THE CITY OF WALTHAM MASSACHUSETTS

PURCHASING DEPARTMENT

Cedarwood Water Storage Tank Rehabilitation Project

ADDENDUM NO.1

February 2nd, 2024

CHANGES, CORRECTIONS AND CLARIFICATIONS

The attention of bidders submitting proposals for the above subject project is called to the following addendum to the specifications. The items set forth herein, whether of omission, addition, substitution, or clarification are all to be included in and form a part of the proposal submitted.

THE NUMBER OF THIS ADDENDUM (NO. 1) MUST BE ACKNOWLEDGED IN SECTION 00300 – BID FORM.

ITEM 1: DATE CHANGE

The date of the BID OPENING has been CHANGED to Monday, February 12th, 2024 at 10:00AM.

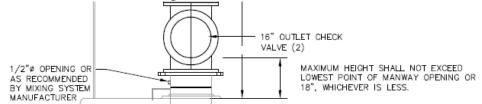
ITEM 2: ANSWERS TO POSED QUESTIONS

- Q1. Can you please clarify the liquidated damage amount? The specification state \$1000 per day and \$500.
- A1. The liquidated damages amount is \$500 per day.
- Q2. Can you please clarify The Interior finish coat of FC 22 mils? This product cannot be applied at 2.5-3.5 mils it has a minimum of 16.0 mils.
- A2. The interior finish coat shall be Tnemec, Series 22 Epoxoline @ 25.0-30.0 mils (dry film thickness dft). See below for additional information:
 - 1. Exterior delete paragraph 2.2.B. of Specification Section 09960 in its entirety and replace with the following:
 - B. Coating System for Base Bid (expressed as dry film thickness (dft):
 - 1. Prime Coat: Series 94 H20 @ 2.5-4.0 mils
 - 2. Stripe Coat: Series 21 Epoxoline @ 3.0 4.0 mils.
 - 3. Intermediate Coat: Series 1095 Endurashield @ 2.5-3.0 mils dft.
 - 4. Finish Coat: Series V701 @ 2.0 -2.5 mils dft.
 - 2. Interior delete paragraph 2.3.B. of Specification Section 09960 in its entirety and replace with the following:
 - **B.** Coating System:
 - 1. Interior Shell Walls, Floor Surfaces, and Tank Mixing System:
 - a. Primer: Series 94 H20 @2.5-4.0 mils dft.
 - b. Stripe Coat: Series 21 Epoxoline. @3.0-4.0 mils dft.
 - c. Finish: Series 22 Epoxoline @ 25.0-30.0 mils dft.

- 2. Interior Underside of Roof Plates and Support Structure:
 - a. Prime Coat: Series 94 H20 primer @ 2.5-4.0 mils dft.
 - b. Intermediate Coat: Series 21 @ 6.0-8.0 dft.
 - c. Finish Coat: Series 21 @ 6.0-8.0 dft.
- Q3. Can a robotic blaster be utilized for the exterior abrasive blasting in lieu of a containment unit? slurry blasting would be performed in the inaccessible areas of the robotic blaster.
- A3. A robotic blaster may be utilized for the exterior abrasive blasting provided the area being blasted is fully contained to achieve the same performance results as full shrouding. This alternative method shall require a shop drawing submittal from the selected Contractor for the Engineer's review and approval.
- Q4. Section 09960-page 11 par D reads for spot priming. Can you please verify that the exterior is a full blast?
- A4. Specification Section 09960, paragraph 3.3.D is for spot priming. All interior and exterior surfaces shall be abrasive blast cleaned. Please refer to Specification Section 09960, paragraphs 3.3.A and 3.3.B.
- Q5. Can an ROV be utilized in lieu of a Diver for the anniversary inspection.
- A5. Yes, an ROV may be utilized for the completion of the anniversary inspection.
- Q6. There is a lot of electrical in the specification but the drawings only show electrical for the sample tap box. Can you clarify the electrical to be performed and the nearest available power source (distance from the tank.) A6. Electrical work includes temporarily relocating and remounting antennas, wiring of the new tank water level transformer, and the Tank Sample Tap Enclosure. Refer to plan sheet C-1 for additional information, including the nearest available power supply source.
- Q7. Can the exterior ladder be steel fabricated and painted to match the tank?
- A7. No. Refer to Specification Section 1320, paragraph 2.6.
- Q8. For the Roof Safety walkway and handrail can these items also be constructed of steel and coated to match the tank?
- A8. No. Refer to Specification Section 1320, paragraph 2.7.
- Q9. What is the diameter of the roof handrail corral to be installed on the roof of the tank?
- A9. The roof walkway system and safety handrail shall provide 36" of clearance around the outside edge of the finial cap roof vent and antennas mounted adjacent to the finial cap roof vent.
- Q10. Do you have a specific design for the new cable tray mounting supports? The specification says what it is to be made from but does not provide a design.
- A10. The cable tray system shall consist of 1 5/8" 304 stainless steel Unistrut welded (MIG) to the tank every 10 horizontal feet.
- Q11. Are the 2" PVC conduit runs just supposed to dead end at the base of the tank and at the roof to shell junction?
- A11. No. For clarification, there shall be three (3) 2" conduits (not two (2) as noted on Sheet C-1). The conduits shall extend from the existing communications panels shown on Sheet C-1, to the existing antennas mounted on the tank (refer to Appendix A).

