ADDENDUM NO. 1

NOTICE is hereby given to prospective Bidders of the following information, clarifications, and modifications to the Bidding Documents. The Bidding Documents remain unchanged except as indicated below. Bidders must acknowledge receipt of this Addendum in the Bid Form and comply with the requirements for submission of Bids as set forth in the Bidding Documents.

INFORMATION

A pre-bid conference was held on Tuesday, October 31, 2017 at 10:00AM local prevailing time at the Town of Warren Wastewater Treatment Plant, 427 Water Street, Warren, RI 02885. Below is a list of attendees.

Name	Company
Jan Reitsma	Town Manager, Town of Warren
Kate Michaud	Town Planner, Town of Warren
Dave Komiega	Plant Manager, Suez Environmental
Jonathan Himlan	Project Manager, Woodard & Curran
Lauren Pepe	Project Manager, Woodard & Curran
Paul Stanton	Walsh
Chris Dykemon	Interstate
Steve Treml	Equality Construction Works
Brendan Halpin	Godwin Pumps
Mike Pacillo	Flygt/Xylem
Dan Rampone	Hart Engineering
Nelson Haeseler	Carlin Contracting Co.
Melissa Holt	Carlin Contracting Co.
William Naragon	Carlin Contracting Co.
Tim Page	A&N
Maria Donahue	Daniel O'Connells
Micahel Loiselle	Methuen Construction
Ryan Keaney	O'Connor Corp.
Jim Ramos	Hart Engineering
Al Border	ECW
Bill Montanaro	Wescor
Dan Angell	JJ O'Rourke
James Burtt	Waynes J Griffin
George Volpicelli	Daniel O'Connells
Jim Remaly	Daniel O'Connells
Matt Tremblay	Generac
Gary MacDonald	Mechanical Solutions
Brian Martin	Carlin Contracting
Jeff Audet	EW Audet
Moji Amini	Atlantic Fluid Tech
Mike Weinzmaker	CH Nickerson
Steve Reinhart	Carlin Contracting

The deadline to submit General Bids is Tuesday, November 21, 2017, at 2:00 PM at the Town Clerk's Office in Town Hall, 514 Main Street, First Floor, Warren, RI 02885. Bids will then and there be publicly opened and read aloud.

The deadline to submit questions for the General Bid opening is Monday, November 13, 2017, at noon. Note: Questions will only be accepted from and information will only be provided to entities registered as a Bidder in accordance with Section 00 11 16, INVITATION TO BID.

PRE-BID CONFERENCE CLARIFICATIONS

1. The Work of the Base Bid shall be substantially complete within 488 calendar days from the commencement of the Contract Times and ready for final payment 548 calendar days from the commencement of the Contract Times. If Additive Bid Alternates are awarded, the time for substantial completion and ready for final payment shall be increased as described in Article 5 of the Bid Form. Refer to reissued Section 00 21 12 INSTRUCTIONS TO BIDDERS, 00 41 01 BID FORM, and 00 52 10 AGREEMENT FORM,

2. There is no requirement in Rhode Island law that alternates need to be selected in a particular order. There is no language in the state procurement statute, RIGL 37-16.1-1 et. seq., or the municipal bid statute RIGL 45-55-1 et. seq.

3. Planholders lists can be obtained by emailing Laura Fitzhenry at LFitzhenry@woodardcurran.com. To obtain a planholders list you must be registered on Procore.

4. The existing sludge handling process blends primary sludge and waste activated sludge (stored in the existing sludge handling building) in a blended sludge tank in the basement of the Operations Building. The blended sludge is then thickened in a rotary drum thickener and stored in thickened sludge tank, all located in the basement of the Operations Building.

5. The new generator is being installed outdoors on the east side of the Operations Building. Refer to Drawing C-022 and E-020 for the Site Layout Plan.

6. Contractors shall not be responsible for the removal and disposal of residual sludge, debris and grit required for the performance of the Work. In the schedule required by the Contract Documents, the Contractor shall indicate when removal and disposal is required and shall provide a minimum of 2 weeks written notice to the Owner, with copy to the Engineer, in advance of when the Contractor needs tanks taken offline and residuals removed. Refer to changes to Section 01 15 20, MAINTAINING OPERATIONS, page 01 15 20-4.

7. Anyone employed or subcontracted to the Contractor who will be onsite will be required to take the safety orientation class. Duration of the safety orientation class will be provided at a later date.

8. Bidders may visit the plant at a later date, but may only visit on Tuesday, Wednesday, or Thursday during normal business hours. Bidders who wish to visit the site must provide a minimum of 48-hour notice by calling the WWTF staff at (401) 245-8326. Bidders shall be aware that any oral statements or information provided by WWTF staff shall not be binding or legally effective.

9. The Town is reviewing whether the Synagro contract for sludge hauling and disposal can be made available.

10. During renovation of the laboratory on the first floor, the Contractor shall provide temporary laboratory facilities. The temporary laboratory facilities shall be in the Lunch Room on the second floor, or other

location as approved in writing by the Engineer. Note that a sink is required for the temporary laboratory facilities, which is available in the Lunch Room.

a. To provide temporary laboratory facilities, the Contractor shall relocate the existing laboratory equipment as follows:
    i. Laboratory dishwasher. Note the dishwasher requires a temporary 220 volt power supply
    ii. Convection oven
    iii. Furnace
    iv. Scale
    v. Portable pH meter
    vi. Portable chlorine residual analyzer
    vii. Laboratory refrigerator
b. To facilitate temporary use as the temporary laboratory, the following items in the lunchroom shall be temporarily relocated to the training room / conference room on the second floor:
    i. Toaster oven
    ii. Microwave
    iii. Refrigerator

11. Contractors may utilize any space available on the third floor except the training room / conference room and the lunch room.

12. There is no Town-owned property available for Contractor use other than what is available on the Treatment Facility property as described in the Contract Documents.

13. The Engineer's Estimate of $17M is based on base bid alone and does not include alternates.

14. Town fees for the Building Permit are waived for work that is performed on property that is owned by the Town of Warren. State fees are the responsibility of the Contractor.

CLARIFICATIONS

1. The Town of Warren shall be considered the "Generator" of all existing Hazardous and/or Contaminated Materials encountered at the site.

2. In Section 00 11 16, INVITATION TO BID, "*5.86 percent D/MBE participation and 5.44 percent D/WBE*" are the required rates and any references in the Bid Documents to 10 percent DBE participation shall be changed to these values..

3. Precast, Post-Tensioned Concrete Tank Option: GC may provide precast, post-tensioned concrete tanks as a design substitution for the conventional cast-in-place concrete tanks designed and detailed on the Contract Drawing under the following conditions:

    a. Substitution of precast, post-tensioned concrete tanks is limited to any or all of the following tanks: Reactor Tank (S-550 drawing series); and Gravity Thickeners (S-606 and S-607 drawings). Substitution of any tanks not specifically listed herein are not permitted.

    b. Substitution of conventional cast-in-place concrete tanks designed and detailed on the Contract Drawings shall only be of precast, post-tensioned concrete tank

construction in strict accordance with attached specification Sections 03 43 00 and 03 42 00. No other type of tank construction will be allowed for substitution.

c. Precast, post-tensioned concrete tanks shall fully satisfy the design intent of the conventional cast-in-place concrete tanks designed and detailed on the contract drawings and shall not negatively impact the mechanical or process design. Any deviations to the design intent shown on the Contract Drawings shall be approved by Engineer before the first submission of the vendor's submittal package.

d. Reinforcing within precast, post-tensioned concrete shall have additional cover on exterior faces to provide protection against saltwater exposure as required by ACI 318-11 7.7.6.

e. Contractor is fully responsible to coordinate and provide any work excluded by precast, post-tensioned concrete tank vendor that is otherwise indicated on the Contract Drawings for the conventional cast-in-place tank designs including, but not limited to:

    i. Concrete testing of tank base slab in accordance with Section 03 30 20.

    ii. Tightness Testing of all Precast, Post-tensioned Concrete Tanks in accordance with Specifications.

    iii. Concrete fills, epoxy bonding agent, and concrete fill reinforcement.

    iv. All miscellaneous metals per Section 05 50 00 including rails, stairs and landings, walkway supports, grating, and mixer supports

    v. FRP Baffle Walls.

    vi. Sealed Aluminum Covers per Division 46 Specifications.

f. Contractor shall account for the following additional work in their base bid price for all Precast, Post-Tensioned, Concrete Tanks:

    i. Add additional rails and toeboards to both sides of all vendor added walkways that are greater than 2-ft wide. Note: Vendor will likely provide additional top of wall walkways to structurally brace their tank walls. Any walkways greater than 2-ft wide will be used by the Owner to access the tank for clean-out and maintenance. Walkways 2-ft wide or less, shall be provided with guardrails at each end of the walkway to prevent access to these narrow walkways.

The answers below are provided in response to questions and comments submitted by prospective Bidders.

1. *Section 01 15 20, MAINTAINING OPERATIONS, Part 1.07.D. states that the Contractor is responsible for disposal of accumulated sludge, grit, grease, debris and all other*

materials in structures in order to make modifications. Please provide assumed quantity of combined materials noted above.

Answer: Refer to the modifications to Section 01 15 20, MAINTAINING OPERATIONS, as part of this addenda.

2. *If the Contractor does not occupy the space on the second floor of the Operations Building and only the Engineer and Resident Project Engineer occupy the space, does the Contractor only need to provide the furnishings and amenities as listed in SECTION 01 50 00, TEMPORARY FACILITIES AND CONTROLS, Part 1.02.G. along with temporary barricades during renovation work on the second floor?*

   Answer: The field offices and amenities specified shall be provided for the Engineer and Resident Project Representative for the entirety of the project.

3. *Section 46 51 22, COURSE BUBBLE AERATION EQUIPMENT, Part 1.03.D.1. Curves from published literature will be submitted for this requirement. Is this acceptable?*

   Answer: Curves from published literature for course diffusers are acceptable.

4. *Section 46 51 22, COURSE BUBBLE AERATION EQUIPMENT, Part 2.01.A., provide clarification on the type of diffuser being offered. A wide band course bubble diffuser is stainless steel body that is NOT functional for intermittent operation. The wide band diffuser does not have a check valve. A diaphragm diffuser – flexcap diffuser has a check valve however Aquarius does not offer a stainless steel body for this diffuser. Please see information for clarification.*

   Answer: The diaphragm check valve course bubble diffusers shall be constructed of acetyl, or polypropylene that shall be fitted to a Schedule 10S, 304S stainless steel air main and drop leg.

5. *Section 46 51 22, COURSE BUBBLE AERATION EQUIPMENT, Part 2.03.A. Please clarify the type of diffuser that needs to be offered and the type of material.*

   Answer: For this project the course bubble diffusers are to be diaphragm check valve type course bubble diffusers. Coarse bubble diffusers shall be plastic (ABS, acetyl or polypropylene).

6. *Section 46 51 22, COURSE BUBBLE AERATION EQUIPMENT, Part 1.05.D.4., Will a professional engineer from the State of Wisconsin be acceptable?*

   Answer: Design calculation shall be signed and stamped by a Professional Engineer in the State of the project location.

7. *Section 46 51 33, FINE BUBBLE AERATION EQUIPMENT, Part 2.03.A.3. What will the supports be anchored to? The difference from diffuser depth and side water depth is 3.25'. The maximum height that Aquarius can support is 25". Please add verbiage that the contractor will provide concrete pedestals to account for the difference in height.*

   Answer: Contractor to work with aeration diffuser manufacturer to locate the aeration diffusers at the prescribed side water depth. This may require the addition of a concrete pedestal upon which the aeration diffuser manufacturer supplied supports are anchored

8. *Section 46 51 33, FINE BUBBLE AERATION EQUIPMENT, Part 2.03.H.4. Please add verbiage that a cooling loop will be needed. With a discharge temperature f 225°F and condition 4, there will be no cooling due to the water level at two (2) feet above the diffusers since this material at this elevation will be PVC. To level the competitive playing field and to give the owner a working product, a cooling loop should be specified to obtain a mean wall temperature of 140°F and less.*

   Answer: Operation of the fine bubble aeration diffuser system at the conditions defined by Section 46 51 33, Part 2.03.H.4 is limited to startup and testing and at reduced flows. The conditions defined by Section 46 51 33, Part 2.03.H.4 are conditions that will be experienced during the installed life of the equipment and expansion and contraction under these conditions must be incorporated.

9. *Section 46 51 33, FINE BUBBLE AERATION EQUIPMENT, Part 2.06.A. Will a threaded union joint be accepted*

   Answer: A threaded union joint is not acceptable.

10. *Section 40 05 16, PROCESS PIPE & EQUIPMENT SPECIALTIES, Part 2.1. Long form static mixer described. Is there a mixer in the piping somewhere? Please indicate where I might find it.*

    Answer: There is a static mixer integrated into the Polymer Blending and Feed Equipment Specification, Section 46 33 33.

11. *Section 40 05 16, PROCESS PIPE & EQUIPMENT SPECIALTIES. Please direct me to the diaphragm isolated pressure gauge spec for the chemicals skids.*

    Answer: Diaphragm seals on metering pump skids shall be comparable to the pressure gauge diaphragm seals specified in Section 40 70 00. Diaphragm seals shall be threaded stainless steel gauge connection with a Teflon diaphragm, glycerin filled, 1/2" NPT. Material of construction for the diaphragm seal wet end shall be the same of the material of construction for the metering pump skid.

12. *Drawing PID-13, PROCESS & INSTRUMENTATION OPERATIONS BUILDING and M-101, OPERATION BUILDING – BASEMENT PLAN. P&ID 13 shows the branch suction lines off the 8" main on the EFW pumps being #3 & #4 as 2" Drawing M-101 appears to show the branch suction piping off the 8" main to EFW pumps #3 & #4 as 3". Please advise.*

    Answer: Drawing M-101 is correct. Correction to E-025., P-103 & P-104 shall change from 5 HP to 10 HP. P-105 & P-106 shall change from 10 HP to 5 HP. Overall number and size of variable frequency drives DO NOT change as a result of this correction. 3" branches from the REF line shall be provided.

13. *Please provide specifications for the 2-yeard dumpster shown on Drawing M-202.*

    Answer: The Contractor is not required to provide the 2-yard dumpster shown on Drawing M-101.

14. *Please clarify if one original and 5 copies of the bid form are required to be submitted on bid day and if that includes all of the D/MBE and D/WBE EPA forms. There are a lot of numbers on the bid form as well as Subcontractor's numbers to be hand written at the last minute, which is a lot of paperwork, especially 6 times over on bid day. This could lead to errors.*

Answer: Refer to modifications to Section 00 21 13, INSTRUCTIONS TO BIDDERS, Article 15, Paragraph 15.01.

15. *OPERATIONS BUILDING BASEMENT PIPING: Drawing M-101 is showing a new 6 " BSL line coming from the existing 6 " SSL wall pipe on the south side of the room, up to the existing 6 " BSL line. The plan view is showing a new flanged 90 bend fitting connecting to the existing BSL pipe. Are we expected to provide a flange adapter for the existing pipe to make the new connection? Is there a flange joint in the existing pipe at this point? There is no callout or flange adapter drawn at this connection. Please review and clarify.*

    Answer: Provide a flange adaptor.

16. *OPERATIONS BUILDING BASEMENT PIPING: Drawing M-101 is showing a new 6 " BSL line coming from the existing 6 " SSL wall pipe on the south side of the room, up to the existing 6 " BSL line. The existing 6 " SSL line has been removed. The existing piping to the right of the new pipe is noted to be abandoned. Does the end of the existing pipe require a blind flange or can it just be left open ended? There is no callout or blind flange drawn at the end of the pipe. Please review and clarify.*

    Answer: Provide a blind flange.

17. *OPERATIONS BUILDING BASEMENT PIPING: Drawing M-101 is showing a new 6 " BSL line coming from the existing 6 " SSL wall pipe on the south side of the room, up to the existing 6 " BSL line. The plan view is showing the existing 6 " SSL wall pipe but there is no elevation provided. We need to know the vertical distance between the two pipe, to provide the correct length vertical riser pipe. Please review and clarify.*

    Answer: Centerline elevation is 8.2'.

18. *OPERATIONS BUILDING BASEMENT PIPING: Drawing M-101 is showing a new 2 " EFW line off of the new 4 " EFW header pipe. The callout for this new line is " 2 " EFW to 1 ¼" HG. We have been looking through the different legends on the plans but have not been able to find a " HG" listed anywhere. Please clarify what HG means.*

    Answer: Hose Gate.

19. *OPERATIONS BUILDING BASEMENT PIPING: Drawing M-101 is showing a new 2 " EFW line off of the new 4 " EFW header pipe. The callout for this new line is " 2 " EFW to 1 ¼" HG. We have been looking but we have not been able to find an indication as to what the 2 " and 1 ½" lines pipe materials. Please review and provide the pipe material to use.*

    Answer: EFW piping within the Operations Building Basement less than 3" shall be copper. Use a copper ball valve for the hose gate.

20. *.OPERATIONS BUILDING BASEMENT PIPING: Drawing M-101 is showing a new 2 " EFW line off of the new 4 " EFW header pipe. There is a callout after the line turns down that indicates the line has reduced to a 1 ½" EFW line. The pipe goes to an existing column and turns to go around the column. The line is shown with two round circles at the corner. We do not know what these circles represent. We did not find them in any of the legends on the plans. Please clarify what these circles are.*

Answer: The pipe drops in elevation and turns the corner to a hose gate. Ignore the circles.

21. *.EFW – EFFLUENT FLUSHING WATER PIPE: We have noticed in several locations the callout for 2 " EFW -DI/1 pipe. This is on the PID sheets and the mechanical piping sheets. The callout is indicating that the 2 " EFW water line is to be ductile iron pipe. We do not believe that anyone manufactures ductile iron pipe in 2 " diameter. American Cast Iron Pipe and U. S. Pipe do not make it. Should this 2 " EFW line be another material? Please review and clarify the 2 " EFW pipe.*

    Answer: The 2" EFW line within the Operations Building shall have a pipe designation of CU/1.

22. *PRIMARY SETTLING TANKS - # 1 & 2 : Drawing M-301 is showing the Primary Settling Tanks No – 1 & 2. We see a 6 "-PSC-DI/2 pipe line going from the Primary Pump Room up to the Primary Scum Well. The line is drawn with a dark line indicating that this is a new pipe to be installed. Looking at the demolition sheet MD-301, we see this same pipe line. Please review and clarify if the 6 " PSC line is new or existing.*

    Answer: The 6" PSC line is new.

23. *On Various drawings pipe is labeled as 2" DI pipe. I believe that size is not commercially available. Can a different pipe material be used in place of pipe labeled 2" DI. See M-301 EFW Piping, M-513 ML Drain & M-601 EFW Pipe*

    Answer: In the Operations Building (M-100 drawings) the 2" EFW shall have a pipe designation of CU/1. At the Primary Sludge Pump Station (M-300 drawings), the 2" EFW shall have a pipe designation of PVC/1. At Sludge Handling Building (M-600 drawings), the 2" EFW shall have a pipe designation of PVC/1. The 2" ML Drain on M-513 shall have a pipe designation of CU/1.

24. *Should Gate 858 on M-902 Schedule be included as part of Alternate #4. Drawing M-201 has this gate tag as Alternate #4.*

    Answer: No. Gate 858 shall be provided as part of the Base Bid. Remove keyed note 11 from Gate 858 on Drawing M-201.

25. *Article 15 paragraph one states that we are to submit one original and five copies of the bid. Can this be reduced to one original and one copy? The bid form consists of 20 bid items and 12 alternates and since it is common for pricing to come in during the final minutes it will be very difficult to fill in 6 bid forms in sufficient time.*

    Answer: Revise Instructions to Bidders, Article 15, 15.01, second sentence: An original signed hard copy of the Bid form, the original of the Bid security, and Supplements shall be completed and submitted along with (2) two copies of the Bid Form, Bid security and Supplements.

26. *For reasons mentioned above, can the bid time be changed from 11:00AM to 2:00PM?*

Answer: The bid time has been changed to 2:00 PM

27. *Can you please clarify if EPA Forms 6100-3 and 6100-4 are to be submitted with the bid? Supplementary Instructions to Bidders paragraph 1.02.C.1 mentions 10 days after Notice of Award the successful bidder shall prepare an MBE Compliance Plan. Paragraph 1.05.A.3 states that forms 6100-3 and 6100-4 are to be submitted with the bid. Are these two paragraphs referencing the same thing?*

    Answer: EPA Forms 6100-3 and 6100-4 shall be submitted with the bid

28. *Are all bidders required to submit the signed Certification Regarding Debarment & Suspension with the bid?*

    Answer: All bidders are required to submit the signed "Certification Regarding Debarment & Suspension and Other Responsibility Matters" (provided at the end of Section 00 22 13 - Supplementary Instructions to Bidders) with the bid

29. *Drawing C-024: The note regarding gas work is: "Gas service and meter to be installed by National Grid. Contractor to co-ordinate with gas company, pay fees, and schedule work". Gas service is not included in the utility allowances outlined in the Measurement & Payment specification. Will an allowance for the gas service work be added to the scope of work?*

    Answer: Remove "pay fees" from the note regarding gas work on Drawing C-024. The gas company has indicated that there will be no cost for the gas company's work in installing the gas service for the new Chemical Building

MODIFICATIONS

NOTICE is hereby given that the Bidding Documents have been modified as follows.

The following new section(s) are to be included herewith in their entirety, have an Issue Date of NOVEMBER 2017, contain(s) reference to "ADDENDUM NO. 1" in the footer.

