shown on covers for visibility, the identification mark shall also appear on the mounting sub-panel. All wiring shall be kept to the upper 3/4 quarters of the control panel.
- T. All miscellaneous components shall be heavy-duty industrial type, or equal. Mounting hardware shall be stainless steel or cadmium plated. All cutouts shall be made true and square with no ragged cuts. The finished cutout shall be deburred, with no sharp edges. All welds shall be ground smooth and be deburred with no sharp edges. Welding on the panel face should be minimized. Adequate stiffness and supports shall be provided to insure a rigid stable structure.
- U. The finished enclosure shall be properly degreased, prime painted (2 coats) and finish painted (2 coats) in accordance with the paint manufacturer's instructions, prior to the installation of equipment. The final finish shall be smooth, free of runs, and uniform in tone and thickness. Two, one-pint containers of each color used shall be supplied with the panel for field touch up.
- V. Provide a LED lighting fixture inside at top of panel with light switch and one duplex receptacle for convenience of 120 volt power during service and maintenance of equipment.
- W. Provide ground lug.
- X. Provide a high-intensity LED push-to-test pilot lights for indication of control panel power on. Control panel power on pilot light (white) shall be illuminated when there is AC utility power provided to the control panel.
- Y. The panel shall have din rail terminal blocks with 20 percent spares in addition to terminals for all wires including spare wires. All external connection points shall be made at terminal blocks with

No. 6-32 or larger screws.

- Y. Provide stripe heater and thermostat to maintain panel internal temperature above 35 degrees Fahrenheit.

2.3. INTRINSICALLY SAFE PANEL

- A. Provide a 8" x 8" x 4" NEMA 4 panel to house intrinsically safe intrinsically safe relays. The panel shall have din-rail mounting terminal strips for all wiring and shall receive 120VAC power from a panelboard.
- B. Intrinsically Safe Relays (IS Relays)
 - 1. Din rail mounted intrinsically safe relays shall be furnished for interconnection of each float switch located in the wet well.
 - 2. Operating voltage shall be 115 or 230 VAC, 50/60 Hz.
 - 3. Load contacts shall be double pole, double throw and shall be rated for 10 amperes resistive load or 3 amperes inductive load at 120 VAC.
 - 4. The intrinsically safe control circuit shall be approved by Factory Mutual and the Canadian Standards Association for Class 1, 119 111; Division 1; Groups A, B, C, D, E, F, G hazardous locations.

2.4 GENERAL EQUIPMENT

A. Electrical Relays

- 1. Electrical relays for handling power circuits shall be general purpose equal to IDEC, Omron, Allen-Bradley, Potter & Brumfield, or approved equal. Relays handling control, telemetering or alarm functions shall be general-duty, plug-in type, complete with dust and moisture proof enclosure equal to IDEC, Omron, Allen-Bradley, Phoenix Contact, Potter & Brumfield, or approved equal. Units shall be provided with integral indicating light to indicate if relay is energized. Units shall have DPDT relay contacts and be rated for 10 A at 120 VAC, 10 A at 24 VDC.

B. Current Splitters

- 1. Current splitter shall transform a single 4-20ma input signal (1-5, 4-20ma) to two proportional current 4-20ma output signals. The unit shall be of solid state electronic circuitry sealed in a protective epoxy compound, and shall be din rail mounted.
- 2. Signal output drive capability shall be 4-20 mA into 600 ohms load.
- 3. Accuracy shall be 0.25 percent of span.

C. Uninterruptible Power Supply (UPS)

1. Provide UPSs, including internal/external batteries, for maintaining power to the control system devices and instrumentation as specified herein.
2. Each UPS shall protect the system from noise, dips, spikes and planned reductions in voltage by utility companies. The UPS shall meet ANSI C62.41/IEEE 578 A&B standards for transients/lightning protection.
3. Each UPS shall continuously operate from the inverter (zero transfer time) and shall output a true high quality low distortion sinusoidal waveform synchronized to the AC utility.
4. The batteries shall be sealed, maintenance free lead-acid type. The batteries shall provide 30 minutes of backup power at full load when fully charged.
5. Each UPS shall have a fail-safe transfer to bypass for UPS internal electronic failures.
6. A UPS installed in a control panel shall be wired into the control panel power distribution circuit so that the UPS can be easily and quickly bypassed while maintaining AC utility power to panel devices and instruments. A UPS installed in a control panel shall be DIN-rail or shelf mounted so that the UPS is above the bottom of the control panel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Equipment shall be installed in accordance with the best field and shop practices.
- B. The workmanship shall be in accordance with the best field shop practices.
- C. Panel shall be installed securely and plumbed.

3.2 START-UP

- A. It shall be the responsibility of the Instrumentation and Controls supplier to provide a factory trained and qualified serviceman to TEST AND CALIBRATE ALL EQUIPMENT.
- B. During the start-up, the Instrumentation and Controls supplier shall provide sufficient personnel to aid with the start-up of the instrument and control equipment to be provided and installed by this Section and by this Contract. This shall include services to correct any faults and to make the necessary adjustments for the proper operation of the equipment and installation.

3.3 TESTING AND CALIBRATING

- A. Test and calibrate all equipment.
- B. The panel and other equipment grounding shall be verified.

- C. Visual inspection and continuity testing shall be made to verify that no damaging wiring errors occur between power and signal wiring.
- D. The systems shall be checked for improper or accidental grounding.
- E. Each system and component shall be energized and their inputs simulated. The output shall be checked to verify the proper calibration and interaction with associated hardware.
- F. Hypotting shall not be permitted on instrument systems unless specific instructions are given to safeguard electronic equipment from damage.

3.4 PRODUCT HANDLING

- A. Upon completion of shop testing, all panels shall be enclosed in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving the equipment without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.
- B. Each package shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.
- C. A permanent stainless steel or other noncorrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number as given in the tabulation shall be provided on each piece of equipment supplied under this section.
- D. Equipment shall not be stored out-of-doors. Equipment shall be stored in dry permanent shelters and, including in-line equipment, shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired or the damaged equipment replaced by the Instrumentation Contractor at his own cost and expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such tests as directed by the Engineer. This shall be at the cost and expense of the Instrumentation Contractor or the apparatus shall be replaced by the Instrumentation Contractor at his own expense.

3.5 GUARANTEE

- A. For guarantee, refer to General Conditions.