- Q12.What is the estimated bid price?
- A12. There is no current estimate at this time.
- Q13. Who will be performing coatings inspections? Any 3rd party inspectors? If so, who will it be? If unknown, who is being considered?
- A13. The design engineer will either perform the coating inspections in-house, or sub-contract those services.
- Q14. Does the city have a preferred vendor that performs work on the antennas and if so, can you provide their contact information?
- A14. The City currently uses All Comm Technologies Inc of Revere for antenna work (781) 289 3000
- Q15. Does the city have a preferred vendor for the erosion control matting and testing lab work and if so, can you provide their contact information?
- A15. As per Specification Section 02025, the erosion control matting was designed around the Flexamat-10NM system, manufactured by Motz Enterprises, Inc. The City does not have a preferred testing lab.
- Q16. Was the sample for the lead test obtained from the exterior of the tank?
- A16. Yes.
- Q17. After a containment system is built there will be minimal space on the site for storage. Will we be provided some storage area in the parking lot adjacent to the tank?
- A17. No. All project storage space is on the tank site. Bidders are encouraged to conduct a site visit. All site visits shall be coordinated with Water & Sewer Division, (781) 314-3855.
- Q18. Will the owner have any trees/limbs infringing on the tank site trimmed prior to the start of work?
- A18. There is no tree pruning planned by the City at this time.
- Q19. Are any logos being painted on the tank?
- A19. No.
- Q20. Reference Agreement 4.03 and Section 00540. The Agreement states liquidated damages is \$1,000, Section 00540 states liquidated damages is \$500. Which is correct?
- A20. Refer to the response to Question #1.
- Q21. Reference Specification 01010 1.2 B. 4. What is the size of the secondary roof hatch?
- A21. Delete "secondary roof hatch" from Specification Section 01010, paragraph B.4.
- Q22. Reference Specification 01010 1.2 B. 4. and Plans C-1. Where does the flapper valve referenced in the Summary of Work go in the detail on C-1?
- A22. The leader notes on Sheet C-1 direct the viewer to the detail on Sheet C-2.
- Q23. Reference Specification 01024 1.2 B. 1. Efflorescence is referenced. Please confirm the tank roof and walls are steel.
- A23. Confirmed, the tank roof and walls are steel. Delete "the removal of efflorescence and minor patching" and "the application of a two-coat architectural coating system to the tank dome and exposed wall" from Specification Section 01024, paragraph 1.2.B.1.