1. Add Section 03 42 00, PRECAST, POST-TENSIONED, CONCRETE TANKS – RECTANGULAR (ACI 350), consisting of 26 pages, see attached.
2. Add Section 03 43 00, PRECAST, POST-TENSIONED, CONCRETE TANKS- CIRCULAR (ACI 350), consisting of 24 pages, see attached.

The following replacement section(s) are reissued herewith in their entirety, have an Issue Date of NOVEMBER 2017, contain(s) reference to "ADDENDUM NO. 1" in the footer., and text changes identified by double-underline for additions and ~~Strikeout~~ for deletions.

1. Section 00 41 01, BID FORM, consisting of 10 pages, see attached.
2. Section 00 52 10, AGREEMENT FORM, consisting of 10 pages, see attached.
3. Section 46 43 25, AUTOMATED WEIR CLEANING SYSTEM, consisting of 10 pages, see attached.

The following section(s) are hereby modified and pages reissued herewith in their entirety, have an Issue Date of November 2017, contain(s) referend to "ADDENDUM NO. 1 in the footer, and text changes identified by double-underline for additions and ~~Strikeout~~ for deletions.

1. Section 00 01 10, TABLE OF CONTENTS – BIDDING DOCUMENTS, replace pages 00 01 10-3 thru 00 01 10-6, consisting of 4 pages, see attached.

2. Section 00 21 13, INSTRUCTIONS TO BIDDERS, replace pages 00 21 13-5 thru 00 21 13-12, consisting of 2 pages, see attached.

3. Section 00 22 13, SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, replace pages 00 22 13-1 thru 00 22 13-2, consisting of 2 pages, see attached.

4. Section 01 15 20, MAINTAINING OPERATIONS, replace pages 01 15 20-3 thru 01 15 20-4, consisting of 2 pages and 01 15 20-9 thru 01 15 20-10, consisting of 2 pages, see attached.

5. Section 26 05 43, UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS, replace pages 26 05 43-3 thru 26 05 43-4, consisting of 2 pages, see attached.

6. Section 26 24 19, MOTOR CONTROL CENTER, replace pages 26 24 19-11 thru 26 24 19-12, consisting of 2 pages, see attached.

7. Section 43 23 31, VERTICAL CENTRIFUGAL IMMERSIBLE WASTEWATER PUMPS, replace pages 43 23 31-9 thru 43 23 31-10, consisting of 2 pages, see attached.

8. Section 43 23 13, HORIZONTAL CENTRIFUGAL WASTEWATER PUMPS, replace pages 43 23 13-9 thru 43 23 13-10, consisting of 2 pages, see attached.

9. Section 46 24 23, IN-LINE GRINDERS, replace pages 46 24 23-7 thru 46 24 23-8, consisting of 2 pages, see attached.

10. Section 46 25 47, FLOATING SCUM REMOVAL EQUIPMENT, replace pages 46 25 47-5 thru 46 25 47-8, consisting of 4 pages, see attached.

11. Section 46 33 44, PERISTALTIC METERING PUMPS, replace pages 46 33 44-7 thru 46 33 44-12, consisting of 6 pages, see attached.

Drawings are hereby <u>modified</u> as follows. Replacement pages/sheets are not being issued.

Drawing modifications are identified in the following table.

Drawing No./ Sheet No.	Modifications
C-024	Remove "pay fees" from the note regarding gas work. The gas company has indicated that there will be not cost for the gas company's work in installing the gas service for the new Chemical Building
M-100's	In the Operations Building (M-100 Drawings), the 2" EFW shall have a pipe designation of CU/1.
M-201	Gate 858 shall be provided as part of the Base Bid. Remove keyed note 11 from Gate 858.
M-300's	At the Primary Sludge Pump Station (M-300 drawings), the 2" EFW shall have a pipe designation of PVC/1.
M-101	All drain piping for CIW Pump # 1 & #2 shall be 2-inches, in accordance with Section 40 50 51, Part 2.14, not 1.5-inches as shown.
M-511	Revise all SS/5 piping designations to SS/1.
M-512	Revise all SS/5 piping designations to SS/1.
M-513	Revise all SS/5 piping designations to SS/1.
M-513	The 2" ML Drain shall have a pipe designation of CU/1.
M-514	Revise all SS/5 piping designations to SS/1.
M-600's	At Sludge Handling Building (M-600 drawings), the 2" EFW shall have a pipe designation of PVC/1.
E-020	Keyed Note 8, Temporary electrical service feeder shall be encased in concrete.
E-025	P-103 and P-104 shall change from 5 HP to 10 HP. P105 & P106 shall change from 10 HP to 5 HP.
E-906	Detail 7, POWER MANHOLE DETAIL, All power manholes shall include manhole rungs as specified in Section 26 05 43, UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS, Part 2.02.G.

This Addendum is provided to Bidders in a single Portable Document Format (.PDF) posted on Procore and will be available for examination at the Issuing Office. It is each Bidder's responsibility to check the Procore for Addenda per the Instructions to Bidders.

Prepared and Issued by Woodard & Curran (Engineer) on behalf of:
The Town of Warren, Rhode Island

SPECIFICATIONS

DIVISION 01 GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

DIVISION 03 – CONCRETE

VOLUME 2

DIVISION 04 - MASONRY

DIVISION 05 - METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

VOLUME 3

DIVISION 26 - ELECTRICAL

DIVISION 27 - COMMUNICATIONS

DIVISION 31 - EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

DIVISION 33 - UTILITIES

DIVISION 40 - PROCESS INTEGRATION

I. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

J. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

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

ARTICLE 5 – PRE-BID CONFERENCE

5.01 A pre bid conference will be held at the time, date and location as indicated in the Invitation to Bid. Bidders are encouraged to attend and participate in the conference.

5.02 Addenda may be issued to all prospective Bidders of record considered necessary in response to questions arising at the pre bid conference. Oral statements shall not be relied upon by Bidders and shall not be binding or legally effective. It is each Bidder's responsibility to check for Addenda per Paragraph 7.03.

ARTICLE 6 – SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to the Engineer in writing as follows. Submission of questions via email is acceptable.

Woodard & Curran
980 Washington Street, Dedham, MA
Attention: Dustin Briere
Telephone: 781-613-0426
Email: dbriere@woodardcurran.com

7.02 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda to all parties recorded by Engineer as having received the Bidding Documents. Questions received after November 13 at noon ~~less than 10 days prior to the date for opening of Bids~~ will not be answered. Only answers in the Addenda will be binding. Oral statements, interpretations, and clarifications shall not be relied upon and shall not be binding or legally effective.

7.03 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer, will be available for examination at the Issuing Office~~. All parties recorded as having received the Bidding Documents will be notified by email on record that Addenda has been posted on the website along with instructions for accessing the Addenda.~~ and will NOT otherwise be transmitted to registered Bidders. It is each Bidder's responsibility to check the website indicated in the Invitation to Bid for Addenda during the Bidding period and obtain and acknowledge Addenda issued. Neither Owner nor Engineer assumes any responsibility for notifying Bidders that addenda have been posted on the website.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price and in the form of a certified check, treasurer's or cashier's check, or money order, or a Bid bond on or consistent with the form included in the Bidding Documents in Section 00 43 13 issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General and Supplementary Conditions, if any.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has furnished the required contract security, met the conditions of the Notice of Intent to Award (if any) and Notice of Award, and executed the Agreement, whereupon the Bid security will be returned. If the Successful Bidder fails to comply with the conditions set forth in the Notice of Intent to Award (if any) and Notice of Award within the time specified therein, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier

of 7 days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. See Supplementary Instructions to Bidders (if any) for additional information.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within 5 days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement ~~for the Base Bid Work. If the Owner awards any of the Alternate Bid Items, the time for substantial completion and final ready for final payment shall be increased as described in Article 5 of the Bid Form~~.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment and construction methods or procedures specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment and construction methods or procedures may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.01 If requested by Owner after Notice of Award, Contractor shall submit a listing and experience statement with pertinent information regarding similar projects and other evidence of qualification for each Subcontractor, Supplier, individual, or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, request Contractor to submit a substitute without an increase in the Bid..

12.02 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form and Supplements are included with the Bidding Documents.

13.02 Bids are to be submitted as indicated in the Bid Form. All blanks on the Bid Form shall be completed in ink or typewritten and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

13.08 All names shall be printed in ink below the signatures**.**

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

13.10 Postal and e-mail addresses and telephone numbers for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form. See Supplementary Instructions to Bidders for additional requirements, if any.

13.12 Bidders are advised to carefully review those portions of the Bid Form and Supplements requiring Bidder's representations and certifications that are to be submitted with a Bid or subsequent to the Bid opening, and made a condition of the Bid.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS

14.01 *Bid Pricing*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed Bid prices shall be stated in both words and figures.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price included The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General and Supplementary Conditions, if any.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between prices written in words and prices written in figures will be resolved in favor of prices written in words.

14.02 *Alternates (if any)*

A. Bidders shall include a separate price for each alternate described in the Bidding Documents as provided for in the Bid Form and Supplements, if any. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.

14.03 *Completion Time Comparisons*

A. Bid prices will be compared after adjusting for exceptions taken by Bidders for the number of days or dates set for Substantial Completion per Article 9 above. The adjusting amount will be determined at the rate set forth in the Agreement for liquidated damages for failing to achieve Substantial Completion.

ARTICLE 15 – SUBMITTAL OF BID

15.01 With each copy of the Bidding Documents, a Bidder is furnished a copy of the Bid Form, the Bid Security Form and Supplements. An original signed hard copy of the Bid Form, the original of the Bid security, and Supplements shall be completed and submitted along with (5) five copies of the Bid Form, Bid security and Supplements.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Invitation to Bid and shall be enclosed in a plainly marked package with the Project title, the name and address of Bidder, and shall be accompanied by the Bid security and other required documents.

15.03 If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." **A Bid sent by mail or courier shall be addressed to Owner as described in 00 11 16 Invitation to Bid.**

15.04 Bidders shall be responsible to confirm the ability of overnight mailing or courier services to deliver to the Owner's offices.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is re-Bid, that Bidder will be disqualified from submitting a Bid on the Work.

ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Invitation to Bid and, unless obviously non-responsive, read aloud publicly.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible or eligible or does not meet the specified qualification or quality requirements, based on poor references or otherwise. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project or public to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

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

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or

entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities are submitted.

A. Owner may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.

A. Owner may conduct reference checks for the projects listed by the Bidder. Poor references may be a basis for deeming Bidder as not responsible. Reference questions will include, but are not limited to, product quality and durability, overall work quality, performance, timely delivery/completion, customer service, and general customer satisfaction.

19.06 If the Contract is to be awarded, Owner may award the Contract to the responsive, and responsible Bidder, offering the lowest price for the Base Bid, OR Base Bid plus any combination of Additive Bid Alternates at the Owner's option, as determined to be in the best interests of the Project and the public.

ARTICLE 20 – CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions and Supplementary Conditions, if any, set forth Owner's requirements as to performance and payment bonds and insurance. The Successful Bidder shall deliver such bonds and evidence of insurance coverage within 10 days of receipt of the Notice of Award.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 The Owner will issue a Notice Award to the Successful Bidder in the form included in Bidding Documents. Within 10 days of receipt of the Notice of Award, the Successful Bidder shall comply with the conditions set forth therein and provide requested information.

21.02 Based on required reviews and approvals, Owner will thereafter provide the required number of counterparts of the Agreement and other Contract Documents which are identified in the Agreement. The Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and other Contract Documents to Owner within the time specified by the Owner. After obtaining required reviews and approvals for Contract execution, Owner shall return one fully signed counterpart the Agreement and other Contract Documents.

ARTICLE 22 – RETAINAGE

22.01 Provisions concerning retainage are set forth in the Agreement.

ARTICLE 23 – CONTRACTOR'S WARRANTY AND GUARANTEES; CORRECTION PERIOD

23.01 Provisions concerning Contractor's general warranty and guarantees and correction period are set forth in Articles 6.19, 13.06, 13.07, 13.09 and 14.03 of the General and Supplementary Conditions, if any.

ARTICLE 24 – EQUAL EMPLOYMENT OPPORTUNITY, ANTI-DISCRIMINATION, AND AFFIRMATIVE ACTION

24.01 Provisions regarding the requirements for equal employment opportunity, anti-discrimination, and affirmative action programs, if any, are set forth in the Supplementary Conditions.

ARTICLE 25 – SAFETY AND HEALTH REGULATIONS

25.01 This Project is subject to the Safety and Health Regulations of the U.S. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments and other requirements identified in the Contract Documents.

ARTICLE 26 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

26.01 Supplementary Instructions to Bidders, if any, are included in Section 00 22 13 and may include certain provisions required by Laws and Regulations and funding agencies. Bidders are solely responsible to determine, obtain, review and interpret the full text of applicable Laws and Regulations.

END OF SECTION

SECTION 00 22 13

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

The following supplement or modify the Instructions to Bidders pursuant to Article 26 therein. This section does not represent or reflect all applicable Laws and Regulations and may only include excerpts, portions, and para-phrasing of certain Laws and Regulations. Bidders are solely responsible to determine, obtain, review and interpret the full text of applicable Laws and Regulations.

1.01 Pre-negotiated Pricing

A. The Owner has pre-negotiated the price for the double disc pumps manufactured by Penn Valley Pump Co., Inc. of Warrington, Pennsylvania as specified in Section 43 23 80, which shall be included the Bid Price. This is the maximum amount Owner will pay for this item under the resulting Contract if awarded.

B. The Owner has pre-negotiated the price for the hyperbolic mixers and mixers/aerators manufactured by Invent Environmental Technologies, Inc. of Cedar Grove, New Jersey as specified in Section 46 41 41, which shall be included the Bid Price. This is the maximum amount Owner will pay for this item under the resulting Contract if awarded.

1.02 Applicable Laws for Bid and Award; General

A. This Contract is being bid in accordance with the provisions of Rhode Island General Law (RIGL) Chapter 45-55, *Award of Municipal Contracts*, section 45-55-5.

B. In accordance with Article 19 of the Instructions to Bidders, ~~a reasonable inquiry to determine the responsibility of a Bidder. Failure~~ failure of a Bidder to promptly supply information in connection with a reasonable inquiry may be grounds for a determination of non-responsibility with respect to a Bidder pursuant to RIGL Section 45-55-11.

C. The Successful Bidder receiving a Notice of Award, must provide a list of Subcontractors as required by RIGL Section 37-13-4 Provisions applicable to public works contracts - Lists of subcontractors.

1. In accordance with state and federal requirements, within 10 days, the Successful Bidder shall also prepare an MBE Compliance Plan and submit it to RI Director of the Department of Administration for approval. The Plan shall identify MBE name, subcontract dollar amount and type, each subcontract estimated to be awarded to MBEs over the period of the Project, meeting the participation goals specified.

1.03 Additional Defined Terms

A. *Lowest Responsible and Responsive Bidder* – Pursuant to RIGL Section 37-13-2, the Successful Bidder (or contractor as used therein), shall mean the Bidder who offers the lowest price and is the Bidder possessing the skills, ability and integrity necessary for the faithful performance of the Contract or Work; who shall certify its ability to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Contract or Work; who has submitted essential information in regard to qualifications; whose Bid is in the best interests of the Project or public; and who obtains within 10 days of the Notice of Award, the bonds and insurance required by the General Conditions and Supplementary Conditions.

1.04 Other Requirements of the RIGL Applicable to the Project

A. **Foreign Corporations**: Pursuant to RIGL Title 7, a foreign corporation must provide a *Certificate of Authority* from the *Rhode Island Secretary of State* in order to transact business in the state of Rhode Island. If a Bidder is a foreign corporation, it shall provide with its Bid, a Certificate of Authority from the Secretary of State, and further, shall provide such certificate for each Subcontractor that is a foreign corporation if it receives a Notice of Award. See the following website. http://sos.ri.gov/divisions/Business-Portal/Forms.

B. **Taxes**: Pursuant to RIGL Title 7, Bidder shall submit with its Bid, a *Letter of Good Standing (Taxation)* from the *Rhode Island Division of Taxation* certifying Bidder has complied with all Laws relating to taxes and reporting of employees and contractors. Bidder shall also provide such Letter for each Subcontractor if it receives a Notice of Award. See the following website. http://www.tax.ri.gov/Tax%20Website/TAX/Letters%20of%20Good%20Standing/index.php

C. **Labor; Wages:** The Director of the Rhode Island Department of Labor and Training has adopted as prevailing wage rates for this Project, the Federal Minimum Wage Rates as determined by the United States Department of Labor under the Davis-Bacon Act in accordance with RIGL Chapter 37-13. It is the responsibility of the Bidders, before Bid opening, to request if necessary, any additional information on prevailing wage rates for those trades people who may be employed for the proposed Work under the resulting Contract. See the Supplementary Conditions.

D. **Sales Tax Exemption:** RIGL Chapter Section 44-18-30, *Gross receipts exempt from sales and use taxes*, exempts materials and supplies to be used in the Project from State of Rhode Island sales and use tax, and Bidder shall not include any amount therefor.

E. **Safety and Health:** Pursuant to RIGL Chapter 37-23, *Safety Awareness Program*, no person, firm, entity, or corporation shall enter into, engage in, solicit, advertise,

SECTION 00 41 01

BID FORM

ARTICLE 1 – DEFINED TERMS

1.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions and Supplementary Conditions, if any.

ARTICLE 2 – BID RECIPIENT

2.01 This Bid is submitted to:

Town of Warren, RI
514 Main Street
Warren, RI 02885

2.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 3 – BIDDER'S ACKNOWLEDGEMENTS

3.01 Bidder accepts all of the terms and conditions of the Bidding Documents including, without limitation:

A. those dealing with disposition of Bid security;

B. those included in the Supplementary Instructions to Bidders;

C. insurance and bonding requirements (Payment Bond and Performance Bond each equal to 100% of the total Contract Price) set forth in the General Conditions and Supplementary Conditions, if any;

D. Contract Times as set forth in the Agreement; and

E. provisions for liquidated damages as set forth in the Agreement.

3.02 This Bid will remain subject to acceptance for 90 days after the Bid opening or for such longer period of time that Bidder may agree to in writing upon request of Owner.

3.03 Bidder acknowledges receipt of the following Addenda.

Addendum No.	Addendum Date

3.04 Bidder acknowledges the representations and certifications included in Section 00 45 05 are made a condition of the Bid.

ARTICLE 4 – BASIS OF BID

4.01 Bidder will complete the Work in accordance with the Contract Documents for the following prices. Bidder shall submit Bids for the Base Bid and all Alternates. However, a single Contract, if awarded, will be awarded for the Base Bid, OR Base Bid plus any combination of Additive Bid Alternates at the Owner's option, as determined to be in the best interests of the Project and the public.

Base Bid

ITEM 1	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	CONSTRUCT WASTEWATER TREATMENT FACILITY IMPROVEMENTS	LS	1		
2	FURNISH DOUBLE DISK PUMPS SPECIFIED IN SECTION 43 23 80	LS	1	$89,085.00	$89,085.00
3	FURNISH HYPERBOLIC MIXERS AND AERATORS SPECIFIED IN SECTION 46 41 41	LS	1	$696,400.00	$696,400.00
4	RELOCATION OF EXISTING UTILITIES AND PROCESS PIPING NOT SHOWN ON THE DRAWINGS	LF-IN DIA	300		
5	EXCAVATION OF UNSUITABLE MATERIALS	CY	150		
6	SELECT BACKFILL	CY	150		
7	ROCK EXCAVATION	CY	150		
8	TEST PITS	EA	10		
9.A.	CONTAMINATED SOILS – ACCEPTABLE FOR LANDFILL BENEFICIAL USE	TON	6,800		
9.B.	CONTAMINATED SOILS – NOT ACCEPTABLE	TON	700		
10	REPAIR TYPE ‘A’ – SHALLOW CONCRETE SPALL	SF	2020		
11	REPAIR TYPE ‘B’ – DEEP CONCRETE SPALL	SF	80		
12	REPAIR TYPE ‘C’ – HORIZONTAL CRACK ROUT & SEAL	LF	900		
13	REPAIR TYPE ‘E’ – JOINT SEALANT	LF	510		
14	REPAIR TYPE ‘F’ – CONCRETE SPOT REPAIR	EA	285		
15	REPAIR TYPE ‘G’ – ELASTOMERIC CONCRETE COATING	SF	10,775		
16	REPAIR TYPE ‘H’ – CRACK INJECTION	LF	1000		
17	FURNISH AND INSTALL NEW GROUNDWATER PRESSURE RELIEF VALVES SPECIFIED IN SECTION 40 05 51	EA	80		
18	ELECTRIC SERVICE ALLOWANCE	AL	1	$5,000.00	$5,000.00
19	WATER SERVICE ALLOWANCE	AL	1	$10,000.00	$10,000.00
20	TELEPHONE, CABLE TV & INTERNET/DATA SERVICE ALLOWANCE	AL	1	$1,000.00	$1,000.00

TOTAL BASE BID PRICE (based on Unit Price Schedule above)

_____

_____ Dollars and

$_____

_____ Cents

(Use words)

(Use figures)

4.02 Unit Prices have been computed in accordance with Paragraph 11.03.A of the General Conditions and Supplementary Conditions, if any.

4.03 Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for unit price items will be based on actual quantities determined and based on the unit prices included above, as provided in the General Conditions and Supplementary Conditions, if any.

Additive Bid Alternates

ADDITIVE BID ALTER-NATE ITEMS	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
ADDITIVE BID ALTERNATE 1	Furnish and Install Primary Sludge Pump Station 12" Plug Valves	LS	1		
ADDITIVE BID ALTERNATE 2	Furnish and Install Primary Sludge Pump Station 4" and 6" Plug Valves	LS	1		
ADDITIVE BID ALTERNATE 3	Furnish and Install Headworks Sluice Gates	LS	1		
ADDITIVE BID ALTERNATE 4	Furnish and Install Headworks 36" Gates	LS	1		
ADDITIVE BID ALTERNATE 5	Furnish and Install Intermediate Pump Station Slide Gates	LS	1		
ADDITIVE BID ALTERNATE 6	Furnish and Install Chlorine Contact Tank Slide Gates	LS	1		
ADDITIVE BID ALTERNATE 7	Furnish and Install Aerated Grit Chamber Diffusers	LS	1		
ADDITIVE BID ALTERNATE 8	Furnish and Install Primary Settling Tank Collectors	LS	1		
ADDITIVE BID ALTERNATE 9	Furnish and Install Dewatering Pump	LS	1		
ADDITIVE BID ALTERNATE 10	Repair Type 'D' – Vertical Crack Rout & Seal	LF	610		
ADDITIVE BID ALTERNATE 11	Repainting Exterior Concrete Walls	LS	1		
ADDITIVE BID ALTERNATE 12	Furnish and Install Granite Curbs in Lieu of Concrete Curbs	LS	1		

1. Unit Prices have been computed in accordance with Paragraph 11.03.A of the General Conditions and Supplementary Conditions, if any.

2. Bidder acknowledges that estimated quantities for Bid Alternates are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for unit price items will be based on actual quantities determined and based on the unit prices included above, as provided in the General Conditions and Supplementary Conditions, if any.

ARTICLE 5 – TIME OF COMPLETION

5.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions and

Supplementary Conditions, if any, on or before the dates or within the number of calendar days indicated in the Agreement for the Base Bid Work. If the Owner awards any of the alternate bid items, the number of calendar days for substantial completion and ready for final payment shall be increased as described in the following table:

Additive bid alternate ITEMs	Description	Additional Time if Awarded (calendar days)
ADDITIVE BID ALTERNATE 1	Furnish and Install Primary Sludge Pump Station 12" Plug Valves	3
ADDITIVE BID ALTERNATE 2	Furnish and Install Primary Sludge Pump Station 4" and 6" Plug Valves	3
ADDITIVE BID ALTERNATE 3	Furnish and Install Headworks Sluice Gates	3
ADDITIVE BID ALTERNATE 4	Furnish and Install Headworks 36" Gates	5
ADDITIVE BID ALTERNATE 5	Furnish and Install Intermediate Pump Station Slide Gates	3
ADDITIVE BID ALTERNATE 6	Furnish and Install Chlorine Contact Tank Slide Gates	5
ADDITIVE BID ALTERNATE 7	Furnish and Install Aerated Grit Chamber Diffusers	5
ADDITIVE BID ALTERNATE 8	Furnish and Install Primary Settling Tank Collectors	35
ADDITIVE BID ALTERNATE 9	Furnish and Install Dewatering Pump	5
ADDITIVE BID ALTERNATE 10	Repair Type 'D' – Vertical Crack Rout & Seal	5
ADDITIVE BID ALTERNATE 11	Repainting Exterior Concrete Walls	7
ADDITIVE BID ALTERNATE 12	Furnish and Install Granite Curbs in Lieu of Concrete Curbs	5

ARTICLE 6 – ATTACHMENTS TO THIS BID

6.01 The following documents are submitted with and made a condition of this Bid:

00 43 13 Bid Bond – Penal Sum Form

Supplements:

00 45 05 Bidder's Representations and Certifications including required submittals

00 45 13 Bidder's Qualifications

00 45 19 Non-collusion Affidavit

ARTICLE 7 – BID SUBMITTAL

7.01 This Bid is submitted by:

A Corporation

Corporation Name: _____

State of incorporation: _____

Type: _____
(*General Business, Professional, Service, other*)

By: _____
(*Signature – attach evidence of authority to sign*)

Name (*typed or printed*): _____

Title: _____

(CORPORATE SEAL)
Attest: _____
(*Signature of Corporate Secretary*)

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

Date of qualification to do business as out-of-state corporation: _____

A Limited Liability Company (LLC)

LLC Name: _____

State in which organized: _____

By: _____
(*Signature – attach evidence of authority to sign*)

Name (*typed or printed*): _____

Title: _____

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

A Joint Venture

First Joint Venturer Name: _____

By: _____
(*Signature – attach evidence of authority to sign*)

Name (*typed or printed*): _____

Title: _____

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

Second Joint Venturer Name: _____

By: _____
(*Signature – attach evidence of authority to sign*)

Name (*typed or printed*): _____

Title: _____

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

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

A Partnership

Partnership Name: _____(SEAL)

By: _____
(*Signature of general partner – attach evidence of authority to sign*)

Name (*typed or printed*): _____

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

An Individual

Name (*typed or printed*): _____

By: _____
(*Individual's signature*)

Doing business as: _____

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

SUBMITTED ON:
EIN/FEIN:

Communications concerning this Bid shall be addressed to:

Name: _____

Title: _____

Business Address: _____

_____

Phone & Facsimile Nos: _____

Email address: _____

END OF SECTION

SECTION 00 52 10

AGREEMENT FORM

THIS AGREEMENT is by and between the Town of Warren, Rhode Island ("Owner") and _____ ("Contractor"). Owner and Contractor hereby agree as follows

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as Wastewater Treatment Facility Improvements (Upgrades).

ARTICLE 2 – THE PROJECT

2.01 The Project under the Contract Documents is generally described as Wastewater Treatment Facility Improvements (Upgrades).

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Woodard & Curran, Inc. (Engineer), which is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Substantial Completion and Final Payment*

A. The Work of the Base Bid shall be substantially complete within 488 calendar days from the commencement of Contract Times as provided in Paragraph 2.03 of the Standard General Conditions and completed and ready for final payment, in accordance with Paragraph 14.07 of the Standard General Conditions, 548 calendar days from the commencement of Contract Times. If the Owner awards any of the Alternate Bid Items, the time for substantial completion and ready for final payment shall be increased as described in Article 5 of the Bid Form.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times

specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the Standard General Conditions and Supplementary Conditions, if any. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner **$1,000.00** for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner **$1,000.00** for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraph 5.01.A below *based on unit pricing stated in Contractor's Bid attached hereto*:

TOTAL PRICE *INCLUDING ALTERNATES #*
[IN WORDS] Dollars and [# OF CENTS] Cents

$[DOLLAR AMOUNT]

A. Unit Prices have been computed in accordance with Paragraph 11.03.A of the Standard General Conditions and Supplementary Conditions, if any.

B. The prices for Unit Price Work set forth as of the Effective Date of the Agreement are based on estimated quantities. As provided in Paragraph 11.03 of the Standard General Conditions and Supplementary Conditions, if any, estimated quantities are not guaranteed (except for those that may be estimated by the Contractor), and determinations of actual quantities and classifications are to be made by Engineer as provided in Paragraph 9.07 of the Standard General Conditions and Supplementary Conditions, if any. Final payment for unit price items will be based on actual quantities determined and based on the unit prices in the Bid Form.

C. When the accepted quantity of any item of Unit Price Work performed by the Contractor (as measured in accordance with 9.07 of the General and Supplementary Conditions, if any) differs from the estimated quantity indicated in the attachment(s) to this Agreement for an item of Unit Price Work, no adjustment or allowance will be made for any increased expenses, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor resulting either directly or indirectly from such increased or decreased quantities, or from unbalanced allocation of overhead expense among the Unit Price Work items on the part of the Contractor, or subsequent loss of expected reimbursements therefor.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the Standard General Conditions and Supplementary Conditions, if any. Applications for Payment will be processed by Engineer as provided in the Standard General Conditions and Supplementary Conditions, if any, and the General Requirements.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 21st day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the Standard General Conditions and Supplementary Conditions, if any, (and in the case of Unit Price Work based on the number of units completed).

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the Standard General Conditions and Supplementary Conditions, if any, and additional retainage allowed by Laws and Regulations.

   a. Progress Payments of 95 percent for Work completed (with the balance of 5 percent being retainage); and

   b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance of 5 percent being retainage).

2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed (with the balance of 5 percent being retainage), less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General and Supplementary Conditions, if any, and less the Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected (Punch List) attached to the certificate of Substantial Completion and subject to Paragraph 14.04 of the General and Supplementary Conditions, if any.

B. An additional sum sufficient to pay the estimated cost of municipal police traffic control shall also be deducted and retained for direct payment by Owner of officers working traffic details every 30 days until the Project is complete.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General and Supplementary Conditions, if any, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

7.01 Interest may accrue on payments not made as allowed by Laws and Regulations. Interest shall not be accrued on retainage.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS AND CERTIFICATIONS

8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."

E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or

data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

8.02 The Contractor certifies, under the penalties of perjury, that:

A. Contractor has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

B. If a foreign corporation, Contractor has provided for itself and each Subcontractor, a Certificate of Authority from the Rhode Island Secretary of State allowing transaction of business in the state of Rhode Island.

C. Contractor has complied with all Laws of the State of Rhode Island relating to taxes and reporting of employees and contractors, and, has provided for itself and each Subcontractor, a Letter of Good Standing (Taxation) from the Rhode Island Division of Taxation and further certifies that, to the best of its knowledge and belief, all state tax returns have been filed and all state taxes have been paid as required by Law;

D. Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work and further certifies that all employees to be employed at the Work Site will have successfully completed an OSHA 10 hour construction safety program for their on-Site employees and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

E. Contractor has provided a list of Subcontractors as required by RIGL Section 37-13-4.

F. Contractor will comply with applicable SRF program and Federal requirements set forth in the Supplementary Conditions, EEO and Affirmative Action, DBE/MBE requirements and the Davis Bacon Act.

1. With regard to the American Iron and Steel requirements of P.L. 113-76; the Contractor acknowledges to and for the benefit of the Town of Warren (Owner) and the State of Rhode Island (State) that it understands the material and equipment, and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund that has statutory requirements commonly known as "American Iron and Steel (AIS) Requirement" that requires all of the iron and steel products used in the Project to be produced in the United States including iron and steel products provided by the Contactor pursuant to this Agreement.

2. The Contractor hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Contractor has reviewed and understands the AIS 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 AIS 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 AIS Requirement, as may be requested by Owner.

3. Notwithstanding any other provision of this Agreement, any failure to comply with this requirement by the Contractor shall permit the Owner or State to recover as damages against the Contractor, any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Owner).

4. While the Contractor has no direct contractual privity with the State, as a lender to the Owner for the funding of its Project, the Owner and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this requirement force or effect) shall be amended or waived without the prior written consent of the State.

G. Contractor will incorporate the applicable provisions of the Contract Documents into all subcontracts and Purchase Orders so that such provisions will be binding upon each Subcontractor or Supplier.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement
2. Items listed in Section 00 54 00
3. Forms listed in 00 60 00
4. Standard General Conditions in Section 00 72 05
5. Supplementary Conditions listed in Section 00 73 05
6. Specifications as listed in the table of contents of the Contract Documents
7. Drawings as listed on the Drawings Package Index Pages
8. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

a. Notice to Proceed

b. Work Change Directives

c. Change Orders

B. The documents listed in Paragraph 9.01.A are attached to this Agreement and made a part hereof.

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the Standard General Conditions and Supplementary Conditions, if any.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the Standard General Conditions and Supplementary Conditions, if any.

10.02 *Assignment of Contract*

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

10.03 *Successors and Assigns*

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

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Other Provisions*

A. Entire Agreement. The provisions of this Agreement (except captions, which are for convenience only and shall be ignored in interpreting this Agreement) shall (1) constitute the entire agreement between the parties, superseding all prior or contemporaneous negotiations, understanding and agreements, and (b) not be modified in any respect except by express written agreement executed by the parties.

B. Governing Law. This Agreement shall be governed by and construed in accordance with the laws (and not the rules governing the conflict of laws) of the State of Rhode Island.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER: [NAME]	CONTRACTOR:
By: Printed Name Title	By: Printed Name Title
By: Printed Name Title	License No.
Attest: Title Address for giving notices:	Attest: Title Address for giving notices:
	Agent for service of process:
(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Approved as to Form by:

_____

Counsel

D. The existing treatment facility was designed with capacity to handle a peak hourly flow of 7.1 million gallons per day. The Contractor shall maintain flow capacity throughout the duration of the Contractors work.

E. A description of the existing treatment facility, from the January 1984 Operation and Maintenance Manual (Table 1-1), is included as an attachment at the end of this Section. The Contractor shall maintain the existing treatment capacity as described in the attachment, or as otherwise described herein, throughout the duration of the Contractors work. Changes since the 1984 Manual are indicated in the attachment with hatching and include:

1. The comminutor has been replaced with a grinder (JWC Environmental, Channel Monster Grinder).

2. The chlorine gas system has been replaced with a sodium hypochlorite feed system, located on the first floor of the Operations Building and a sodium bisulfite dichlorination feed system, located in the basement of the Operations Building. The sodium hypochlorite injection location is at the chlorine mixer structure adjacent to the chlorine contact tanks. The sodium bisulfite injection location is the chlorine contact tank influent channel.

3. The vacuum filter sludge dewatering system, including lime and ferric chloride systems, has been abandoned. The current sludge handling system consists of thickening blended primary and secondary waste (WAS) sludge with a rotary drum thickener (RDT). The solids handling operation is entirely manual. Operators pump WAS from the secondary gallery to the sludge storage tank. WAS is allowed to settle and the supernatant is decanted. Primary sludge is pumped directly from the primary settling tanks. Three days per week (on average) operators pump sludge from the WAS storage tank to a blend tank (formerly one of the two Sludge Stabilization Tanks) in the operations building basement. This tank is mixed by a mechanical mixer, and the blended sludge is pumped to a flocculation tank. Polymer is added ahead of the flocculation tank, and the flocculated sludge flows by gravity to the RDT. The RDT thickens the sludge to between 5 and 6 percent solids. Thickened sludge is pumped to a tanker truck and hauled off-site for incineration at the Synagro Facility in Woonsocket. The average solids production is 22,000 lbs per week, with peak week solids production of 57,000 lbs per week. Sludge hauling on average consists of 27,000 gallons per week at an average concentration 5.5 percent.

F. Grit from the aerated grit chamber is removed approximately one time per year by a vacuum truck.

G. The facility receives approximately 8,000 to 10,000 gallons per week of septage on average.

1.06 WORK DURING LOW FLOW CONDITIONS

A. The proposed work sequence described herein shall be accomplished at such times that will be acceptable or agreed to by the Owner. Any construction activity defined herein to be performed during a low flow period shall meet the following criteria. Low influent flow periods are defined as early weekday and weekend mornings (between midnight and 6:00 a.m.), during dry weather periods only. Overtime work by the Contractor to conform to these requirements shall be considered as normal procedure under this Contract, and the Contractor shall make no claim for extra compensation as a result thereof.

1.07 LIMITATIONS AND CONSTRAINTS ON CONSTRUCTION TO PROVIDE FOR EXISTING PLANT OPERATIONS

A. Work shall be sequenced to achieve project objectives, maintain plant operations, and maintain compliance with WWTP discharge permit requirements.

B. All work connecting with, cutting into, and reconstructing existing pipes or structures shall be planned to minimize interference with the operation of the existing facilities and when the demands on the facilities best permit such interference, which may necessitate work outside of normal working hours to meet these requirements.

C. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all labor, tools, materials, and equipment are made ready. The Contractor shall also assist in instructing operations and maintenance personnel in any new operating procedures.

D. The Contractor shall provide, maintain, and operate all necessary temporary facilities. ~~The Contractor shall be responsible for cleaning structures to make modifications, including removal and disposal of accumulated sludge, grit, grease, debris and all other materials.~~The Owner shall be responsible for cleaning structures to make modifications, incuding reoval and disposal of accumulated sludge, grit, grease, debris and all other materials.

E. Flow to and through the treatment facility shall not be interrupted without written approval from the Owner. Flow through portions of the plant may only be shut-down to perform work as delineated herein. All shut-downs shall occur only upon written request and with prior written authorization from the Owner. Such authorizations will be limited to times when the hydraulic capacity of units remaining in service shall not be exceeded. When work requires that a portion of the plant be shut down, the Contractor shall be fully prepared to execute the work in the most expeditious manner. The Contractor shall plan the work by taking into consideration all potential problems that may be encountered. Spare pumps, pipe and fittings, and any other equipment appropriate for the work to be done shall be readily available for use in an emergency. The Contractor shall be prepared to work continuously (24 hrs per day, 7 days per week) during the time when any units or pipelines are out of service that affects the treatment process.

for the construction Work, the maximum time it can be out of service is (3) three months. While work within the chlorine contact tank flash mix chamber is being completed a temporary means of rapidly mixing the sodium hypochlorite into the secondary settling tank effluent must be provided.

20. The existing sodium bisulfite storage tank and metering pumps shall remain in service until the new sodium bisulfite storage tanks and metering pumps located within the Sludge Handling Building are put into service.

21. Existing sludge thickening equipment and system in the Operations Building shall remain in service until the new gravity thickeners (GT) and rotary drum thickener (RDT), and all supporting equipment such as sludge pumps and polymer systems, are installed, tested, accepted and put into operation.

22. The scope of work includes the complete demolition of the existing Sludge Storage Building. ~~or~~ Contractor shall carefully coordinate demolition of the existing Sludge Storage Building and construction of the new Sludge Handling Facilities to maintain the existing capacity by use of one the following methods;

    a. Temporary facilities for secondary sludge storage. This method shall include the requirement that the Contractor provides a means to convey sludge from the temporary facility to the existing sludge thickening operation in the basement of the Operations Building shall be provided or sludge must be disposed of without thickening. The Contractor shall be responsible for the cost increase to dispose of waste sludge that has not been thickened to 5.5%.

    b. The use of one or more of the existing Primary Settling Tanks for secondary sludge storage. This method shall be coordinated with the Owner such that this operation does not impact the minimum online equipment requirements or generate nuisance odors.

    c. Other Engineer Approved Method.

23. The existing double disc pump within the sludge storage building may be relocated once the temporary secondary sludge storage from the existing secondary sludge storage tank has been established.

24. To perform the Work, the existing primary electrical service for the site shall be relocated by one of the following methods:

    a. Install the new primary electrical service and associated distribution equipment;

b. Provide a temporary primary feeder to the existing pad mounted transformer located adjacent to the existing emergency generator; or

c. Other Engineer Approved Method.

25. Emergency power to the treatment plant must be maintained throughout construction. Prior to demolition of the existing emergency generator and the associated fuel tank and supply pumps a new emergency power supply must be connected. Maintenance of emergency power may be provided by:

a. Installation of the new emergency generator;

b. Temporary installation of an emergency generator with sufficient fuel supply to maintain operations at the plant for 48-hours; or,

c. Other Engineer approved method.

26. Construction of the underground electrical duct banks north of the Operations Building from the emergency generator and the secondary side of the site electrical service pad mounted transformer to the automatic transfer switch shall be closely coordinated with the Owner and the Engineer as to minimize interference with access to the gravel parking area and commercial fishing boat launch.

27. Demolition and replacement of motor control centers (MCC):

a. MCC-1 and MCC-3: The existing MCC-1 and MCC-3 provides power to equipment that is required to maintain plant operation. The Contractor shall provide temporary equipment and materials as required to power the existing equipment fed from the existing MCCs prior to demolition. When making the switch over, the Contractor shall be allowed to have only one of each type of equipment/system (i.e. full aeration to a aeration tank train , RAS pumps, WAS pumps, etc.) out of service at any given time. The Contractor shall coordinate with the Owner and Engineer, have a plan that is approved in writing prior to the Work.

b. MCC-2: The existing MCC-2 provides power to equipment that required to maintain plant operation. The Contractor shall provide temporary equipment and materials as required to power the existing equipment fed from the existing MCC prior to demolition. When making the switch over, the Contractor shall be allowed to have only one of each type of equipment/system (i.e. primary sludge pump, primary scum pump, primary sludge collector drives, etc.) out of service at any given time. The Contractor shall coordinate with the Owner and Engineer, have a plan that is approved in writing prior to the Work To facilitate demolition of the primary sludge pump station MCC, the contractor shall provide a temporary MCC rated NEMA 12 and temporarily installed outdoors immediately behind

SECTION 03 42 00

PRECAST, POST-TENSIONED, CONCRETE TANKS – RECTANGULAR (ACI 350)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Contractor has the option of providing conventional cast-in-place concrete tanks as designed and detailed on the contract documents OR Contractor may provide precast, post-tensioned, concrete tanks per this specification.

B. This Section includes the performance criteria, materials, design, production, and erection of rectangular precast, post-tensioned, concrete tanks for the entire project. The work performed under this Section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the rectangular precast, post-tensioned, concrete tanks shown on the Contract Drawings.