- Q24. Reference Specification 02901 3.7 A. Item references multiple tanks being painted. Please confirm air monitoring applies to this project.
- A24. Confirmed, air monitoring is required for this project due to the presence of lead paint. Delete "for each of the water tanks to be painted" from Specification Section 02901, paragraph 3.7.A.
- Q25.Reference Specification 09960 2.3 B. 3. The DFT range for the FC22 topcoat is 2.5-3.5 mils. The Tnemec PDS for FC22 states the minimum DFT is 16 mils. Please advise what the specified DFT range is for FC22. A25. **Refer to the response to Question #2.**
- Q26. Reference Specification 13210 2.6. Is a carbon steel ladder painted with the exterior paint system acceptable in lieu of an aluminum ladder?
- A26. Refer to the response to Question #7.
- Q27. Reference Plans C-1. On the Tank Side View, a new walkway system and handrail detail is referenced. That detail isn't on page C-3. Can you please provide the detail?
- A27. Refer to Safety Rail Detail on Sheet C-3.
- Q28. Reference Plans C-1. On the Tank Side View, the silt stop note references a "Pipe Connection Detail" on page C-3. That detail isn't on page C-3. Can you please provide the detail?
- A28. Refer to the following detail:



The piping connection to the silt stop shall be by means of a flange adapter. For additional information, refer to the tank mixing system details on Sheet C-2 and page 9 of Appendix A.

- Q29. Reference Specification 09960 2.2 B. 3. Themec is advising us that Series 750 UVX is no longer in production. Can you please advise on a substitute for the exterior finish coat?
- A29. Refer to the response to Question #2.
- Q30. The C-1 plan view shows a 12" x 6" Tee for the hydrant. Detail view shows a tapping sleeve and gate valve. Can you confirm which is to be used?
- A30. A 12" x 6" tee is preferred, provided it can be coordinated and completed when the tank is shut down to replace the two (2) 8-inch butterfly valves in the vault (refer to revised Sheet C-3 included with this addendum). If the work cannot be coordinated with the tank shut down, then a tapping sleeve and valve shall be used.
- Q31. The scale appears to be off on the plan C-1 for the Erosion Control Matting System. If you field measure, the measurements are approximately 1800 SF (12'x 150 LF). Should the quantity be increased to 1800 SF? A31. Refer to the revised bid form (Specification Section 00300) included with this addendum. The quantity for Bid Item #13 has been updated to 1,600 SF.

ADDENDUM NUMBER 1 (CONT.)

2/2/2024

- Q32. Note 7 and 8 in the General Notes on sheet C-1 talks about the Erosion Controls prior to construction. Where is the silt sock erosion control to be installed? Does there need to be silt fence installed with the sock? A32. Refer to Note 8 on Sheet C-1: the silt sock shall be installed down grade of the construction limits. Erosion controls shall extend across the site entrance, and as needed, to control erosion and sediment leaving the site. Refer to Specification Section 02020 for additional information.
- Q33. What material is to be used to backfill on top of the Erosion Control Matting System? Loam, stone, gravel?
- A33. The erosion control matting shall be backfilled with top soil, and then seeded. Refer the Specification Sections and 02901 and 02945.
- Q34. Do the waterworks costs (hydrant install) go in Item 15 Miscellaneous Items?
- A34. Yes.
- Q35. Sheet C-1, says Cut and Cap 8" Drain. Any specific material as to what to use for Capping?
- A35. Refer to Specification Section 02616.
- Q36. Sheet C-1 says Decommission Valve. Are we to remove the valve in its entirety or abandon in place?
- A36. Refer to note 6 on Sheet C-1.
- Q37. On the erosion control matting, what is the length and width of the mat?
- A37. Refer to Sheet C-1 (12 ft wide erosion control matting). Limits and extents of matting are shown on Sheet C-1. The matting shall end at the top of the slope, abutting with the existing asphalt surface south of the vault (to be field verified). Estimated contract quantities are provided in Specification Section 00300.

ITEM 3: DELETE AND REPLACE

- <u>DELETE</u> Specification Section 00300 BID FORM in its entirety and <u>REPLACE</u> with the attached new Specification Section 00300.
- **DELETE** paragraph 1.2.0.1 of Section 01024 in its entirety and **REPLACE** with the following:

Item 15: Miscellaneous Items

- Under the unit price for Item 15, the Contractor shall provide all labor, equipment, materials, and incidentals required to provide miscellaneous items and work not described in other bid items. This item includes general conditions, project management, Division 1 items not included in other bid items, site work not included in other items, replacement of the two butterfly valves in the vault, replacement of barbed wire on perimeter fencing, perimeter fencing around the vault, erosion controls and construction entrance, restoration of site and all other work shown on Drawings and described in Specifications not included in other bid items.
- DELETE drawing sheets C-1 and C-3 and REPLACE with the revised sheets included with this addendum.