C. Work includes, but is not limited to:

1. Reactor Tank (Refer to S-550 drawing series)

D. Related Sections include the following:

1. Section 01 15 00.05 “Geotechnical Report”
2. Section 01 15 00.06 “Revised Geotechnical Report”
3. Section 31 00 00 “Earthwork” for preparing the subgrade to support the tanks and for backfilling requirements.
4. Section 31 26 16 Steel H Piles
5. Section 03 30 00 “Cast-in-Place Concrete” for Precast, Post-tensioned Tank cast-in-place base slab.
6. Section 05 50 00 “Metal Fabrications” for furnishing and installing loose hardware items.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide rectangular precast, post-tensioned, concrete tanks capable of withstanding the following design loads within limits and under conditions indicated:

1. Internal Fluid Loads: **65 pcf**
2. Walkway Loads: **As per Contractor Drawing, sheet S-552**
3. Basic Ground Snow Load: **As per Contract Drawing, sheet S-001**
4. Backfill Loads: **As per Geotechnical Report**
5. Lateral Surcharge Loads to Account for Vehicles: **125 psf**
6. Natural Groundwater Elevation: **As per Contract Drawing, sheet S-001**
7. 100-year Flood Elevation: **As shown in Contract Drawing, sheet S-001**
8. Seismic Loads: **As per Contract Drawing, sheet S-001**

B. General Tank Design Criteria:
1. Wall thickness shall be as required by ACI 350.
2. Backfill shall not be used to offset fluid loads.
3. The tank walls shall be post-tensioned in accordance with ACI 350.
   a. Tank walls shall have horizontal post-tensioned tendons to provide residual compression stress.
   b. Minimum residual compression shall be 125 psi after allowance for all prestress losses.
4. Comply with ACI 350 requirements including, but not limited to:
   a. Load factors.
   b. Limits on stresses at transfer of prestress and under service load.
   c. Minimum bonded reinforcement.
   d. Concrete cover over reinforcement.
5. Flotation safety factors:
   a. Worst case condition with flood to the top of the structure and only using dead load to resist flotation, minimum factor of safety shall be 1.10.
   b. All other cases not included above, whether due to flood or natural groundwater, minimum factor of safety shall be 1.25.
6. The tank structure shall be designed for normal environmental exposure.
7. Design rectangular precast, post-tensioned, concrete tanks to allow for fabrication and construction tolerances, and to accommodate deflection, shrinkage and creep of primary tank structure. Maintain structural precast concrete deflections within limits of ACI 350.

C. Base Slab Design Criteria:
1. Design the base slab to resist all imposed loads within the allowable bearing capacity listed below.
   a. Allowable Pile Capacity: **As per Contract Drawing, sheet S-551**
   b. Subgrade Modulus: **As per Contract Drawing, sheet S-001**

c. Refer to Geotechnical Engineering Report by **S.W. Cole Engineering, Inc.** dated **October 27, 2015 and revised June 3, 2016** for additional foundation design recommendations. Note that the revised report only contains recommendations regarding deep pile foundations.

2. Minimum membrane slab thickness shall be six inches for prestressed and non-prestressed floors.
3. Minimum reinforcement in each orthogonal direction shall be in accordance with ACI 350.
4. For non-prestressed membrane slabs, the minimum reinforcement in each orthogonal direction shall be 0.5 percent of gross concrete area.
5. For prestressed membrane slabs:
   a. Minimum residual compression in each orthogonal direction shall be 200 psi after allowance for tensile forces from internal fluid loads at the base of the wall, slab-subgrade friction, and all prestress losses.
   b. Minimum non-prestressed reinforcement in each orthogonal direction shall be 0.15 percent of gross concrete area.
6. Minimum perimeter footing thickness shall be 12 inches.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Include minimum required compressive strength.

C. Shop (Erection) Drawings:

1. Indicate stone requirements for pressure relief valves.
2. Indicate configuration, thickness, dimensions and details of cast-in-place concrete base slab.
3. Indicate size, spacing and details of all necessary base slab reinforcing.
4. Indicate plan views, elevations, sections, and details necessary to install the tank.
5. Indicate locations of all post-tensioned tendons.
6. Indicate tendon stressing sequence and force, and theoretical elongations for all post-tensioned tendons.
7. Include and locate all pipe penetrations. Indicate all penetration styles.
8. Coordinate and indicate openings required by other trades.
9. Indicate location of each precast concrete member by same identification mark placed on unit.
10. Indicate relationship of structural precast concrete members to adjacent materials.
11. Indicate locations and details of joint treatment.
12. Indicate shim sizes and grout requirements.

13. Indicate bearing pad sizes and materials.

D. Comprehensive engineering design signed and sealed by a qualified professional engineer responsible for its preparation licensed in the Commonwealth of Pennsylvania

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Tank Supplier and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.

B. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.

1. Cementitious materials.
2. Aggregates.
3. Reinforcing materials and post-tensioning strands.
4. Admixtures.
5. Bearing pads.
6. Other components specified in Contract Documents with applicable standards.

C. Provide handling procedures, erection sequences, and temporary bracing as required for special conditions.

D. Field quality-control test reports.

1.06 QUALITY ASSURANCE

A. Tank Supplier Qualifications: A firm that complies with the following requirements and is experienced in producing rectangular precast, post-tensioned, concrete tanks that have a record of successful in-service performance.

1. Assumes responsibility for engineering rectangular precast, post-tensioned, concrete tanks to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

2. Precast Tank Engineer Qualifications: A professional engineer licensed in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for designs and installations of rectangular precast, post-tensioned,

concrete tanks.

3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group C, Category C3.

   a. Certification shall be maintained throughout the production of the precast concrete units. Production shall immediately stop if at any time the fabricator's certification is revoked, regardless of the status of completion of contracted work. Production will not be allowed to re-start until the necessary corrections are made and certification has been re-established. In the event certification cannot be re-established in a timely manner to avoid project delays, the fabricator, at no additional cost, will contract out the remainder of the units to be manufactured at a PCI certified plant.

4. Has sufficient production capacity to produce required members to meet the project schedule.

B. Tank Supplier: Subject to compliance with requirements, provide rectangular precast, post-tensioned, concrete tanks by Dutchland, Inc. located in Gap, Pennsylvania, or pre-approved equal.

C. Alternate Tank Supplier Pre-approval Qualifications: Alternate Tank Suppliers wishing to become pre-approved shall comply with the Tank Supplier Qualifications listed above, and the following requirements.

1. The firm shall have a minimum of 15 consecutive years in designing, producing and installing tanks of similar arrangement, size and complexity using the precast, post-tensioned system.
2. The firm shall document the successful installation and performance of a minimum of ten similar facilities, and certify compliance of those structures will all applicable provisions of ACI 350 for a precast, post-tensioned structure.
3. The firm shall employ a full-time engineer on staff who meets the Precast Tank Engineer Qualifications listed above and who has served as the engineer in responsible charge of at least ten similar structures.
4. The firm shall submit, at least 5 days prior to the bid, a preliminary design and tank layout establishing full compliance with these qualifications and specifications.
5. The firm seeking pre-approval shall also submit a reference sheet listing contact names and telephone numbers of at least ten similar structures built by the firm and that comply with ACI 350 for a post-tensioned structure. All projects must be of a similar size and complexity.

D. Post-Tensioning Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."

E. Post-Tensioning Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 Unbonded PT - Field Installation course.

1. Superintendent must receive training from post-tensioning supplier in the operation of stressing equipment to be used on Project.

F. Post-Tensioning Inspector Qualifications: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 2 Unbonded PT - Inspector course.

G. Design Standards: Comply with ACI 350, "Code Requirements for Environmental Concrete Structures" and the design recommendations of PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete," applicable to types of structural precast concrete members indicated.

H. Quality-Control Standard: For manufacturing procedures and testing requirements and quality control recommendations for types of members required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Concrete Products."

1. Comply with dimensional tolerances of PCI MNL 135, "Tolerance Manual for Precast and Prestressed Concrete Construction."

I. Referenced Standards:
1. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials"
2. ACI 301, "Specifications for Structural Concrete"
3. ACI 318, "Building Code Requirements for Structural Concrete"
4. ACI 350, "Code Requirements for Environmental Engineering Concrete Structures"
5. ACI 350.1, "Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures"
6. ACI 350.3, "Seismic Design of Liquid-Containing Concrete Structures"
7. ACI 350.4R, "Design Considerations for Environmental Engineering Concrete Structures"
8. ACI 350.5, "Specifications for Environmental Concrete Structures"
9. ACI 423.7, "Specification for Unbonded Single-Strand Tendon Materials and Commentary"
10. ASCE 7, "Minimum Design Loads for Buildings and Other Structures"
11. AWS D1.4, "Structural Welding Code – Reinforcing Steel"

12. PCI MNL-116, "Manual for Quality Control for Plants and Production of Structural Concrete Products"
13. PCI MNL-120, "PCI Design Handbook – Precast and Prestressed Concrete"
14. PCI MNL-135, "Tolerance Manual for Precast and Prestressed Concrete Construction"
15. PTI TAB.1, "Post-Tensioning Manual"
16. PTI M10.2, "Specification for Unbonded Single Strand Tendons"
17. PTI M10.3, "Field Procedures Manual for Unbonded Single Strand Tendons"
18. PTI M55.1, "Specification for Grouting of Post-Tensioned Structures"

J. Tank designs that rely on bolted or welded connections, or ship-lap joints, for primary, fluid-retaining walls shall not be allowed.

K. Shotcrete shall not be allowed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

B. Deliver all precast concrete members in such quantities and at such times to assure compliance with the agreed upon project schedule and setting sequence to ensure continuity of installation.

C. Handle and transport precast concrete members in a manner to avoid excessive stresses that could cause cracking or other damage.

D. Store precast concrete members with adequate dunnage and bracing, and protect units to prevent contact with soil, staining, and to control cracking, distortion, warping or other physical damage.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain post-tensioning materials and equipment from single source.

2.02 FORM MATERIALS

A. Forms: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required surface finishes.

1. Form-Release Agent: Commercially produced form-release agent that will not bond with, stain or affect hardening of precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.03 NON-PRESTRESSED REINFORCING STEEL

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A706, deformed.

C. Welded Wire Reinforcement: ASTM A1064, plain or deformed, flat sheet.

D. Supports: Use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

E. Provide additional cover on exterior faces to provide protection against saltwater exposure as required by ACI 318-11 7.7.6.

2.04 PRESTRESSING TENDONS

A. ACI Publications: Comply with ACI 423.7, "Specification for Unbonded Single Strand Tendon Materials and Commentary."

B. Prestressing Strand: ASTM A 416, Grade 270, 7-wire, low-relaxation, 0.6-inch-diameter strand with corrosion inhibitor conforming to ACI 423.7, with polypropylene tendon sheathing.

C. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.

D. Tendon Sheathing:

1. Virgin high-density polyethylene or polypropylene with a minimum thickness of 50 mils.
2. Continuous over the length of tendon to provide watertight encapsulation of strand.

E. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.

1. Anchorage devices and coupler assemblies shall be fully-encapsulated with either plastic or epoxy coating.

F. Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:

1. Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.
2. Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of 4 inches with sheathing and completely filled with post-tensioning coating.
3. The encapsulation system shall meet the hydrostatic pressure testing requirements of ACI 423.7, except with a hydrostatic pressure of 10 psi, instead of the specified 1.25 psi.

2.05 ACCESSORIES

A. Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of 2 inches (50 mm), in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.

2.06 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II or Type I/II.

1. For surfaces exposed to view in finished structure, use same type, brand, and mill source throughout the precast concrete production.

B. Supplementary Cementitious Materials

1. Fly Ash: ASTM C618, Class F with maximum loss on ignition of 6%.
2. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

C. Normal weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse, non-reactive aggregates. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

E. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixture: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
4. Water-Reducing and Accelerating Admixture ASTM C494, Type E.
5. High Range, Water-Reducing Admixture: ASTM C494, Type A and F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
7. Plasticizing Admixture for Flowable Concrete: ASTM C1017.

2.07 STEEL EMBEDDED MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A36

B. Carbon-Steel Headed Studs: ASTM A108, Grades 1010 through 1020, cold finished, AWS D1.1, Type A or B, with arc shields and with the minimum mechanical properties of PCI MNL 116, Table 3.2.3.

C. Deformed-Steel Wire or Bar Anchors: ASTM A496 or ASTM A706.

D. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123, after fabrication.

1. Galvanizing Repair Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

2.08 STAINLESS-STEEL EMBEDDED MATERIALS

A. Stainless-Steel Plate: ASTM A666, Type 304, Type 316, or Type 201, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.

C. Stainless-Steel Headed Studs: ASTM A276, with minimum mechanical properties for studs as indicated under MNL 116, Table 3.2.3.

2.09 BEARING PADS AND OTHER ACCESSORIES

A. Provide one of the following bearing pads for structural precast concrete members as recommended by tank supplier for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D2240, minimum tensile strength 2250 psi per ASTM D412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 3000 psi with no cracking, splitting or delaminating in the internal portions of the pad.
3. High-Density Plastic: Multimonomer, nonleaching, plastic strip capable of supporting loads with no visible overall expansion.

B. Erection Accessories: Provide steel plates and brackets, clips, hangers, high density plastic shims, and other accessories required to install precast concrete members.

2.10 GROUT MATERIALS

A. Nonshrink Grout: Premixed, prepackaged, non-metallic, shrink-resistant grout complying with ASTM C 1107, Grade C. Grout shall not contain chlorides.

1. Acceptable Products:
    a. SikaGrout 212®, or equal.
    b. SikaGrout 328®, or equal.

2.11 PATCHING MATERIALS

A. One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

1. Acceptable Products:
    a. ProSpec® BlendCrete, or equal.

2.12 CONCRETE MIXTURES

A. Prepare design mixtures for each type of concrete required.

1. Limit use of fly ash to 25 percent replacement of portland cement by weight.
2. Limit use of ground granulated blast-furnace slag to 40 percent replacement of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at Tank Supplier's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 350 or PCI MNL 116 when tested in accordance with ASTM C1218.

D. Normal weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal weight concrete.

E. Precast Concrete:
1. Compressive Strength (28 Days): 5,000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.40.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

H. Concrete Mixture Adjustments: Concrete mixture design adjustments may be made if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.13 FORM FABRICATION

A. Form: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placement and vibration operations and temperature changes, and for prestressing and detensioning operations. Coat contact surfaces of forms with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain forms to provide completed structural precast concrete members of shapes, lines, and dimensions within fabrication tolerances specified.

1. Edge and Corner Treatment: Uniformly chamfered or as built-in on standard forms.

2.14 FABRICATION

A. Cast-in Plates, Inserts, Angles, and Other Hardware: Fabricate hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1 and AWS C5.4, "Recommended Practices for Stud Welding."

B. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy coated reinforcing exceeds limits specified in ASTM A775, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Locate and support reinforcement by plastic tipped or corrosion resistant metal or plastic chairs, runners, bolsters, spacers, hangers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.
3. Provide cover requirements in accordance with ACI 350. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces in accordance with ACI 350 and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

C. Reinforce structural precast concrete members to resist handling, transportation, and erection stresses, and specified in-place loads, whichever governs.

D. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

E. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete members.

F. Place self-consolidating concrete with minimal vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

G. Comply with PCI MNL 116 procedures for hot and cold-weather concrete placement.

H. Identify pickup points of precast concrete members and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete member on a surface that will not show in finished structure.

I. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure members until compressive strength is high enough to ensure that stripping does not have an effect on the performance of final product.

2.15 WATERSTOPS

A. Flexible PVC Waterstops: Corp of Engineers CRD-C 572 for embedding in concrete construction joints to prevent the passage of fluids through joints. Factory-fabricate corners, intersections and directional changes.

1. Profile: Ribbed without center bulb.
2. Dimensions: 9 inches by 3/8-inch-thick, non-tapered.
3. Acceptable Products:
    a. Greenstreak PVC Waterstop #646, or equal.

B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free, hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete.

1. Acceptable Products:
    a. Greenstreak Hydrotite® CJ-1030-4M, or equal.

C. Self-Expanding Extrudable Waterstops: Extrudable, swelling, bentonite-free, one-part polyurethane.

1. Acceptable Products:
    a. SikaSwell® S-2, or equal

2.15 RELATED MATERIALS

A. Joint/Crack Filler: ASTM C920, Type S, Grade NS, Class 35 one-part polyurethane, elastomeric sealant, for sealing precast panel joints and minor cracks.

1. Acceptable Products:
    a. Sikaflex®-1a+, or equal

B. High-Performance Joint Filler: ASTM C920, Type S, Grade NS, Class 100/20 low-modulus, high-performance, one-part polyurethane-based, elastomeric sealant, for sealing precast panel joints subject to movement.

1. Acceptable Products:
    a. Sikaflex®-15 LM, or equal

C. Sealant/Adhesive Primer: Specially-formulated primer to promote adhesion of sealants and adhesives to concrete.

1. Acceptable Products:
    a. Sikaflex® 429/202, or equal

D. Joint Sealant, Epoxy: High-build, two-part, protective, solvent-free epoxy.

1. Acceptable Products:
    a. Sikagard® 62, or equal

E. Joint Sealant, Urethane: Liquid-applied, elastomeric, urethane.

1. Acceptable Products:
    a. CIM 1000, or equal

F. Epoxy Injection Adhesive: Two-part, moisture-tolerant, epoxy injection adhesive.

1. Acceptable Products:
    a. Sikadur® 52, or equal

G. Chemical Grout: Expanding, polyurethane, chemical grout.

1. Acceptable Products:
    a. SikaFix® HH+, or equal
    b. SikaFix® HH Hydrophilic, or equal

2.16 FABRICATION TOLERANCES

A. Fabricate structural precast concrete members of shapes, lines and dimensions indicated, so each finished member complies with PCI MNL 135 product tolerances as well as position tolerances for cast-in items.

2.17 FINISHES

A. Form Finish:

1. Standard Grade: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are acceptable. Fill air holes greater than 1/4 inch in width that occur in high concentration (more than one per 2 square inches). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Allowable joint offset limited to 1/8 inch.

B. Smooth steel-trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float and trowel to a smooth, uniform finish.

2.18 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements. If using self-consolidating concrete also test and inspect according to ASTM C1611, ASTM C1712, ASTM C1610, and ASTM C1621.

B. Strength of precast concrete members will be considered deficient if units fail to comply with ACI 350 concrete strength requirements.

C. Testing: If there is evidence that strength of precast concrete members may be deficient or may not comply with ACI 350 requirements, fabricator shall employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42 and ACI 350.

a. Test results shall be reported in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports shall include the following:

1. Project identification name and number.
2. Date when tests were performed.
3. Name of Tank Supplier.
4. Name of concrete testing agency.
5. Identification letter, name, and type of precast concrete member(s) represented by core tests; design compressive strength; type of

failure; actual compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and precast concrete members comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture or repair material, and finish to match adjacent precast concrete surfaces.

E. Acceptability. Structural precast concrete members that do not comply with acceptability requirements in PCI MNL 116, including concrete strength, and manufacturing tolerances, are unacceptable. Chipped, spalled or cracked members may be repaired. Replace unacceptable units with precast concrete members that comply with requirements.

PART 3 – EXECUTION

3.01 PREPARATION

A. General Contractor shall prepare subgrade in accordance with Section 31 00 00 "Earthwork."
B. General Contractor shall install piles in accordance with Section 31 62 16 "Steel H Piles."

3.02 EXAMINATION

A. Owner's Geotechnical Engineer shall inspect and approve the subgrade supporting the tank.

B. Unsatisfactory conditions shall be corrected to the satisfaction of the Owner's Geotechnical Engineer.

C. General Contractor shall notify Tank Supplier in writing that supporting subgrade has been approved by the Owner's Geotechnical Engineer.

D. Proceed with base slab construction only after unsatisfactory conditions have been corrected.

E. The stone sub-base shall be prepared, leveled, and graded to within ± one inch of stone grade, as indicated on the approved Tank Supplier's Shop (Erection) drawings.

F. Excavation shall include a minimum of four feet in plan beyond the perimeter of the approved exterior wall line.

G. Site access roads:

1. Shall be provided and maintained by the General Contractor throughout the installation of the base slab and precast tank structure.
2. Shall be cleared, leveled, stoned, and free of mud to provide 14-feet of vertical clearance and 14-feet of horizontal clearance.
3. Shall be capable of handling 80,000 pounds GVWR.
4. Shall support live loaded trucks operating under their own power.
5. Shall allow drop-deck, spread axle combinations with 53-ft trailers. This includes a 60-foot-long sweep radius for corners and egress/regress to roadways.

H. Crane and concrete pump pads:

1. Shall be provided and maintained by the General Contractor.
2. Shall be cleared, leveled, stoned, and free of mud.
3. Tank Supplier shall communicate the required locations and sizes of the pads with the General Contractor.

3.03 CAST-IN-PLACE CONCRETE BASE SLAB

A. Install the base slab in accordance with Section 03 30 20 "Concrete Placing Curing and Finishing.

3.04 ERECTION

A. Erect structural precast concrete level, plumb and square within the specified allowable erection tolerances. Provide temporary bracing as required to maintain position, stability, and alignment of members until permanent connections are completed.

1. Install temporary plastic spacing shims as necessary as precast concrete members are being erected.
2. Use patching material to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.

B. Install post-tensioning tendons as soon as practical.

C. Grouting or Dry-Packing Connections and Joints: Indicate joints to be grouted and any critical grouting sequences on Shop (Erection) Drawings. Grout open spaces at keyways, connections and joints where required or indicated with non-shrink, non-metallic grout. Retain flowable grout in place until it gains sufficient strength to support itself. Fill joints completely without seepage to other surfaces. Alternatively, pack spaces with stiff dry pack grout material, tamping until voids are completely filled. Promptly remove grout material from exposed surfaces before it hardens.

D. Field cutting of precast concrete members is not permitted without approval of the Precast Tank Engineer.

3.05 ERECTION TOLERANCES

A. Erect structural precast concrete members level, plumb, square and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

3.06 TENDON INSTALLATION

A. Inspect sheathing for damage before installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.

   a. Ensure that sheathing is watertight and there are no air voids.
   b. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

B. Immediately remove and replace tendons that have damaged strand.

3.07 TENDON STRESSING

A. Stressing jacks and gauges shall be individually identified and calibrated to known standards at intervals not exceeding six months. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.

B. Stress tendons only under supervision of a qualified post-tensioning superintendent.

C. Tendon stressing shall not begin until grout strength in the joints has attained at least 2,500 psi compressive strength.

D. Tendon stressing shall be performed in the sequence indicated on the Shop (Erection) Drawings.

E. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8-inch.

F. Tendon elongations shall be recorded and compared to the theoretical elongations indicated on the Shop (Erection) Drawings. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and theoretical and measured elongations agree.

G. In the event that measured elongations exceed the tolerances indicated on the Shop (Erection) Drawings, the Precast Tank Engineer shall be notified for resolution.

3.08 TENDON FINISHING

A. Strand tails may be cut once prestressing has been deemed acceptable.

B. Do not cut strand tails or cover anchorages of tendons where elongations exceed tolerances until all discrepancies have been resolved to the satisfaction of the Precast Tank Engineer.

C. Cut strand tails as soon as possible after approval of elongations.

D. The tendon tails shall be cut using hydraulic shears.

E. The strand length protruding beyond the wedges after cutting of the tendon tail shall be between 0.5-inch and 0.75-inch.

F. Wedge-cavity caps shall be installed within one working day after cutting tendon tails.

G. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

H. If stressing pockets are not able to be filled within ten days after tendon tail cutting, then temporary protection shall be provided.

3.09 FIELD QUALITY CONTROL

A. Place no concrete for the base slab until the subgrade has been inspected and approved by the Owner's Geotechnical Engineer.

B. Testing: Contractor will engage accredited independent testing and inspecting agency to perform field tests and prepare reports in accordance with Section 03 30 20 "Concrete Placing Curing and Finishing".

1. Testing agency will report test results promptly and in writing to Contractor, Engineer of Record and Tank Supplier.

C. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

3.10 PROTECTION OF PRESTRESSED REINFORCEMENT

A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.

B. Prevent water from entering tendons during installation and stressing.

C. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.11 REPAIRS

A. Repairs will be permitted provided structural adequacy, serviceability and durability of members are not impaired.

B. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780.

C. Repair base slab shrinkage cracks as required for watertightness. Rout a ¼-inch vee-notch along the crack and fill the crack with epoxy injection adhesive.

D. Surface chips or spalls shall be cleaned and then patched with patching material.

E. Misaligned grout ports or connection ports in walkways may be repaired by either enlarging the existing port, or drilling a new one, as required. Coordinate with the Precast Tank Engineer to avoid internal reinforcing and hardware.

F. Damage that occurs during the shipping, installation or construction process shall be brought to the attention of the Precast Tank Engineer for resolution.

G. Additional repairs, if necessary, shall be performed as directed by the Precast Tank Engineer.

H. Remove and replace damaged structural precast concrete members when repairs do not comply with specified requirements.

3.12 CLEANING

A. Clean grout and any other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete members after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect adjacent work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

3.13 TIGHTNESS TESTING

A. Each cell of multi-cell tanks shall be considered a single containment structure and shall be tested individually, unless otherwise specified.

B. The General Contractor shall commence tightness testing within five business days of notification that the structure is ready for testing.

C. Testing shall be performed using the hydrostatic tightness test, which consists of two parts. Part 2 may be waived if approved by the Project Engineer-of-Record.

1. Part 1 shall be a qualitative criterion.
2. Part 2 shall be a quantitative criterion expressed as a maximum allowable volume loss of 0.100 percent per 24-hour period.

D. No backfill may be placed against the walls or on the wall footings of the containment structures to be tested, unless otherwise specified.

E. The initial filling of a new containment structure shall not exceed four feet per hour. Filling shall be continued until the water surface is at the design maximum liquid level, or either one inch below any fixed overflow level in covered containment structures or four inches in open containment structures, whichever is lower.

F. Water for the initial filling shall be provided by the General Contractor. Use potable water unless otherwise specified.

G. Part 1 – Qualitative criteria

1. If any water is observed on the containment structure exterior wall surfaces where moisture can be picked up on a dry hand, the containment structure shall be considered to have failed Part 1 of the hydrostatic test.
2. Wet areas on top of the wall footing shall not be cause to fail Part 1 unless the water can be observed to be flowing.

3. Although Part 2 of the test may begin prior to completion of repairs for Part 1, all defects causing the failure of Part 1 shall be repaired before acceptance of the containment structure.
4. The standard repair procedure for areas failing Part 1 is to inject chemical grout into the affected area. Consult with the Precast Tank Engineer before commencing any such repairs.

H. Part 2 – Quantitative criteria

1. Part 2 of the hydrostatic tightness test shall not be scheduled for a period when the forecast is for a difference of more than 35°F between the ambient temperature readings at the times of the initial and final level measurements of the water surface. The test shall also not be scheduled when the weather forecast indicates the water surface could freeze before the test is completed.
2. The vertical distance to the water surface shall be measured to within 1/16 inch from a fixed point on the containment structure above the water surface. The initial measurement shall not be taken until at least 24 hours after the tank is completely filled. Measurements shall be recorded at 24-hour intervals.
3. The test period shall be the theoretical time required to lower the water surface 3/8 inch, assuming a loss of water at the maximum allowable rate. However, the test period shall not be longer than five days.
4. In uncovered containment structures, evaporation and precipitation shall be measured.
5. At the end of the test period, the water surface shall be recorded to within 1/16 inch at the location of the original measurements. The water temperature and precipitation measurements shall be recorded.
6. The change in water volume in the containment structure shall be calculated and corrected, if necessary, for evaporation, precipitation, and temperature. If the loss exceeds the required criterion, the containment shall be considered to have failed Part 2 of the test.

I. Retesting

1. A restart of the test shall be required when test measurements become unreliable due to unusual precipitation or other external factors.
2. It shall be permitted to immediately retest a containment structure failing Part 2 of the hydrostatic test when Part 1 is passed. If the containment structure fails the second test or if not immediately retested after the first test failure, the interior of the containment structure shall be observed for probable problem areas by the Tank Supplier. The containment structure shall only be retested after the probable problem areas are repaired.
3. Containment structures shall be retested until they meet the required Part 1 and Part 2 criteria. Repairs shall be made before each retest.

J. The containment structure shall be deemed substantially complete upon successful completion of tightness testing. All final payments, including retainage, for all structural elements related to the precast, post-tensioned tank, including the foundation system and cast-in-place base slab, shall be made at this time. This clause supersedes any conflicting clauses in the contract documents.

3.14 SPECIAL WARRANTY

A. The Tank Supplier shall provide a two-year structural warranty to the Owner. The warranty shall at minimum include the following items:

1. The Tank Supplier shall provide a corporate guarantee not covered by any form of insurance or bond as a warranty for the precast tank that warrants the tank is free from structural defect due to faulty design, workmanship, or structural materials.

2. The Tank Supplier shall warrant the structural aspects of the tank for a period of two years from the substantial completion date of the precast tank.

3. The Owner must report in a timely manner any claim to the warranty in writing to the tank manufacturer within the effective coverage dates of the warranty.

4. The Tank Supplier shall furnish, without charge to the Owner, all necessary labor and materials required to repair all structural defects subject to this warranty with a maximum cost of repair not exceeding the Tank Supplier's contract value of the tank and under the condition that the Tank Supplier has been paid in full for the project.

B. Specific Exclusions from Warranty:

1. Maintenance items (sealants, coatings, equipment, plumbing, etc.), all non-structural items.

2. Consequential damages, punitive damages, incidental costs, bodily injury, death, and damage to the property other than the tank.

3. Emptying of tanks, inspection of tanks, processing of the water/wastewater, drying or cleaning of the tanks, filling of tanks, etc. complete in preparation for, and completion of repairs.

4. Defects or issues caused by accident, abuse, misuse, storage or processing of corrosive liquids, improper maintenance, negligence, modifications, additions, or deletions not made by tank manufacturer, improper or defective application, acts of God, force majeure, untimely action by Owner to minimize damage or losses,

unstable or improperly designed or constructed soil/subgrade, or defects caused by work supplied by any party other than the Tank Supplier.

5. A loss or defect that is covered by insurance.

C. All materials and labor for work performed by the Tank Supplier which is not covered under the standard two-year limited structural warranty shall be warranted for a period of one (1) year from substantial completion of the tank per the Contract Documents.

3.15 BACKFILL

A. General Contractor shall place and compact backfill in accordance with Section 31 00 00 "Earthwork."

B. Do not commence backfilling around the tank until the tank has been examined and approved by the Engineer of Record.

C. The General Contractor shall be responsible to protect the tank from damage by construction activity, equipment and vehicles. Damaged structures shall be repaired or replaced to the satisfaction of the Tank Supplier.

D. When backfilling against the tank, place backfill material in equal lifts and to similar elevations on opposite sides of structures in order to equalize opposing horizontal pressures, except where required for final grading.

E. The excavation shall be kept free of water by the General Contractor at all times.

END OF SECTION

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SECTION 03 43 00
PRECAST, POST-TENSIONED, CONCRETE TANKS – CIRCULAR (ACI 350)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Contractor has the option of providing conventional cast-in-place concrete tanks as designed and detailed on the contract documents OR Contractor may provide precast, post-tensioned, concrete tanks per this specification.

B. This Section includes the performance criteria, materials, design, production, and erection of circular precast, post-tensioned, concrete tanks for the entire project. The work performed under this Section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the circular precast, post-tensioned, concrete tanks shown on the Contract Drawings.

C. Work includes, but is not limited to:

1. Gravity Thickeners (Refer to drawing S-606 and S-607)

D. Related Sections include the following:

1. Section 01 15 00.05 “Geotechnical Report”
2. Section 01 15 00.06 “Revised Geotechnical Report”
3. Section 31 00 00 “Earthwork” for preparing the subgrade to support the tanks and for backfilling requirements.
4. Section 03 30 00 “Cast-in-Place Concrete” for Precast, Post-tensioned Tank cast-in-place base slab.
5. Section 05 50 00 “Metal Fabrications” for furnishing and installing loose hardware items.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide circular precast, post-tensioned, concrete tanks capable of withstanding the following design loads within limits and under conditions indicated:

1. Internal Fluid Loads: **65 pcf**
2. Basic Ground Snow Load: **As per Contract Drawing, sheet S-001**
3. Backfill Loads: **As per Geotechnical Report**
4. Lateral Surcharge Loads to Account for Vehicles: **125 psf**
5. Natural Groundwater Elevation: **As per Contract Drawing, sheet S-001**
6. 100-year Flood Elevation: **As shown in Contract Drawing, sheet S-001**
7. Seismic Loads: **As per Contract Drawing, sheet S-001**

B. General Tank Design Criteria:
1. Wall thickness shall be as required by ACI 350.
2. Backfill shall not be used to offset fluid loads.
3. The tank walls shall be post-tensioned in accordance with ACI 350.
   a. Tank walls shall have horizontal post-tensioned tendons to provide residual compression stress.
   b. Minimum residual compression shall be 125 psi after allowance for all prestress losses.
4. Comply with ACI 350 requirements including, but not limited to:
   a. Load factors.
   b. Limits on stresses at transfer of prestress and under service load.
   c. Minimum bonded reinforcement.
   d. Concrete cover over reinforcement.
5. Flotation safety factors:
   a. Worst case condition with flood to the top of the structure and only using dead load to resist flotation, minimum factor of safety shall be 1.10.
   b. All other cases not included above, whether due to flood or natural groundwater, minimum factor of safety shall be 1.25.
6. The tank structure shall be designed for normal environmental exposure.
7. Design circular precast, post-tensioned, concrete tanks to allow for fabrication and construction tolerances, and to accommodate deflection, shrinkage and creep of primary tank structure. Maintain structural precast concrete deflections within limits of ACI 350.

C. Base Slab Design Criteria:
1. Design the base slab to resist all imposed loads within the allowable bearing capacity listed below.
   a. Allowable Bearing Capacity: **As per Contract Drawing, sheet S-001**
   b. Modulus of Subgrade Reaction: **As per Contract Drawing, sheet S-001**
   c. Refer to Geotechnical Engineering Report by **S.W. Cole Engineering, Inc.** dated **October 27, 2015 and revised June 3, 2016** for additional foundation

design recommendations. Note that the revised report only contains recommendations regarding deep pile foundations.

2. Minimum membrane slab thickness shall be six inches for prestressed and non-prestressed floors.
3. Minimum reinforcement in each orthogonal direction shall be in accordance with ACI 350.
4. For non-prestressed membrane slabs, the minimum reinforcement in each orthogonal direction shall be 0.5 percent of gross concrete area.
5. For prestressed membrane slabs:
   a. Minimum residual compression in each orthogonal direction shall be 200 psi after allowance for tensile forces from internal fluid loads at the base of the wall, slab-subgrade friction, and all prestress losses.
   b. Minimum non-prestressed reinforcement in each orthogonal direction shall be 0.15 percent of gross concrete area.
6. Minimum perimeter footing thickness shall be 12 inches.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Include minimum required compressive strength.

C. Shop (Erection) Drawings:

1. Indicate stone requirements for pressure relief valves.
2. Indicate configuration, thickness, dimensions and details of cast-in-place concrete base slab.
3. Indicate size, spacing and details of all necessary base slab reinforcing.
4. Indicate plan views, elevations, sections, and details necessary to install the tank.
5. Indicate locations of all post-tensioned tendons.
6. Indicate tendon stressing sequence and force, and theoretical elongations for all post-tensioned tendons.
7. Include and locate all pipe penetrations. Indicate all penetration styles.
8. Coordinate and indicate openings required by other trades.
9. Indicate location of each precast concrete member by same identification mark placed on unit.
10. Indicate relationship of structural precast concrete members to adjacent materials.
11. Indicate locations and details of joint treatment.
12. Indicate shim sizes and grout requirements.
13. Indicate bearing pad sizes and materials.

D. Comprehensive engineering design signed and sealed by a qualified professional engineer responsible for its preparation licensed in the Commonwealth of Pennsylvania

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Tank Supplier and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.

B. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.

1. Cementitious materials.
2. Aggregates.
3. Reinforcing materials and post-tensioning strands.
4. Post-tensioning duct and anchorages.
5. Admixtures.
6. Bearing pads.
7. Other components specified in Contract Documents with applicable standards.

C. Provide handling procedures, erection sequences, and temporary bracing as required for special conditions.

D. Field quality-control test reports.

1.06 QUALITY ASSURANCE

A. Tank Supplier Qualifications: A firm that complies with the following requirements and is experienced in producing circular precast, post-tensioned, concrete tanks that have a record of successful in-service performance.

1. Assumes responsibility for engineering circular precast, post-tensioned, concrete tanks to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

2. Precast Tank Engineer Qualifications: A professional engineer licensed in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for designs and installations of circular precast, post-tensioned, concrete tanks.

3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group C, Category C3.

   a. Certification shall be maintained throughout the production of the precast concrete units. Production shall immediately stop if at any time the fabricator's certification is revoked, regardless of the status of completion of contracted work. Production will not be allowed to re-start until the necessary corrections are made and certification has been re-established. In the event certification cannot be re-established in a timely manner to avoid project delays, the fabricator, at no additional cost, will contract out the remainder of the units to be manufactured at a PCI certified plant.

4. Has sufficient production capacity to produce required members to meet the project schedule.

B. Tank Supplier: Subject to compliance with requirements, provide circular precast, post-tensioned, concrete tanks by Dutchland, Inc. located in Gap, Pennsylvania, or pre-approved equal.

C. Alternate Tank Supplier Pre-approval Qualifications: Alternate Tank Suppliers wishing to become pre-approved shall comply with the Tank Supplier Qualifications listed above, and the following requirements.

1. The firm shall have a minimum of 15 consecutive years in designing, producing and installing tanks of similar arrangement, size and complexity using the precast, post-tensioned system.
2. The firm shall document the successful installation and performance of a minimum of ten similar facilities, and certify compliance of those structures will all applicable provisions of ACI 350 for a precast, post-tensioned structure.
3. The firm shall employ a full-time engineer on staff who meets the Precast Tank Engineer Qualifications listed above and who has served as the engineer in responsible charge of at least ten similar structures.
4. The firm shall submit, at least 5 days prior to the bid, a preliminary design and tank layout establishing full compliance with these qualifications and specifications.
5. The firm seeking pre-approval shall also submit a reference sheet listing contact names and telephone numbers of at least ten similar structures built by the firm and that comply with ACI 350 for a post-tensioned structure. All projects must be of a similar size and complexity.

D. Post-Tensioning Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."

E. Post-Tensioning Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 Bonded PT - Field Installation course.

1. Superintendent must receive training from post-tensioning supplier in the operation of stressing equipment to be used on Project.

F. Post-Tensioning Inspector Qualifications: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 Bonded PT – Field Installation course.

G. Design Standards: Comply with ACI 350, "Code Requirements for Environmental Concrete Structures" and the design recommendations of PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete," applicable to types of structural precast concrete members indicated.

H. Quality-Control Standard: For manufacturing procedures and testing requirements and quality control recommendations for types of members required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Concrete Products."

1. Comply with dimensional tolerances of PCI MNL 135, "Tolerance Manual for Precast and Prestressed Concrete Construction."

I. Referenced Standards:
1. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials"
2. ACI 301, "Specifications for Structural Concrete"
3. ACI 318, "Building Code Requirements for Structural Concrete"
4. ACI 350, "Code Requirements for Environmental Engineering Concrete Structures"
5. ACI 350.1, "Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures"
6. ACI 350.3, "Seismic Design of Liquid-Containing Concrete Structures"
7. ACI 350.4R, "Design Considerations for Environmental Engineering Concrete Structures"
8. ACI 350.5, "Specifications for Environmental Concrete Structures"
9. ASCE 7, "Minimum Design Loads for Buildings and Other Structures"
10. AWS D1.4, "Structural Welding Code – Reinforcing Steel"
11. PCI MNL-116, "Manual for Quality Control for Plants and Production of Structural Concrete Products"
12. PCI MNL-120, "PCI Design Handbook – Precast and Prestressed Concrete"
13. PCI MNL-135, "Tolerance Manual for Precast and Prestressed Concrete Construction"

14. PTI TAB.1, "Post-Tensioning Manual"
15. PTI M50.1, "Acceptance Standards for Post-Tensioning Systems"
16. PTI M55.1, "Specification for Grouting of Post-Tensioned Structures"

J. Tank designs that rely on bolted or welded connections, or ship-lap joints, for primary, fluid-retaining walls shall not be allowed.

K. Shotcrete shall not be allowed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle post-tensioning materials in accordance with PTI.

B. Deliver all precast concrete members in such quantities and at such times to assure compliance with the agreed upon project schedule and setting sequence to ensure continuity of installation.

C. Handle and transport precast concrete members in a manner to avoid excessive stresses that could cause cracking or other damage.

D. Store precast concrete members with adequate dunnage and bracing, and protect units to prevent contact with soil, staining, and to control cracking, distortion, warping or other physical damage.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain post-tensioning materials and equipment from single source.

2.02 FORM MATERIALS

A. Forms: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required surface finishes.

1. Form-Release Agent: Commercially produced form-release agent that will not bond with, stain or affect hardening of precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.03 NON-PRESTRESSED REINFORCING STEEL

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A706, deformed.

C. Welded Wire Reinforcement: ASTM A1064, plain or deformed, flat sheet.

D. Supports: Use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

E. Provide additional cover on exterior faces to provide protection against saltwater exposure as required by ACI 318-11 7.7.6.

2.04 PRESTRESSING TENDONS

A. Bonded Prestressing Strand: ASTM A416, Grade 270, 7-wire, low-relaxation, 0.6-inch-diameter strand.

B. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.

2.05 ACCESSORIES

A. Duct: Flexible, corrugated, high-density polyethylene.

2.06 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type II or Type I/II.

1. For surfaces exposed to view in finished structure, use same type, brand, and mill source throughout the precast concrete production.

B. Supplementary Cementitious Materials

1. Fly Ash: ASTM C618, Class F with maximum loss on ignition of 6%.
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normalweight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse, non-reactive aggregates. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

E. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixture: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
4. Water-Reducing and Accelerating Admixture ASTM C494, Type E.
5. High Range, Water-Reducing Admixture: ASTM C494, Type A and F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
7. Plasticizing Admixture for Flowable Concrete: ASTM C1017.

2.07 STEEL EMBEDDED MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A36

B. Carbon-Steel Headed Studs: ASTM A108, Grades 1010 through 1020, cold finished, AWS D1.1, Type A or B, with arc shields and with the minimum mechanical properties of PCI MNL 116, Table 3.2.3.

C. Deformed-Steel Wire or Bar Anchors: ASTM A496 or ASTM A706.

D. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 23, after fabrication.

1. Galvanizing Repair Paint: Zinc paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

2.08 STAINLESS-STEEL EMBEDDED MATERIALS

A. Stainless-Steel Plate: ASTM A666, Type 304, Type 316, or Type 201, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.

C. Stainless-Steel Headed Studs: ASTM A276, with minimum mechanical properties for studs as indicated under MNL 116, Table 3.2.3.