ITEM 4: ADD ATTACHMENTS

• <u>ADD</u> the attached Specification Section 02834 - 358 WELDED WIRE MESH FENCE AND GATE to Division 2 specifications.

ADDENDUM NUMBER 1 (CONT.)

2/2/2024

- <u>ADD</u> the attached Specification Section 11201 PROCESS PIPING AND VALVES to Division 11 specifications.
- <u>ADD</u> the attached photos of the Cedarwood tank roof as supplemental information.

SECTION 02834

358 WELDED WIRE MESH FENCE AND GATE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work includes: Provide 358 welded wire mesh fencing and accessories, all as required by the Contract Documents.

1.2 RELATED WORK

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 1. Section 01300 Submittals

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Shop Drawings showing details of each frame type, details of openings, and details of construction, installation, and anchorage.
 - 4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

1.4 STANDARDS

A. The following American Society for Testing and Materials (ASTM) standards form a part of this specification as referenced:

| 1. | ASTM A53 | Pipe, Steel, Black and Hot-Dipped, Zinc Coated, |
|----|----------|---|
| | | Welded and Seamless. |

- 2. ASTM A121 Metallic-Coated Carbon Steel Barbed Wire.
- 3. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM F626 Fence Fittings.

5. ASTM F900 Industrial and Commercial Steel Swing Gates.

6. ASTM F1083 Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized)

Welded, for Fence Structures.

7. FS RR-F-191 Fencing Wire and Post, Metal (and Grates, Chain Link

Fabric, and Accessories).

PART 2 - PRODUCTS

2.1 FENCE POSTS AND APPURTENANCES

- A. All posts, gate frames, braces, and horizontal rails shall meet ASTM F1083 for Standard Weight Galvanized Pipe.
 - 1. Type I round post.
 - 2. Minimum tensile strength of 50,000 lb./in².
 - 3. Minimum yield strength of 25,000 lb./in².
 - 4. Line post cross-section shall be 2-3/8-inch outside diameter steel pipe weighting not less than 3.65 lbs/lf.
 - 5. End, corner, and pull posts cross-section dimensions shall be 2-7/8-inch outside diameter steel pipe weighing not less than 5.79 lbs/lf.
 - 6. All tubular and pipe posts shall be capped unless a barbed wire extension arm assembly acts as a cap.
 - 7. Posts, other fence framework, accessories, fittings, and miscellaneous items shall be hot dipped galvanized and have an extrusion bonded PVC coating, minimum of 10 mils thick.
 - 8. Framework color coating shall match fabric.
 - 9. Galvanized finish shall have not less than the following weight of zinc per square foot:
 - a. Pipe: 1.8 oz., complying with ASTM A53.
 - b. Hardware and accessories: Comply with Table I of ASTM A153.
 - 10. Minimum cross section dimension for the top railings and top, middle, and bottom braces between terminal posts and adjacent line posts shall be 1-5/8-

inch OD steel pipe weighing not less than 2.26 lbs/lf.

- 11. Diagonal truss braces for gauge framework between terminal and adjacent line posts shall not be less than 3/8-inch diameter steel rod.
- 12. Fittings shall be galvanized press steel, malleable or cast steel as specified in ASTM F626 and Federal Specification RR-F-191.
- 13. Where posts do not have provisions for weaving fence fabric to posts, tension or stretcher bars for attaching fabric to terminal posts such as end, corner, gate, and pull posts, shall be flat bars with nominal dimension no less than 3/16-inch by 3/4-inch for use with fence fabric having mesh larger than 1 inch, of a length equal to full height of the fence fabric, and used with bar bands, bolts and nuts. Bar bands shall be no thinner than No. 11 gauge coated sheet steel. Bolt diameter shall not be less than 3/8-inch for use with bar bands.
- 14. Ties for fastening fence fabric to line posts and rails shall be not less than No. 9 AWG steel wire with the same coating as the fence fabric or other approved bands.