2.09 BEARING PADS AND OTHER ACCESSORIES

A. Provide one of the following bearing pads for structural precast concrete members as recommended by tank supplier for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D 2240, minimum tensile strength 2250 psi per ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 3000 psi with no cracking, splitting or delaminating in the internal portions of the pad.
3. High-Density Plastic: Multimonomer, nonleaching, plastic strip capable of supporting loads with no visible overall expansion.

B. Erection Accessories: Provide steel plates and brackets, clips, hangers, high density plastic shims, and other accessories required to install precast concrete members.

2.10 GROUT MATERIALS

A. Grout for Bonded Tendons: Provide cement grout for bonded tendons as indicated below:

1. Maximum Water-Cementitious Materials Ratio: 0.43
2. Limit use of fly ash to 10 percent replacement of portland cement by weight.
3. Limit use of slag to 20 percent replacement of portland cement by weight.
4. Add High-Range, Water-Reducing admixture on-site as necessary for placement.
5. Provide admixtures to prevent bleeding and grout settlement. Material shall be added to the mix on-site.
    a. Acceptable Products: Sika Intraplast-N®, or equal.
6. Grout shall not contain water-soluble chloride ions in excess of 0.06 percent by weight of cementitious materials.

B. Nonshrink Grout: Premixed, prepackaged, non-metallic, shrink-resistant grout complying with ASTM C 1107, Grade C. Grout shall not contain chlorides.

1. Acceptable Products:
    a. SikaGrout 212®, or equal.
    b. SikaGrout 328®, or equal.

2.11 PATCHING MATERIALS

A. One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

1. Acceptable Products:
    a. ProSpec® BlendCrete, or equal.

2.12 CONCRETE MIXTURES

A. Prepare design mixtures for each type of concrete required.

1. Limit use of fly ash to 25 percent replacement of portland cement by weight.
2. Limit use of ground granulated blast-furnace slag to 40 percent replacement of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at Tank Supplier's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 350 or PCI MNL 116 when tested in accordance with ASTM C1218.

D. Normalweight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normalweight concrete.

E. Precast Concrete:
1. Compressive Strength (28 Days): 5,000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.40.

F. Self-Consolidating Cast-in-Place Concrete for Vertical Wall Joints:
1. Compressive Strength (28 Days): 5,000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.40.
3. Provide High-Range, Water-Reducing, polycarboxylate-based admixture to achieve a spread of 18 to 24 inches.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

I. Concrete Mixture Adjustments: Concrete mixture design adjustments may be made if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.13 FORM FABRICATION

A. Form: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placement and vibration operations and temperature changes, and for prestressing and detensioning operations. Coat contact surfaces of forms with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain forms to provide completed structural precast concrete members of shapes, lines, and dimensions within fabrication tolerances specified.

1. Edge and Corner Treatment: Uniformly chamfered or as built-in on standard forms.

2.14 FABRICATION

A. Cast-in Plates, Inserts, Angles, and Other Hardware: Fabricate hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1 and AWS C5.4, "Recommended Practices for Stud Welding."

B. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy coated reinforcing exceeds limits specified in ASTM A775, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Locate and support reinforcement by plastic tipped or corrosion resistant metal or plastic chairs, runners, bolsters, spacers, hangers, and other devices for spacing, supporting, and

fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

3. Provide cover requirements in accordance with ACI 350. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces in accordance with ACI 350 and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

C. Reinforce structural precast concrete members to resist handling, transportation, and erection stresses, and specified in-place loads, whichever governs.

D. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

E. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete members.

F. Place self-consolidating concrete with minimal vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

G. Comply with PCI MNL 116 procedures for hot and cold-weather concrete placement.

H. Identify pickup points of precast concrete members and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete member on a surface that will not show in finished structure.

I. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure members until compressive strength is high enough to ensure that stripping does not have an effect on the performance of final product.

2.15 WATERSTOPS

A. Flexible PVC Waterstops: Corp of Engineers CRD-C 572 for embedding in concrete construction joints to prevent the passage of fluids through joints. Factory-fabricate corners, intersections and directional changes.

1. Profile: Ribbed without center bulb.
2. Dimensions: 9 inches by 3/8-inch-thick, non-tapered.
3. Acceptable Products:

a. Greenstreak PVC Waterstop #646, or equal.

B. Self-Expanding Rubber Strip Waterstops: Manufactured circular or trapezoidal strip, bentonite-free, hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete.

1. Acceptable Products:
   a. Greenstreak Hydrotite® CJ-1030-4M, or equal.

C. Self-Expanding Extrudable Waterstops: Extrudable, swelling, bentonite-free, one-part polyurethane.

1. Acceptable Products:
   a. SikaSwell® S-2, or equal

2.16 RELATED MATERIALS

A. Joint/Crack Filler: ASTM C920, Type S, Grade NS, Class 35 one-part polyurethane, elastomeric sealant, for sealing precast panel joints and minor cracks.

1. Acceptable Products:
   a. Sikaflex®-1a+, or equal

B. High-Performance Joint Filler: ASTM C920, Type S, Grade NS, Class 100/20 low-modulus, high-performance, one-part polyurethane-based, elastomeric sealant, for sealing precast panel joints subject to movement.

1. Acceptable Products:
   a. Sikaflex®-15 LM, or equal

C. Sealant/Adhesive Primer: Specially-formulated primer to promote adhesion of sealants and adhesives to concrete.

1. Acceptable Products:
   a. Sikaflex® 429/202, or equal

D. Joint Sealant, Epoxy: High-build, two-part, protective, solvent-free epoxy.

1. Acceptable Products:
   a. Sikagard® 62, or equal

E. Joint Sealant, Urethane: Liquid-applied, elastomeric, urethane.

1. Acceptable Products:
   a. CIM 1000, or equal

F. Epoxy Injection Adhesive: Two-part, moisture-tolerant, epoxy injection adhesive.

1. Acceptable Products:
   a. Sikadur® 52, or equal

G. Chemical Grout: Expanding, polyurethane, chemical grout.

1. Acceptable Products:
   a. SikaFix® HH+, or equal
   b. SikaFix® HH Hydrophilic, or equal

2.17 FABRICATION TOLERANCES

A. Fabricate structural precast concrete members of shapes, lines and dimensions indicated, so each finished member complies with PCI MNL 135 product tolerances as well as position tolerances for cast-in items.

2.18 FINISHES

A. Form Finish:

1. Standard Grade: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are acceptable. Fill air holes greater than 1/4 inch in width that occur in high concentration (more than one per 2 square inches). Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Allowable joint offset limited to 1/8 inch.

B. Smooth steel-trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float and trowel to a smooth, uniform finish.

2.19 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements. If using self-consolidating concrete also test and inspect according to ASTM C1611, ASTM C1712, ASTM C1610, and ASTM C1621.

B. Strength of precast concrete members will be considered deficient if units fail to comply with ACI 350 concrete strength requirements.

C. Testing: If there is evidence that strength of precast concrete members may be deficient or may not comply with ACI 350 requirements, fabricator shall employ an

independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42 and ACI 350.

a. Test results shall be reported in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports shall include the following:

1. Project identification name and number.
2. Date when tests were performed.
3. Name of Tank Supplier.
4. Name of concrete testing agency.
5. Identification letter, name, and type of precast concrete member(s) represented by core tests; design compressive strength; type of failure; actual compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and precast concrete members comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture or repair material, and finish to match adjacent precast concrete surfaces.

E. Acceptability. Structural precast concrete members that do not comply with acceptability requirements in PCI MNL 116, including concrete strength, and manufacturing tolerances, are unacceptable. Chipped, spalled or cracked members may be repaired. Replace unacceptable units with precast concrete members that comply with requirements.

PART 3 – EXECUTION

3.01 PREPARATION

A. General Contractor shall prepare subgrade in accordance with Section 31 00 00 “Earthwork.”

3.02 EXAMINATION

A. Owner’s Geotechnical Engineer shall inspect and approve the subgrade supporting the tank.

B. Unsatisfactory conditions shall be corrected to the satisfaction of the Owner’s Geotechnical Engineer.

C. General Contractor shall notify Tank Supplier in writing that supporting subgrade has been approved by the Owner’s Geotechnical Engineer.

D. Proceed with base slab construction only after unsatisfactory conditions have been corrected.

E. The stone sub-base shall be prepared, leveled, and graded to within ± one inch of stone grade, as indicated on the approved Tank Supplier's Shop (Erection) drawings.

F. Excavation shall include a minimum of five feet in plan beyond the perimeter of the approved exterior wall line.

G. Site access roads:

1. Shall be provided and maintained by the General Contractor throughout the installation of the base slab and precast tank structure.
2. Shall be cleared, leveled, stoned, and free of mud to provide 14-feet of vertical clearance and 14-feet of horizontal clearance.
3. Shall be capable of handling 80,000 pounds GVWR.
4. Shall support live loaded trucks operating under their own power.
5. Shall allow drop-deck, spread axle combinations with 53-ft trailers. This includes a 60-foot-long sweep radius for corners and egress/regress to roadways.

H. Crane and concrete pump pads:

1. Shall be provided and maintained by the General Contractor.
2. Shall be cleared, leveled, stoned, and free of mud.
3. Tank Supplier shall communicate the required locations and sizes of the pads with the General Contractor.

3.03 CAST-IN-PLACE CONCRETE BASE SLAB

A. Install the base slab in accordance with Section 03 30 20 "Concrete Placing Curing and Finishing"

3.04 ERECTION

A. Erect structural precast concrete level, plumb and square within the specified allowable erection tolerances. Provide temporary bracing as required to maintain position, stability, and alignment of members until permanent connections are completed.

1. Install temporary plastic spacing shims as necessary as precast concrete members are being erected.
2. Use patching material to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.

B. Install post-tensioning tendons as soon as practical.

C. Place concrete in the vertical wall joints after installing post-tensioning tendons and duct connectors between wall panels.

D. Grouting or Dry-Packing Connections and Joints: Indicate joints to be grouted and any critical grouting sequences on Shop (Erection) Drawings. Grout open spaces at keyways where required or indicated with non-shrink, non-metallic grout. Retain flowable grout in place until it gains sufficient strength to support itself. Fill joints completely without seepage to other surfaces. Alternatively, pack spaces with stiff dry pack grout material, tamping until voids are completely filled. Promptly remove grout material from exposed surfaces before it hardens.

E. Field cutting of precast concrete members is not permitted without approval of the Precast Tank Engineer.

3.05 ERECTION TOLERANCES

A. Erect structural precast concrete members level, plumb, square and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

3.06 TENDON INSTALLATION

A. Inspect for damage before installing tendons.

B. Immediately replace tendons that have damaged strands.

3.07 TENDON STRESSING

A. Stressing jacks and gauges shall be individually identified and calibrated to known standards at intervals not exceeding six months. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.

B. Stress tendons only under supervision of a qualified post-tensioning superintendent.

C. Tendon stressing shall not begin until concrete strength in the vertical wall joints has attained at least 2,500 psi compressive strength.

D. Tendon stressing shall be performed in the sequence indicated on the Shop (Erection) Drawings.

E. Mark and measure elongations to closest 1/8-inch.

F. Tendon elongations shall be recorded and compared to the theoretical elongations indicated on the Shop (Erection) Drawings. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and theoretical and measured elongations agree.

G. In the event that measured elongations exceed the tolerances indicated on the Shop (Erection) Drawings, the Precast Tank Engineer shall be notified for resolution.

3.08 TENDON FINISHING

A. Strand tails may be cut once prestressing has been deemed acceptable.

B. Do not cut strand tails or cover anchorages of tendons where elongations exceed tolerances until all discrepancies have been resolved to the satisfaction of the Precast Tank Engineer.

C. Cut tendon tails using hydraulic shears as soon as possible after approval of elongations.

3.09 GROUTING OF BONDED TENDONS

A. Execute grouting within 10 days after approval of tendon elongations. If grouting will not be performed within this time period, provide weather protection for the jacking access pockets.

B. Pump grout through ports into the ducts under pressure.

C. Temperature of concrete walls at time of grouting shall be above 35° F and shall be maintained above 35° F until field-cured 2-inch grout cubes reach a minimum of 800 psi.

D. Grout temperatures shall not be above 90° F during mixing and pumping.

E. Coat tendon anchor plates with epoxy coating after grouting is complete.

F. Patch jacking access pockets.

3.10 FIELD QUALITY CONTROL

A. Place no concrete for the base slab until the subgrade has been inspected and approved by the Owner’s Geotechnical Engineer.

B. Testing: Contractor will engage accredited independent testing and inspecting agency to perform field tests and prepare reports in accordance with Section 03 30 20 "Concrete Placing Curing and Finishing".

1. Testing agency will report test results promptly and in writing to Contractor, Engineer of Record and Tank Supplier.

C. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

3.11 PROTECTION OF PRESTRESSED REINFORCEMENT

A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.

B. Prevent water from entering tendons during installation and stressing.

C. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.12 REPAIRS

A. Repairs will be permitted provided structural adequacy, serviceability and durability of members are not impaired.

B. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780.

C. Repair base slab shrinkage cracks as required for watertightness. Rout a ¼-inch vee-notch along the crack and fill the crack with epoxy injection adhesive.

D. Surface chips or spalls shall be cleaned and then patched with patching material.

E. Damage that occurs during the shipping, installation or construction process shall be brought to the attention of the Precast Tank Engineer for resolution.

F. Additional repairs, if necessary, shall be performed as directed by the Precast Tank Engineer.

G. Remove and replace damaged structural precast concrete members when repairs do not comply with specified requirements.

3.13 CLEANING

A. Clean grout and any other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete members after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect adjacent work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

3.14 TIGHTNESS TESTING

A. Each cell of multi-cell tanks shall be considered a single containment structure and shall be tested individually, unless otherwise specified.

B. The General Contractor shall commence tightness testing within five business days of notification that the structure is ready for testing.

C. Testing shall be performed using the hydrostatic tightness test, which consists of two parts. Part 2 may be waived if approved by the Project Engineer-of-Record.

1. Part 1 shall be a qualitative criterion.
2. Part 2 shall be a quantitative criterion expressed as a maximum allowable volume loss of 0.100 percent per 24-hour period.

D. No backfill may be placed against the walls or on the wall footings of the containment structures to be tested, unless otherwise specified.

E. The initial filling of a new containment structure shall not exceed four feet per hour. Filling shall be continued until the water surface is at the design maximum liquid level, or either one inch below any fixed overflow level in covered containment structures or four inches in open containment structures, whichever is lower.

F. Water for the initial filling shall be provided by the General Contractor. Use potable water unless otherwise specified.

G. Part 1 – Qualitative criteria

1. If any water is observed on the containment structure exterior wall surfaces where moisture can be picked up on a dry hand, the containment structure shall be considered to have failed Part 1 of the hydrostatic test.

2. Wet areas on top of the wall footing shall not be cause to fail Part 1 unless the water can be observed to be flowing.
3. Although Part 2 of the test may begin prior to completion of repairs for Part 1, all defects causing the failure of Part 1 shall be repaired before acceptance of the containment structure.
4. The standard repair procedure for areas failing Part 1 is to inject chemical grout into the affected area. Consult with the Precast Tank Engineer before commencing any such repairs.

H. Part 2 – Quantitative criteria

1. Part 2 of the hydrostatic tightness test shall not be scheduled for a period when the forecast is for a difference of more than 35°F between the ambient temperature readings at the times of the initial and final level measurements of the water surface. The test shall also not be scheduled when the weather forecast indicates the water surface could freeze before the test is completed.
2. The vertical distance to the water surface shall be measured to within 1/16 inch from a fixed point on the containment structure above the water surface. The initial measurement shall not be taken until at least 24 hours after the tank is completely filled. Measurements shall be recorded at 24-hour intervals.
3. The test period shall be the theoretical time required to lower the water surface 3/8 inch, assuming a loss of water at the maximum allowable rate. However, the test period shall not be longer than five days.
4. In uncovered containment structures, evaporation and precipitation shall be measured.
5. At the end of the test period, the water surface shall be recorded to within 1/16 inch at the location of the original measurements. The water temperature and precipitation measurements shall be recorded.
6. The change in water volume in the containment structure shall be calculated and corrected, if necessary, for evaporation, precipitation, and temperature. If the loss exceeds the required criterion, the containment shall be considered to have failed Part 2 of the test.

I. Retesting

1. A restart of the test shall be required when test measurements become unreliable due to unusual precipitation or other external factors.
2. It shall be permitted to immediately retest a containment structure failing Part 2 of the hydrostatic test when Part 1 is passed. If the containment structure fails the second test or if not immediately retested after the first test failure, the interior of the containment structure shall be observed for probable problem areas by the Tank Supplier. The containment structure shall only be retested after the probable problem areas are repaired.
3. Containment structures shall be retested until they meet the required Part 1 and Part 2 criteria. Repairs shall be made before each retest.

J. The containment structure shall be deemed substantially complete upon successful completion of tightness testing. All final payments, including retainage, for all structural elements related to the precast, post-tensioned tank, including the foundation system and cast-in-place base slab, shall be made at this time. This clause supersedes any conflicting clauses in the contract documents.

3.15 SPECIAL WARRANTY

A. The Tank Supplier shall provide a two-year structural warranty to the Owner. The warranty shall at minimum include the following items:

1. The Tank Supplier shall provide a corporate guarantee not covered by any form of insurance or bond as a warranty for the precast tank that warrants the tank is free from structural defect due to faulty design, workmanship, or structural materials.

2. The Tank Supplier shall warrant the structural aspects of the tank for a period of two years from the substantial completion date of the precast tank.

3. The Owner must report in a timely manner any claim to the warranty in writing to the tank manufacturer within the effective coverage dates of the warranty.

4. The Tank Supplier shall furnish, without charge to the Owner, all necessary labor and materials required to repair all structural defects subject to this warranty with a maximum cost of repair not exceeding the Tank Supplier's contract value of the tank and under the condition that the Tank Supplier has been paid in full for the project.

B. Specific Exclusions from Warranty:

1. Maintenance items (sealants, coatings, equipment, plumbing, etc.), all non-structural items.

2. Consequential damages, punitive damages, incidental costs, bodily injury, death, and damage to the property other than the tank.

3. Emptying of tanks, inspection of tanks, processing of the water/wastewater, drying or cleaning of the tanks, filling of tanks, etc. complete in preparation for, and completion of repairs.

4. Defects or issues caused by accident, abuse, misuse, storage or processing of corrosive liquids, improper maintenance, negligence, modifications, additions, or deletions not made by tank manufacturer, improper or defective application, acts of God, force majeure, untimely action by Owner to minimize damage or losses,

unstable or improperly designed or constructed soil/subgrade, or defects caused by work supplied by any party other than the Tank Supplier.

5. A loss or defect that is covered by insurance.

C. All materials and labor for work performed by the Tank Supplier which is not covered under the standard two-year limited structural warranty shall be warranted for a period of one (1) year from substantial completion of the tank per the Contract Documents.

3.16 BACKFILL

A. General Contractor shall place and compact backfill in accordance with Section 31 00 00 "Earthwork."

B. Do not commence backfilling around the tank until the tank has been examined and approved by the Engineer of Record.

C. The General Contractor shall be responsible to protect the tank from damage by construction activity, equipment and vehicles. Repair or replace damaged structures to the satisfaction of the Tank Supplier.

D. When backfilling around the tank, place backfill material in equal lifts and to similar elevations on opposite sides of structures in order to equalize opposing horizontal pressures, except where required for final grading.

E. The excavation shall be kept free of water by the General Contractor at all times.

END OF SECTION

1. Layouts showing the proposed routing of duct banks and the locations of manholes, handholes and areas of reinforcement

2. Profiles of duct banks showing crossings with piping and other underground systems

3. Typical cross sections

4. Installation procedures

5. Manufacturer's technical information for manholes, handholes and accessories proposed for use

6. Drawings showing interior and exterior manhole and handhole dimensions and details of openings, jointing, inserts, reinforcing, size and locations of openings, and accessory locations

7. Certificate of concrete and steel used in underground pre-cast concrete utility structures, according to ASTM C858

8. Product Data for nonmetallic conduit and manhole accessories

C. Record Drawings

1. Layouts showing the actual routing of duct banks including the dimensions and depth of the top of duct bank below grade. Record Drawings for duct banks should also include cross sections of the duct bank indicating the circuit, use, conduit size, orientation and number of conduits.

2. Locations of manholes, handholes, and areas of reinforcement

1.06 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

1.08 SITE CONDITIONS

A. Existing Conditions: per Division 01 General Requirements.

PART 2 – PRODUCTS

2.01 DUCT BANK CONDUIT

A. Duct: Schedule 40 and Schedule 80 PVC conduit and fittings in accordance with Division 26, Section Raceways and Boxes for Electrical Systems.

B. Rigid Steel Conduit: Rigid steel conduit and fittings in accordance with Division 26, Section Raceways and Boxes for Electrical Systems.

C. All shielded instrumentation and communications cable shall be installed in ferrous metal, steel conduit throughout the entire run of conduit from end to end.