2.2 FABRIC – 358 WELDED WIRE MESH

- A. 358 welded wire mesh fabric shall comply with the following:
 - 1. Surface Treatment: Hot dipped galvanized.
 - 2. Wire diameter: 6 mm.
 - 3. Wire size: 9 gauge.
 - 4. Height: 8 feet.
 - 5. Mesh size: 12.7x76.2 mm to 25x75 mm (1/2"X3").

2.3 FITTINGS AND ACCESSORIES

- A. All fittings shall be of malleable or heavy pressed steel construction conforming to ASTM A153.
- B. All materials shall be in accordance with Federal Specifications RR-F-191, Type IV, Class 1B.

2.4 BARBED WIRE

- A. Barbed wire shall be three lines of double strand No. 12-1/2 AWG wire, conforming to ASTM A121, with No. 14 AWG 4-point barbs placed 5-inches apart.
- B. Barbed wire support arms shall project outward from the top of line posts at 45°, and shall be vertical at terminal posts.

- 1. Shall support 250 pounds applied downwards at the outermost wire attachment.
- 2. Shall have formed tongues or other approved provision for attachment of three strands of barbed wire, with the outside strand located approximately 12 inches horizontally away from the fence, and other strands spaced evenly.

2.5 CONCRETE

- A. Concrete for post bases (footings) shall be as specified in Section 03300, Cast-In-Place Concrete.
 - 1. 28 day strength: 3,000 psi.

2.6 WARRANTY

A. Prior to installation, the Contractor shall provide the fence manufacturer's notarized certification that all vinyl components are fully warranted by the manufacturer for 15 years from Substantial Completion against rust and corrosion.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Fence shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer and these specifications. These specifications shall take precedence over the recommendations of the manufacturer if any discrepancy exists between them.

B. Posts:

- 1. Posts shall be set true to the line and grade of the proposed fence in concrete bases, as shown on the Drawings.
- 2. Line posts shall be spaced at a maximum of 10 feet, center to center.
- 3. Concrete post foundations shall be concrete cylinders with a minimum diameter of 12 inches, and shall extend into the ground to the dimensions shown on the Drawings. Posts shall be set in the full depth of the foundations except for 6 inches of concrete under terminal posts and 4 inches of concrete under line posts. If foundation holes are excavated in unsuitable material, the Engineer shall be notified for determination of suitable construction precautions.
- 4. If solid rock is encountered without an overburden of soil, poles shall be set into the rock a minimum depth of 12 inches for line posts and 18 inches for terminal posts, such as end, corner, gate, and pull posts, and grounded into solid rock with the post hole diameter a minimum of 1 inch larger than that of

the post.

- 5. Where solid rock is covered by an overburden of soil or loose rock, the posts shall be set into the rock as specified above. The total pole setting depth shall not exceed the depths required for setting in earth.
- 6. Any change in direction of fence line of 30° or more shall be considered a corner. Pull posts shall be used at all abrupt changes in grade. Maximum area of unbraced fence shall not exceed 1,500 square feet.
- 7. Terminal posts such as end, corner, gate, and pull posts shall be braced to the adjacent post(s) with horizontal rail braces used as compression members and diagonal truss braces with truss tighteners for tension members, with the lower ends at the terminal post in each panel of fence framework.

C. Top Rails:

1. Top rails shall pass through intermediate or line post tops, form a continuous brace with all splices made by approved couplings, and shall be fastened to terminal posts.

D. Mesh Panels:

- 1. Shall be stretched taut, with the bottom edge following the finish grade, and shall be a continuous mesh between terminal posts.
- 2. Each span of fabric shall be attached independently at terminal posts.
- 3. Where terminal posts do not have provisions for weaving fabric to posts, stretcher bars shall be placed through the end weave of the fabric and secured to the post with bar bands spaced not more than 12 inches apart on the post.
- 4. Shall be attached with ties to line posts at intervals of not more than 14 inches (and to the top railing and braces at intervals not exceeding 24 inches).
- 5. Bottom tension wire shall be interlaced in the weave of the fabric, pulled taut and fastened to terminal posts.