2.02 MANHOLES

A. Manholes shall conform to the requirements as shown and detailed on the Drawings.

B. Material and Construction

1. Pre-cast reinforced concrete

2. Minimum interior dimensions as indicated on the Drawings or required by the Utility Company

3. Duct entrances sized and located to suit duct banks. Duct-bank penetration shall be watertight.

4. Modular sections with tongue-and-groove joints. Joints shall be gasketed and water tight.

5. Nominal inside dimensions as shown

6. Base Section: Shall include sump, grate, and ground rod openings.

7. Sump Covers; ASTM A48; Class 30B galvanized iron

C. Frames and Covers

1. Material: Cast iron conforming to ASTM A 48, Class 30A

2. Covers: ~~42 inch~~30 inch minimum diameter clear opening, watertight, sealed type, marked "ELECTRICAL" in raised 2-inch letters

3. Frame shall be grouted on the manhole.

4. Manufacturer: Provide frames and covers of one of the following

k. Overload relay shall include an on-board logic processor to allow basic logic to be performed within the overload relay based on network data and the status of the inputs to the overload relay

l. The overload relay shall support the following CIP messaging types: Polled I/O messaging, Change-of-state/cyclic messaging, Explicit messaging, Group 4 offline node recovery messaging, and Unconnected Message Manager (UCMM)

m. The overload relay shall provide the following functions to minimize network configuration time: Full parameter object support, Configuration consistency value, and Add-on Profile

3. Starters shall be provided with a minimum of two (2) normally open and one (1) normally closed auxiliary contact in addition to the hold-in contact and the auxiliary contacts shown on the Drawings up to a maximum of seven beyond the hold-in contact.

4. Starters shall be provided with a minimum of two (2) normally open and one (1) normally closed auxiliary contact in addition to the hold-in contact and the auxiliary contacts shown on the Drawings up to a maximum of six beyond the hold-in contact.

5. Provide a control power transformer with a rated secondary voltage of 120VAC and a VA rating of at least twice the sealed VA rating of the starter. Provide both primary and secondary fuse protection for the starter.

6. Provide a door mounted selector switch for Hand/Off/Auto operation for each motor starter bucket unless indicated otherwise on the drawings or elsewhere in the specifications. The Hand Mode shall provide a local start control. In the Auto Mode, the start control shall be provided via a remote contact or via Ethernet communications as indicated on the Contract Drawings. Provide an extra set of contacts on the selector switch to monitor the AUTO switch position. Motor starter buckets for the sump pumps shall not include door mounted Hand/Off/Auto switches.

7. Provide door mounted 120VAC push-to-test LED pilot lights for ON (green) and OFF (Red) indication.

I. Internally Mounted Variable Frequency Drives

1. Provide internally mounted VFDs as indicated on the Contract Drawings. VFDs shall be provided in accordance with ~~specification section 26 29 23 "Variable Frequency Motor Controllers"~~ Section 26 24 19, Part 2.01.I, J and K.

1. The unit shall be provided with a 120V control power transformer. The control power transformer shall be provided with primary and secondary fusing.

2. For exterior mounted motor control centers, provide each VFD bucket with internally mounted space heater in accordance with Manufacturers recommendations.

3. Provide VFDs with 24V control interface.

4. Provide a door mounted selector switch for Hand/Off/Auto operation. The Hand Mode shall provide a local start control. In the Auto Mode, the start control shall be provided via a remote contact or via Ethernet communications as indicated on the Contract Drawings. Provide an extra set of contacts on the selector switch to monitor the switch position.

5. Provide a door mounted full human interface module for programming, display and control.

8. Provide door mounted push-to-test LED pilot lights for ON (green) and OFF (Red) indication.

6. Unit shall be provided with input Line Reactor with an Impedance rating of 3% or 5% as indicated on the Drawings for voltage transient protection, and for a degree of protection from harmonic distortion.

7. Ethernet/IP communication interface shall be provided to allow for communication between the solid-state component and the Ethernet network.

8. Provide VFD's in the following configuration;

Equipment	HP	Voltage	Application	Duty Type
Aeration Blowers BL-503, BL-504, BL-505	75	480V	Constant Torque	Heavy
Primary Effluent Pump 1 P-502, P-503	60	480V	Constant Torque	Heavy
Primary Effluent Pump 3 P-504	40	480V	Constant Torque	Heavy
Secondary Clarifiers SC-501 & SC-502	½	480V	Constant Torque	Heavy
Return Activated Sludge Pumps P-505, P-506, P-507	7.5	480V	Variable Torque	Normal
Night Soil Blower BL-302	10	480V	Constant Torque	Heavy

12. The pumps shall be provided with a nameplate securely affixed with manufacturers name, address, type or style, model, serial number, and catalog number, capacity in gpm at rated speed in rpm and head in feet of water.

D. Acceptable Manufactures

1. Wemco
2. Fairbanks Nijhuis Pump
3. ~~Flowserve~~ Egger Pump
4. Morris Pump
5. Or approved equal

2.02 NON-CLOG PUMP

A. Pump Performance

	RAS Pumps	**WAS Pumps**
Number of Units	3	2
Material Being Pumped	Settled Secondary Solids	Mixed Liquor or Settled Secondary Solids
Area Classification	Unclassified	Unclassified
Suction / Discharge Port Size, inches	6”/6”	4”/3”
Maximum Pump Speed, RPM	1200	1750
Maximum Motor Horsepower, HP	7.5	3
Motor Data, Volts/Phase/Hertz	480V/3P/60Hz	480V/3P/60Hz
Drive Type	Variable	Variable
Design Flow and TDH, gpm @ ft	1000 @ 15	150 @ 40

B. Pump Construction

1. Materials of Construction

a. Pump Casing, Back Plate: Cast Iron, ASTM A-48, Class 30 or ASTM A278 Class 30

b. Impellers: Cast Iron, ASTM A-48, Class 30 or ASTM A-278, Class 30

c. Bearing Housings: Cast Iron, ASTM A-48 Class 30

d. Pump Shaft: ASTM A193 AISI 4140 High Strength Alloy Steel

e. Shaft Sleeve: AISI 316 Stainless Steel

f. Casing Wear Rings: ASTM A743 Grade CF-3 Cast Stainless Steel (304L) or AISI 440A 300-350 BHN

g. Impeller Wear Ring: ASTM A487 GR CA15, 200-250 BHN

h. Bolts, Nuts, Cap Screws, Anchor Bolts: 316 Stainless Steel

i. Nameplates: Stainless Steel

2. The pump casing shall be end suction volute type and shall be specifically designed to handle solids while optimizing hydraulic efficiency and ease of maintenance. The pumps shall be designed for continuous duty under normal service.

3. The casing shall be a tangential/centerline discharge with a back pullout design permitted the removal of the rotating assembly without removal of the suction and discharge piping. The casing shall have a heavy wall thickness to provide a long life with abrasives entering the pump. Piping connections to the pump shall be ANSI 125# flange faced drilled flanges. The volute shall have a cleanout opening at the impeller centerline designed for easy access to the impeller. The cleanout opening shall be the largest size opening possible for that size volute. The pump casing shall have a cleanout port designed for easy access to the impeller. The cleanout cover shall be contoured to match the casing contours and sealed with a bolted connection and an O-ring seal.

4. The casing shall be fitted with a non-adjustable wear ring that is press fit into place.

5. Pumps shall be furnished with a reducing fitting for connection to suction piping. The reducing fitting shall be flanged, in accordance with the requirements of Section 43 05 13 and the manufacturer's requirements, and include a cleanout opening (handhole) with removable cover to allow access to clear blockages from pump intake. Provide a ½" pipe tap for pressure gauge connection.

6. The back plate shall be fitted with the stuffing box and the bearing housing. Bearings shall be roller type bearings designed to withstand the axial and radial loads and provide a AFBMA B10 life of 40,000 hours minimum. Bearings shall be oil/grease lubricated and located within the bearing housing. The bearing housing shall contain seals in the bearing covers to prevent the entrance of contaminants.

7. The bearing housing shall have two large opening for accessing the stuffing box to install and maintain the stuffing box mechanical seal, glands and bolts. The stuffing shall contain a type 2 mechanical seals shall be a single

2.03 DESIGN BASIS MANUFACTURER

A. The Contract Documents are based upon Flowserve. As such, the physical installation, all services, all connections, and all appurtenances were designed around the characteristics of this product.. In addition to an "Engineer Approved Equal", Flygt, Yeomans, and Wemco are acceptable Alternate Manufacturers. Alternate Manufacturers equipment may differ from the Contract Documents. The Contractor shall be responsible for modifications to piping, wiring, controls, other services, and structures as required for Alternate Manufacturers. The Contractor shall coordinate these modifications with the Manufacturer and the Engineer. Any additional costs required for these modifications shall be at no additional cost to the Owner or Engineer. No change in Contract Time shall be granted for arrangements and/or modifications which differ from the Contract Documents. The Contractor shall assume the cost and the responsibility for satisfactorily accomplishing all necessary changes and/or modifications for "Named Alternate Manufacturer's" as well as "Engineer Approved Equal" equipment which is submitted.

B. Submittals for the "Design Basis Manufacturer", "Named" products and/or equipment other than the design basis; as well as "Engineer Approved Equal" products and/or equipment shall specifically outline "All" deviations from the Contract Documents. Submittals which do not specifically outline "All" deviations from the Contract Documents; including the "Design Basis Manufacturer", "Named Manufacturer(s)", and "Engineer Approved Equal Manufacturer(s)" will be "Rejected" without review. No change in Contract Time shall be granted for delays in construction which result from lack of coordination and/or lack of "All" deviations from the Contract Documents being specifically outlined in the submittals.

C. All ~~positive displacement blower packages~~vertical centrifugal immersible wastewater pumps of the same type, style, and duty shall be supplied by a single Manufacturer. All positive displacement blowers shall be a product of the following Manufacturer:

1. Flowserve;
2. Flygt;
3. Yeomans;
4. Wemco; and,
5. Engineer Approved Equal

PART 3 – EXECUTION

3.01 FACTORY TESTING

A. All pump tests shall be in accordance with the Hydraulic Institute's Standards. All tests shall be performed at the manufacturer's facility prior to shipment. All test results shall be certified by a registered professional engineer, and shall be submitted to Engineer for approval prior to shipment.

B. Each Pump shall be performance tested at all specified duty points, plus five additional points. Pump test curves shall be developed to illustrate conformance with the contract documents. Capacity, head, motor speed, pump speed, efficiency and input horsepower shall be recorded for each test point. For variable speed units, each pump shall be tested at full speed plus 3 equally spaced speeds between maximum and minimum design conditions.

C. Each pump shall be hydrostatically tested to 1.5 times shutoff head.

D. All motors shall be tested in accordance with IEEE standards. All test results shall be submitted to the Engineer for approval prior to shipment. Each motor shall be tested at no load running current, high potential, and winding resistance.

E. Pump units shall not be shipped to Site until factory test reports are submitted and approved by Engineer.

3.02 INSTALLATION

A. Each pump and motor shall be installed in accordance with the written instructions of the manufacturer and under the direct supervision of the manufacturer's representative. Correct installation and assembly of the pumps and other equipment shall be the Contractor's responsibility and shall be in accordance with the Drawings and with the manufacturers' installation instruction manual. The Contractor shall furnish all bolts, shims, tools, and other devices necessary for installing the pumping units. The manufacturer's representative(s) familiar with the equipment being installed shall supervise the handling, installation, start-up, and testing of the equipment.

B. A certificate from the pump manufacturer shall be provided stating that the installation of the pumping equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication and care of each type unit provided.

C. Installation shall include furnishing of all required lubricants for initial operation, including startup and six (6) months of operation. The grades and quantities of oil supplied following acceptance shall be as recommended by the pump manufacturer.

lubrication. The mechanical seal shall be able to resist 15" Hg vacuum and be rated for 90 PSI continuous duty by the seal manufacturer. The upper bearings shall be protected by a combination of a replaceable and independent tortuous path device and a dual lip nitrile or polyacrylate elastomer low-pressure seal rated at 7 PSI. A lower bearing is not required for Type B Monolithic Cutter Assembly.

2. The bearings shall be part of a replaceable cartridge independent of the shafts which shall meet required pressure rating regardless of cutter stack fit.

3. O-rings shall be made of Buna-N elastomers or fluoroelastomers. Products requiring continuous or occasional lubrication or flushing shall not be accepted.

H. Motor Controller

1. The controller shall be equipped with a HAND, OFF/RESET, AUTO switch. In the OFF/RESET position, the electric motor will not run. In the HAND position, the motor will run. In the AUTO position, grinder will be interlocked with downstream pump operation by a remotely located dry contact. The controller can only be reset from the local panel controls.

2. Upon the grinder encountering a jam condition, the motor controller shall stop the grinder then reverse its rotation to clear the obstruction. If the jam is cleared, the controller shall return the grinder to normal operation. If the jam condition still exists, the controller shall go through two (2) additional reversing cycles within 30 seconds (three (3) times total) before signaling a grinder overload condition. Upon a grinder overload condition, the controller shall shut off the grinder and interlocked pump and activate a FAIL contact.

3. If a power failure occurs while the grinder is running, the grinder shall resume running when power is restored. If the grinder is stopped due to an overload condition and a power failure occurs, the overload indicator shall reactivate when power is restored.

4. The controller shall provide overcurrent protection. The overload relay shall be adjustable so that the range selected includes the full load amps (FLA) rating and service factor.

5. The controller shall have indicator lights for POWER ON, FAIL, and RUN conditions.

6. The controller shall be rated 480 volts, 3-phase, 60 hertz.

7. Each controller enclosure shall house the control devices, relays, terminal blocks, and reversing motor starter.

8. The controller shall be compatible with Allen-Bradley PLC control systems. Refer to Division 40 for instrument and controls requirements.

9. Control Devices:

   a. Control devices shall be mounted in the front panel of the enclosure. Indicating lights shall be integral transformer type with low voltage long life 6 volt lamps. Lamps and selector switches shall be heavy duty NEMA 4X type.

   b. Short circuit protection requires that a properly sized circuit breaker or fuses be installed by others.

   c. One 10A contact relay is provided for a FAIL signal and one 10A relay for RUN signal.

10. Enclosure: Lockable NEMA 4X, fiberglass reinforced polyester resins, suitable for wall mounting. Doors shall have hinges and corrosion resistant latches.

11. Reversing Motor Starter: Full voltage reversing type, 120 volt operating coil, interlock, and captive terminal crews. OL relay shall be sized to the motor full load amperage (FLA).

2.04 FINISHES

A. All fabricated steel, aluminum and cast iron shall be factory prepared, primed and factory finished painted in accordance with Section 09 90 00. Touch-up paint shall be provided as specified to restore integrity of coating system that may be damaged during construction. All paint system components for the entire project shall be the product of a single manufacturer as required by Section 09 90 00 unless otherwise noted on the Drawings or approved by the Engineer.

B. Ferrous surfaces not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.

2.05 SPARE PARTS

A. The manufacturer's recommended spare parts and special tools shall be provided to the Owner prior to the start-up of the equipment. They shall be packaged and identified by name, function and equipment. The Contractor shall unload and store the parts in the location directed by the Owner.

B. All spare parts shall be properly protected for long term storage and packed in clearly marked containers as to their contents.

C. Each grinder shall be provided with the following spare parts and special tools. Provide any additional recommended spare parts as appropriate:

1. Three (3) fuses

1. Scum collection pipe shall be of stainless steel construction with ¼" wall thickness, or as thick as necessary to allow for a maximum deflection of 1/16" under all potential conditions (operating or offline).

2. A 60° angle slot shall be cut symmetrically about the vertical axis of the pipe with the edges serving as a weir over which scum will flow into the pipe when the pipe is rotated. Edges of the slot shall be parallel to the longitudinal axis of the pipe.

3. Full periphery bands not less than 2" wide shall be left in the pipe at intervals not exceeding 30" to act as stiffeners. Corners of slot openings shall be rounded; sharp corners in pipe penetrations which may create stress concentrations in the pipe shall not be allowed.

B. End Supports:

1. The revolving pipe shall be supported at each end in such a manner that a slight vertical or horizontal misalignment will not interfere with the smooth operation of the pipe.

2. The pipe shall be supported by and revolve in a rolled 316L stainless steel collar which shall be welded to an adjustable 316L stainless steel plate.

3. End supports shall have a replaceable UHMW-PE bearing liner securely fitted within the collar to provide a bearing surface for the scum collection pipe, and to prevent load transfer through the seal.

4. Neoprene gaskets shall be provided with the open-end supports to provide watertight connections to the tank walls without grouting. Other materials may be used in conjunction with the neoprene gaskets as fillers or spacers (PVC, polypropylene, etc.), however the use of plywood or other wood-based materials will not be acceptable.

C. Set Collars & Seals:

1. A watertight seal shall be provided for the open end of the pipe. The pipe seal shall be constructed to maintain watertight contact with the pipe walls, even with a slight misalignment of the pipe and collar.

2. The seal shall not be affected by grease, mild acids or alkalis. The seal shall be readily renewable without removing the pipe from the supporting brackets, and shall not bind or impede the smooth action of the revolving pipe.

3. A formed ¼" thick 316L stainless steel set collar shall be provided at each end support to retain the skimmer pipe end seals.

D. Operating Mechanism:

1. General: All parts of the mechanism shall be amply proportioned for all stresses that may occur during fabrication, erections and intermittent or continuous operation.

2. Operator: Stem shall be fabricated to compliment the physical requirements of the pedestal and hand wheel. The hand wheel shall be 18" diameter hot-dipped galvanized, cast iron or aluminum with a revolving handle.

3. Operator Stand/Pedestal: The non-rising stem operator/pedestal and wall bracket shall be constructed of stainless steel. The height shall be such that the operator shaft is approximately ~~36 inches~~36, or 48 inches above the operating floor. Wall brackets shall be used to support floor stands where shown on the Drawings. Wall brackets shall be constructed of fabricated stainless steel or cast iron. Wall brackets shall be designed to withstand all loads that may occur during fabrication, installation and intermittent operating loads.

4. Worm: Cast nylon, cast iron or cast steel, rigidly mounted on stainless steel support bracket with a worm shaft revolving in ~~babbitt~~Babbitted, or UHMW-PE bearings. The worm shaft shall be secured to the pipe stem in such a manner that a slight misalignment of the operating stem will not affect meshing of worm and worm gear. The worm reduction ratio shall provide adequate mechanical advantage so that slight pressure on the hand wheel will turn the pipe and allow easy, accurate adjustment.

5. Worm Gear: Cut-tooth UHMW-PE, cast nylon or cast iron worm gear wheel fastened with 316L stainless steel bolts to scum collection pipe to ensure permanent mechanical connection. Worm gear wheel shall allow 75° rotations in both directions.

6. Manufacturer shall fabricate the operator mechanisms from materials appropriate for exterior use minimizing potential for corrosion, including galvanic corrosion.

7. All grease fittings shall be equipped with stainless steel extensions accessible from the walkways and be in compliance with Specification 40 00 00. Grease fittings extensions shall be 316L stainless steel.

E. Guards & Guides

1. The pipe stem shall pass through fabricated 316L stainless steel ~~guide brackets~~operating stand, with upper and lower grease lubricated bearings as necessary to maintain pipe stem alignment and prevent lateral stress on worm shaft.

2. Worm and worm gear shall be protected from damage from floating debris through the use of 316L stainless steel guarding mounting bracket.

F. Finishes

1. All ferrous surfaces shall be shop cleaned and primed in accordance with Section 09 90 00.

2. Sharp projections of cut or sheared edges of ferrous metals shall be ground to a radius by multiple passes of a power grinder as required to ensure satisfactory coating adhesion.

3. All stainless steel shall be passivated per ASTM A967 and ASTM A380 after fabrication.

G. Anchors and Fasteners

1. All anchor bolts shall be a minimum of 1/2" diameter and made of type 316L stainless steel. The equipment supplier shall furnish all anchor bolts, nuts and washers required for the equipment.

2. All structural fasteners shall be a minimum of 1/2" diameter and made of type 316L stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The equipment shall be installed properly to provide a complete working system. Installation shall follow the Manufacturer's recommendations.

3.02 FIELD QUALITY CONTROL

A. The Manufacturer shall provide the service of a qualified representative for one (1) trip and one (1) day to inspect the mechanism installation, assist in start-up and instruct plant personnel in the proper operation and maintenance of the mechanism. Contractor shall video record the training and provide the Owner with a digital copy of all training.

B. A written report covering the representative's findings and installation approval shall be submitted to the Engineer covering all inspections and outlining in detail any deficiencies noted.

3.03 STARTUP & COMMISSIONING

A. The Manufacturer shall provide the service of a qualified representative for one (1) trip and one (1) day to inspect the mechanism installation, assist in start-up and instruct plant personnel in the proper operation and maintenance of the mechanism.

B. A written report covering the representative's findings and installation approval shall be submitted to the Engineer covering all inspections and outlining in detail any deficiencies noted.

3.04 MAINTENANCE

A. The equipment supplier shall furnish four (4) copies of operation and maintenance manuals which will be retained at the installation site to assist plant operators. The manual shall include the supplier's erection and assembly recommendations and a complete list of recommended spare parts.

END OF SECTION

a. Flow range: See Operating Conditions.

b. Display: Backlit graphical display capable of displaying flow rate, and programming instructions. Display shall also provide visual indication of running status via screen color.

c. Keypad: Keypad for start, stop, speed increment, speed decrement, rapid prime, and programming.

d. Flow units: Programmable in either ml/min or gallons/hour.

e. Security: Programmable keypad lock and PIN security for optional lockout of all keys except emergency start/stop.

f. Auto Restart: feature to resume pump status in the event of power outage interruption.

2. Remote I/O

a. Speed Control Input: Analog 4-20mA speed input with incremental steps of 10 microamps. Speed scalable over any part of the drive speed range. Pump shall be programmable to either increase pump speed or decrease pump speed against an increasing Analog 4-20 mA signal.

b. Run/Stop Input: dry contact output from SCADA system.

c. Pump Running: dry contact output to SCADA system indicating pump operation

d. Leak Detected Alarm: dry contact output to SCADA system indicating a leak

e. General Faults: dry contact output to SCADA system

3. Minimum requirements: Pumps that do not meet the minimum manual and automatic control requirements as specified above are not acceptable.