E. Barbed Wire:

1. Shall be stretched taut and fastened at each support.

F. Gates:

1. Gates shall open 180° outward unless otherwise specified on the Contract Documents. The Contractor shall propose modifications to the operational direction if grade and clearance, gate obstruction, or other field conditions are determined to interfere with gate operation, as approved by the Engineer.

2. Install gates true to opening and plumb in a closed position. END OF SECTION

SECTION 00300

BID FORM

To the City of Waltham, Massachusetts:

Regarding: Cedarwood Water Storage Tank Rehabilitation Project

The Owner reserves the right to reject any bid in the event that any bid item or items are obviously unbalanced or appear to the Owner to be so unbalanced as to affect or to be liable to affect adversely any interest of the Owner.

The Owner reserves the right to reject any or all bids if it deems it to be in its best interest to do so. The Owner reserves the right to award the Contract based on sufficiency of appropriated funds to complete the work.

The undersigned states that no officer, agent, or employees of the Owner directly or indirectly have a financial interest in this Bid.

The undersigned, as Contractor, declares as follows:

- The only parties interested in this Bid as Principals are named herein.
- This Bid is made without collusion with any other person, firm, or corporation.
- No officer, agent, or employee of the Owner is directly or indirectly interested in this Bid.
- The Contractor has carefully examined the proposed Work and fully informed and satisfied themself as to the conditions there existing, the character and requirements of the proposed Work, the difficulties attendant upon its execution and the accuracy of all estimated quantities stated in this Bid and has carefully read and examined the annexed proposed AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof.
- Understands that information relative to subsurface and other conditions, natural phenomena, existing pipes, and other structures (surface and/or subsurface) has been furnished only for his information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes, and other structures (surface and/or subsurface) actually encountered will be the same as those shown within the Contract Documents and agrees that the Contract Documents or otherwise or obtained by him in his own examination of the site, as a basis of or ground for any claim against the Owner of the Engineer arising from or by reason of any variance which may exist between the aforesaid information made available to or acquired by him and the subsurface and/or other conditions, natural phenomena, existing pipes, and other structures (surface and/or subsurface) actually encountered during the construction work, and has made due allowance therefore in this BID.
- The Contractor understands that the quantities of work tabulated in this Bid or indicated in the Specifications of other Contract Documents are only approximate and are subject to increase or decrease as deemed necessary by the Engineer.

• The Contractor agrees that, if this BID is accepted, they will contract with the Owner, as provided in the copy of the Contract Documents deposited in the office of the Engineer, this BID from being part of said Contract Documents, and that the Contractor will perform all the work and furnish all the materials and equipment, and provide all labor, services, plant, machinery, apparatus, appliances, tools, supplies, and all other things required by the Contract Documents in the manner and within the time therein prescribed and according to the requirements of the Engineer as therein set forth, and that the Contractor will take in full payment therefore the lump sum or unit price applicable to each item of the Work as stated in the schedule below.

Contractors must bid on each Item.

| Refer to | Section | 01024 for | Measurement | and Payment | for Item | Descriptions. |
|----------|---------|-----------|-------------|-------------|----------|---------------|
| | | | | <i>J</i> | | 1 |

| Addenda: This BID includes Addenda numbered to (To be filled in by Bidder | if Addenda |
|---|------------|
| are issued.) | |
| (Bidder) | |
| (by) | _ |
| (Title) | |

BASE SCOPE OF WORK BID FORM

The Base Bid includes all the work of the Contractor, being all work covered by Items 1 through 17, inclusive.