2.03 CHEMICAL METERING PUMP SKID

A. ~~The system's frame shall be of rugged 304 stainless steel construction. No mild steel shall be used. The skid shall be constructed of 3/16" minimum 304 stainless steel. The frame shall be constructed of 3/16" angle or structural stainless steel tubing. The panel supporting the control panel shall be a minimum of 12 ga. Vertical frame members shall be gusseted. All pipe supports shall be stainless steel. The skid shall be designed for fork-lifting and shall have holes for mounting to concrete pad. The systems frame shall be designed for an integral dilution water booster pump in the event the plant's water system is incapable of providing sufficient dilution water pressure. Maximum system dimensions shall be per schedule above. Control panel shall be mounted in vertical position and at 60" high. Pump suction shall not exceed 18" from the skid base.~~ The systems from shall be constructed of thermal plastic welded corrosion resistant 1/2" HDPE (minimum). Bolted or screwed construction is not acceptable. The skid shall include a solid base, back panel and side panels

with open font and top to ensure ease of access to all components. The skids shall contain a two-inch lip to contain spills during maintenance with a 1/2" drain valve to the chemical storage tank containment for wash down purpose. Pedestals shall be provided to elevate the pump and piping above the spill containment basin. Chemical metering pump skids shall be designed for fork—lifting and shall holes for mounting to concrete pads. The control panel/junction box shall be mounted in a vertical position at a height sixty inches high. Pump suction shall not exceed eighteen inches from the pump skid base.

B. All piping and valves shall be rigidly supported.

C. Provide a calibration column for each skid that includes two full port PVC ball valves with Viton O-rings unless incompatible with the fluid being pumped. The column shall be calibrated for a 30 second draw-down and read in GPH and milliliters. Calibration columns shall be rigidly mounted to the system frame. The column shall be graduated in increments of 0.1 gallons/10mL. Supporting the calibration column with the polymer piping is not acceptable. See Spec 40 05 16 for details on the pulsation dampener.

D. Provide a suction and discharge manifold that includes a pulsation damper and 0-75 psi pressure relief valve as recommended by the manufacturer for each skid. See Spec 40 05 16 for details on the pulsation dampener.

E. Provide a 2-1/2” stainless steel liquid filled pressure gauge to monitor system discharge pressure for each skid. Four (4) total.

2.04 CHEMICAL DILUTION SYSTEMS

A. The dilution systems shall be capable of supplying a solution of diluted chemical to the points shown on the drawing (Sodium Bisulfite Feed System).

B. The following equipment is associated with the chemical dilution systems:

1. Flow Control Valves: Globe valves of PVC body and stem, polypropylene disc and EPDM seals.

2. Dilution water rotameter: PVC with machined, cast acrylic metering tube, 316 stainless steel floats, calibrated in gallons per minute with a maximum upper value of 5 gpm and equipped with flow regulating valve. Rotameters shall be provided with mounting hardware.

3. Pressure reducing valve (Type V01 or V02 for metallic or PVC pipes, respectively- See 40 05 51) for plant water providing the dilution water as the pressure is too high for the metering pumps.

2.05 FINISHES

A. Factory finished painted in accordance with Section 09 90 00. Touch-up paint shall be provided as specified to restore integrity of coating system that may be damaged during construction. All paint system components for the entire project shall be the product of a single manufacturer as required by Section 09 90 00 unless otherwise noted on the Drawings or approved by the Engineer.

B. Ferrous surfaces not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.

2.06 SPARE PARTS

A. Provide manufacturer's recommended spare parts and special tools to the Owner prior to the start-up of the equipment. Spare parts shall be packaged and identified by name, function, and equipment. The Contractor shall unload and store parts in the location directed by the Owner.

B. Protect all spare parts for long term storage and pack in clearly marked containers as to their contents.

C. Each pump skid shall be provided with the following spare parts and special tools. Provide any additional recommended spare parts as appropriate:

1. One (1) maintenance kit for each installed chemical feed pump (excluding shelved spare pumps). The kits shall include a 50' roll of tubing or ten (10) tube assemblies, one (1) tube of silicon grease (or manufacturer recommended equal), and one (1) roller assembly re-build kit or spare pump head.

2. One (1) maintenance kit for each installed chemical feed skid. The kits shall include one (1) replacement for each type of consumable hardware, including pressure safety valve diaphragms, gauge isolation diaphragms, wye strainer screens, and compression nuts and rings for tubing couplings (suction and discharge).

D. A set of any special tools required for the normal operation and maintenance of the pumps shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

2.07 DESIGN BASIS MANUFACTURER

A. All peristaltic pump metering pump packages of the same type, style, and duty shall be supplied by a single Manufacturer. All peristaltic pump metering pump packages shall be a product of the following Manufacturer:

1. Blue-White Industries;

2. Lutz-Jesco America Corp.;

3. Flowmotion Systems, Inc.;
4. Watson-Marlow; or,
5. Engineer Approved Equal

2.08 ACCESSORIES

A. Each room housing the chemical storage containers as specified in this section shall have the entire room act as a containment area sized according to the minimum containment depth required as shown in the Operation Conditions.

B. Chemical containment areas shall be isolated; double containment systems for dissimilar chemicals will not be accepted.

C. Provide one (1) spill containment pallet designed to hold two 330 gallon IBC totes vertically and must have a minimum containment capacity of 400 gallons. Spill containments shall be rated for a 10,000-lb load capacity. Spill containment pallet shall be the same make and model as the containment pallet specified in Section 46 33 33. Spill containment pallets shall be of equal quality and performance as Model 1683D as manufactured by Eagle Manufacturing of West Virginia, Empac Corporation of Ohio, New Pig of Pennsylvania or Engineer approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install all items in accordance with printed instructions of manufacturers, as indicated and specified. Make adjustments necessary to place equipment in service at time of tests. Metering pumps to be calibrated by manufacturing representative.

3.02 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

B. Factory Testing

1. All pump tests shall be in accordance with the Hydraulic Institute's Standards. All tests shall be performed at the manufacturer's facility prior to shipment. All test results shall be certified by a registered professional engineer, and shall be submitted to Engineer for approval prior to shipment.

2. Each Pump shall be performance tested at all specified duty points, plus five additional points. Pump test curves shall be developed to illustrate conformance with the contract documents. Capacity, head, motor speed, pump speed, efficiency and input horsepower shall be recorded for each test point. For variable speed units, each pump shall be tested at full speed plus 3 equally spaced speeds between maximum and minimum design conditions.

3. Each pump shall be hydrostatically tested to 1.5 times shutoff head.

4. All motors shall be tested in accordance with IEEE standards. All test results shall be submitted to the Engineer for approval prior to shipment. Each motor shall be tested at no load running current, high potential, and winding resistance.

5. Pump units shall not be shipped to Site until factory test reports are submitted and approved by Engineer.

C. Field Testing

1. After installation of the pumping units and appurtenances is complete, operating tests shall be carried out to assure that the pumping equipment operates properly. The Contractor shall make arrangements to have the manufacturer's representatives present when field equipment tests are made. Each pumping unit shall be given a running field test pumping water in the presence of the Engineer for a minimum of 2 hours. Each pumping unit shall be operated at its rated capacity, the design conditions specified herein, or such other point on its head-capacity curve selected by the Engineer. The Contractor shall provide an accurate and acceptable method of measuring the discharge flow. Tests shall assure that the units and appurtenances have been installed correctly, that the assembly is free from undue stress imposed by the piping or mounting bolts, that there is no objectionable heating, vibration, or noise from any parts, and that all manual and automatic controls function properly. If any deficiencies are revealed during any tests, such deficiencies shall be corrected and the tests shall be re-conducted.

2. Following successful completion of the water field test the chemical shall be completely drained from the system and the chemical shall be pumped through the system at the pump discharge maximum flow rate and a calibration column flow test completed to confirm successful operation of the system.

3. Provide Field Test Booklets for each unit showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls, and all data gathered during testing.

D. Manufacturer Field Services

1. Provide the services of a factory trained service representative to assist in the installation, start-up, and testing of the equipment, and to perform training to WWTF personnel in the operation and maintenance of the equipment. Provide a minimum of eight (8) hours of instruction for installation and training on each pump skid, thirty-two (32) hours total. Instruction time shall be in addition to startup, checkout, testing and travel

time. A factory-trained representative shall be present during testing of all pumps.

3.03 STARTUP & COMMISSIONING

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION

SECTION 46 43 25

AUTOMATED WEIR CLEANING SYSTEM
~~(PROPRIETARY SPECIFICATION)~~

PART 1 – GENERAL

1.01 SUMMARY

A. Provide an apparatus for cleaning algae and debris from the baffle, weir, spillway and effluent flow launder of the two (2) circular secondary clarifiers.

~~B. The Owner has determined that it is in the Public interest to make the Weir Cleaning System, as described in this Section, a proprietary item. The equipment included under this Section shall be the Weir Wolf System, by Ford Hall Company (Lexington, KY) and no substitutions for this equipment will be allowed.~~

C. The system shall consist of an attachment sleeve mounted to the skimmer of the clarifier, a mainframe member (to which the individual brush arms are attached), collars for attaching brush arms and spring mounts, brush arms, numerous brushes of various sizes, and an assortment of springs in different configurations to provide the biasing forces.

D. Descriptive Work:

1. Provide all labor, materials, equipment, for installation in two (2) secondary settling tanks (SC 501 & 502), with one (1) complete automated weir cleaning system in each tank.

E. Work and Components Include:

1. The Manufacturer shall furnish the items listed below:

a. Attachment sleeve mounted to be mounted to the skimmer of the clarifier

b. Mainframe member

c. Collars for attaching brushing arms and spring mounts

d. Brush arms

e. Numerous brushes of various sizes

f. Assortment of springs in different configurations to provide the biasing forces

g. Bridging device to be positioned over the effluent discharge hole to support the launder brush as it passes.

2. Contractor shall coordinate fabrication and installation of all related equipment, including clarifier mechanisms, in a manner to ensure no operational conflicts exist between system components.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and payment requirements: per Division 01 General Requirements

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination, Sequencing, and Scheduling: per Division 01 General Requirements.

1.04 SUBMITTALS

A. Submit in accordance with Division 01 General Requirements.

B. Shop Drawings

1. Dimensional layouts, materials, details of appurtenances and anchoring. Fabrication and installation shall be in accordance with approved drawings.

2. Diagrams and instructions for integrating the system.

3. Drawings to show how multiple systems and interdisciplinary work shall be coordinated.

C. Product Data

1. Catalog cut sheets, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

2. Calculations for bridge clearances and skimmer strengths.

D. Certificates

1. Certification that the Manufacturer has not less than five (5) years of experience in the application, design and manufacture of similarly specified automated brush systems.

2. Certified statement signed by responsible official of the Manufacturer attesting that the equipment supplied under the work described herein meets the specification requirements. The certificate must be dated after project award, clearly naming the project and acknowledging any and all addendum issued up to the date on the certificate.

3. List of previous installations and references demonstrating compliance with quality assurance requirements

E. Manufacturer's Instructions

1. Preprinted material describing installation, including special notices and safety data sheets concerning impedances, hazards and safety precautions.

F. Operation and Maintenance Data

1. Submit operation and maintenance data in accordance with Division 01 General Requirements. The manual shall include but is not limited to the following:

a. All required cuts, drawings, equipment lists, descriptions, which are required to instruct operation and maintenance personnel unfamiliar with such equipment. The O&M manuals shall include instructions for cleaning and maintenance.

G. Closeout Submittals

1. Documentation to record compliance with technical or administrative requirements, including start-up and testing reports.

1.05 QUALITY ASSURANCE

A. Provide in accordance with Division 01 General Requirements.

B. Qualifications: per Division 01 General Requirements and as follows.

1. Manufacturers: Firms shall have a minimum of 5 years' experience in the design, application and supply of automated brush systems, and shall have successfully furnished automated brush systems that have been in operation for more than five (5) years.

2. All automated brush system equipment specified herein, shall be supplied by one manufacturer. The manufacturer shall coordinate with circular clarifier equipment supplier to ensure no conflicts occur between the automated brush systems and the other clarifier equipment.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Packing, Shipping, Handling, and Unloading

1. All components shall be erected immediately upon receipt from the manufacturer or stored in strict conformance with storage recommendations provided by the manufacturer in the operations and maintenance manual.

1.07 SITE CONDITIONS

A. Existing Conditions: per Division 01 General Requirements.

1.08 SPARE PARTS & SPECIAL TOOLS

A. Spare Parts:

1. Contractor shall submit Manufacturer's recommended spare parts list. Recommended spare parts shall then be furnished with the equipment by the manufacturer in accordance with Section 01 70 00.

2. As a minimum, the following spare parts shall be furnished for each unit provided under this section:

~~a. One (1) set of shear pins for each size shear pin supplied as part of the assembly.~~

b. One (1) complete set of brushes for the assembly.

B. Special Tools:

1. Provide all special tools required for normal maintenance. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended. Include any special equipment required to facilitate drainage or refill of lubricating oils. Include the manufacturer's recommended summer and winter grades of lubricant along with alternative references to products of other manufacturers.

1.09 WARRANTY

A. Equipment supplied under this section shall be warranted to be free from defects in workmanship, design and materials for a period of the five (5) years. Such warranty shall cover all defects or failures of materials or workmanship which occur as the result of normal operation and service. If any part of the equipment should prove to be defective during the warranty period, the manufacturer at no expense to the Owner shall replace the part.

PART 2 – PRODUCTS

2.01 GENERAL

A. Acceptable manufacturers:

1. Ford Hall

2. Envirodyne

3. Or approved equal

B. Custom designed, field assembled and constructed for the individual clarifier it shall be installed.

C. Designed for a brush to make contact with each of the following surfaces:

1. Inner baffle
2. Outer baffle
3. Inner weir(s)
4. Outer weir(s)
5. Top spillway surface
6. Angled spillway surface
7. Inner launder wall
8. Launder bottom
9. Outer launder wall

D. Designed to work off the power of the clarifier drive motor. The system shall be constructed to avoid any torque increases. The unit shall be capable of encountering an indefinite stall without incurring damage.

E. The system shall weigh no more than 150 pounds in total for a single skimmer installation and shall not affect the drive motor, bearings and steel construction of skimmer arms. For dual surface skimmers, a split brush system shall be installed and weigh no more than 100 pounds per skimmer arm.

F. Designed with an engaged position for cleaning and a disengaged position allowing the system to ride idle around the tank.

G. Approved by the clarifier manufacturer on which it shall be installed to ensure compatibility. Refer to Section 46 43 21 Circular Clarifier Equipment.

2.02 EQUIPMENT

A. Attachment Assembly

1. Provide a means of attached the automated brush system to the skimmer arm and or rake truss so as not to interfere with any other operations of the skimmer arm.
2. Custom design for each specific clarifier. Constructed of 304 stainless steel.

B. Mainframe

1. Constructed of 304 stainless steel and designed to slip easily into the attachment assembly and be tightened in position with the use of set screws.

2. Designed so the brush arms can be positioned at any point on the Mainframe.

C. Brush Arms

1. Constructed of thin wall Type 316 stainless steel undersized ¾"x¾"x16 GA tube with maximum thickness of 749" to keep automated cleaning brush system within the required weight limits.

2. Each brush arm will allow/contain the following:

   a. Designed to allow flexibility to clean effluent surfaces within a plus or minus 4-inch radial variance (specifically clarifier walls, both sides of weirs and baffles).

   b. Brush holder component allowing for insertion of a brush – opposite the mainframe end.

   c. Allow brush holder to be adjusted in order to adjust maximum number of brush arms.

   d. Means of biasing the arm to the mainframe to provide sufficient force to remove algae and debris.

   e. Include a component that allows for each arm to be "locked out" or disengaged to allow operators to customize cleaning schedule and extend the life of the brushes.

D. Spring Assemblies

1. Each brush arm requires a spring tension to bias the brush arm with the brush holder and brushes into tight engagement with the appropriate effluent surface to be cleaned. Spring assemblies require the following:

   a. A minimum of one (1) spring assembly of 316 stainless steel for each brush arm.

   b. Two (2) stainless steel springs and one (1) stainless steel guide.

   c. Each spring will be composted of 316 stainless steel wire with a minimum diameter of 0.95 inch and a minimum of 260 active coils per spring length.

   d. Spring coils shall have a mean diameter of 0.655 inches. A minimum inner coil diameter of 0.56 inch and an outer diameter of 0.75 inch are required of each stainless steel spring.

   e. Springs to have a minimum initial spring tension of 6.68 lbf and a maximum of 10.02 lbf with a minimum load tolerance of 18.44 lbf.

E. Brush Holder

1. Constructed of 316 stainless steel at the end of each brush arm to allow the insertion of a cleaning brush.

2. Shall be aligned with each of the following surfaces: both sides of the baffle, both sides of the weird and each of the effluent launder surfaces.

3. Each brush holder shall:

   a. Consist of a "bolted clamp design" to allow for the easy insertion and removal of brushes.

   b. Include a factory supplied brush suitable for prolonged exposure to the wastewater environment.

   c. Contain a ~~shear~~ safety component at the point where the brush holder attaches to the brush arm to allow for safety breakaway.

~~F. Shear Safety Component~~

~~1. Each brush holder shall contain a shear safety component having a frangible point designed to break when subjected to a force within each brush holder.~~

~~2. The stress value on each component shall be low enough to release the brush holder to forgo any damage to the automated brush cleaning system and/or skimmer equipment but shall be high enough to allow standard operation of the automated brush system.~~

G. Brushes

1. Each brush holder shall contain one (1) cleaning brush. Brushes shall be provided that slip easily into the brush holder and provide the cleaning means necessary to remove algae and debris from their respective surfaces. A brush shall be aligned to make contact with both sides of the baffle, both sides of the weir and all the effluent launder surfaces.

2. Brush construction shall be as follows:

   a. Brush backing shall be of durable plastic able to with stand continuous exposure to sunlight, seasonal temperature changes and the corrosive elements found in wastewater.

   b. Brush bristles shall be polypropylene with adequate trim length, density, and stiffness for extended continuous use.

   c. Brushes shall be cut and shaped appropriately so as to clean their respective surfaces without binding.

3. Brushes provided by the automated brush system manufacturer should average approximately one (1) year.

H. Lock In/Lock Out Design

1. Each automated brush system shall be designed with an engaged or locked in position for cleaning and a disengaged or locked out position for riding idle around the tank.

2. Each brush arm shall have a lock out hook permanently mounted corresponding to a lock out ring, which allows disengagement of the individual brushes. The lock out ring shall be mounted to a lock out boss that shall be attached parallel to the mainframe.

3. Each automated brush system shall be designed so that the entire brush system can be disengaged or individual brush Arms can be disengaged allowing for customized cleaning of weir and effluent surfaces.

I. Brush Bridges

1. Provides the automated brush system launder brush assembly a "bridge" over the effluent hole and scum box on which to travel. Incline and decline guide ramps of 304 stainless steel shall be provided for each scum box in the clarifier.

2. Constructed entirely out of Type 304 stainless steel.

J. Weight and Counterbalances

1. Weight of the automated brush system shall not exceed 150 pounds total for all brush systems attachments, brush arms, components and parts for a single skimmer arm design. Dual skimmer designs will require the automated brush system to be divided into halves. One half of the brush arms and holders shall be installed on the first skimmer and the remaining brush arms and holders shall be installed on the second skimmer. Total weight of the dual skimmer design shall not exceed 200 pounds installed for all automated brush system attachments, brush arms, components and parts.

2. Counterbalance shall be installed on the opposite rake mechanism to offset the weight of the brush system that has been added to the skimmer. Manufacturer of the automated brush systems shall provide additional counterbalances totaling the weight of the installed brush system, attachment sleeve and mainframe and shall be responsible for the correct placement and installation. No counterbalances shall be required on the dual skimmer design.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Inspect all items immediately upon delivery to Site for damage.

B. Install all materials in strict conformance with the Contract Drawings, approved shop drawings and the Manufacturer's recommendations and instructions.

3.02 FIELD QUALITY CONTROL

A. Provide in accordance with Division 01 General Requirements.

B. Field Testing

1. All material and testing apparatus necessary for conducting field testing shall be supplied by the Manufacturer and/or the Contractor at no additional cost to the Owner.

C. Operating Tests

1. The mechanism shall be operated in the clarifier for a minimum of 4 continuous hours. There shall be no binding, jerky, or unusual motion exhibited during this run in period. The brush system shall clean all surfaces as specified with the proper force and contact. If the unit should fail under any of these conditions, the test shall be halted and the problem corrected. If, after several attempts, the unit does not successfully pass the field test, the faulty portion of the equipment shall be repaired or replaced and the test re-run.

D. Manufacturer Field Services

1. Provide the services of a factory trained service representative to assist in the installation, start-up, and testing of the equipment, and to train WWTF personnel in the operation and maintenance of the equipment. Provide a minimum of one (1 on-site) eight-hour day per automated cleaning system. Field testing shall only be performed in the presence of the factory trained service representative. Manufacturer's field services requirements shall not be considered complete until all automated cleaning systems have been started up and tested and facility personnel have been satisfactorily trained on the operation and maintenance of the equipment.

3.03 STARTUP & COMMISSIONING

A. Provide in accordance with Division 01 General Requirements.

3.04 CLOSEOUT REQUIREMENTS

A. Provide in accordance with Division 01 General Requirements.

END OF SECTION

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