Cedarwood Water Storage Tank Rehabilitation Project

| | **** | | ITEM DESCRIPTION WITH UNIT BID PRICE | UNIT PRICE | |
|----------|----------|--------------------------------|--------------------------------------|------------|-----------------|
| ITEM NO. | QUANTITY | QUANTITY UNIT WRITTEN IN WORDS | | IN FIGURES | EXTENDED AMOUNT |
| 1 | 1 | EACH | MOBILIZATION/DEMOBILIZATION | | |
| | | | AT | | |
| | | | per each | | |
| 2A | 1 | EACH | EXTERIOR TANK COATING SYSTEM | | |
| | | | AT | | |
| | | | per each | | |
| 2B | 1 | EACH | INTERIOR TANK COATING SYSTEM | | |
| | | | AT | | |
| | | | per each | | |
| 3 | 20 | EACH | STEEL TANK PIT REPAIR | | |
| | | | AT | | |
| | | | per each | | |
| 4A | 1 | EACH | SEAL CONCRETE FOUNDATION | | |
| | | | AT | | |
| | | | per each | | |
| 4B | 1 | EACH | SEAL STEEL TANK ROOF SEAMS | | |
| | | | AT | | |
| | | | per each | | |
| 5 | 1 | EACH | GROUT CONCRETE FOUNDATION | | |
| | | | AT | | |
| | | | per each | | |
| 6 | 1 | EACH | TANK MIXING SYSTEM | | |
| | | | AT | | |
| | | | per each | | |
| 7 | 1 | EACH | EXTERIOR OSHA COMPLIANT LADDER | | |
| | | | AT | | |
| | | | per each | | |
| 8 | 1 | EACH | OVERFLOW PIPE UPGRADES | | |
| | | | AT | | |
| | | | per each | | |
| 9 | 1 | EACH | ROOF HANDRAIL AND WALKWAY SYSTEM | | |
| | | | AT | | |
| | | | per each | | |
| 10 | 1 | EACH | VALVE VAULT ACCESS HATCH REPLACEMENT | | |
| | | | AT | | |
| | | | per each | | |
| 11 | 1 | EACH | PRESSURE/LEVEL TRANSMITTER IN VAULT | | |
| | | | АТ | | |
| | | | per each | | |

| ITEM NO. | QUANTITY | UNIT | ITEM DESCRIPTION WITH UNIT BID PRICE WRITTEN IN WORDS | UNIT PRICE IN FIGURES | EXTENDED AMOUNT |
|----------------|------------------|-------|---|--------------------------|-----------------|
| 12 | 1 | EACH | TANK SAMPLE TAP AND ENCLOSURE | | |
| | | | AT | | |
| | | | per each | | |
| 13 | 1,600 | SF | ACCESS DRIVE EROSION CONTROL MATTING | | |
| | | | AT | | |
| | | | per square foot | | |
| 14 | 1 | EACH | TEMPORARY RELOCATE AND RESET ANTENNAS | | |
| | | | AT | | |
| | | | per each | | |
| 15 | 1 | EACH | MISCELLANEOUS ITEMS | | |
| | | | AT | | |
| | | | per each | | |
| 16 | 1 | ALLOW | ADDITIONAL REPAIRS | | |
| | | | AT Seventy-Five Thousand Dollars | \$75,000.00 | \$75,000.00 |
| | | | Per allowance | | |
| 17 | 1 | ALLOW | POLIC DETAILS | | |
| | | | ATTwenty-Five Thousand Dollars | \$25,000.00 | \$25,000.00 |
| | | | Per allowance | | |
| TOTAL BA | SE BID: | | , | | |
| (Basis for det | termining lowest | bid) | | | |
| | | | | | |
| | | | | | |

Price written in: Words (Dollars and Cents) Figures

**** Indeterminate quantities. These quantities are not guaranteed. Payment will be based on actual quantities constructed. ****

<u>Basis of Award</u>: The basis of award shall be at the Owner's sole discretion. The Contractor hereby agrees that he will not withdraw this BID within thirty (30) consecutive calendar days after the actual date of the opening of Bids and that, if the Owner shall accept this BID, the Contractor will duly execute and acknowledge the AGREEMENT and furnish, duly executed and acknowledge, the required CONTRACT BONDS within ten (10) calendar days after notification that the AGREEMENT and other Contract Documents are Ready for signature.

If this BID is accepted by the Owner, the undersigned agrees to substantially complete work provided to be done under the Contract within **180 calendar days**, as stipulated in the AGREEMENT. For the Contractor to perform this work, the Cedarwood water storage tank will be taken offline and drained on May 22, 2024 and shall be placed back into service by August 31, 2024.

A performance bond in an amount equal to 100% of the total amount of the bid with a surety company qualified to do business in the Commonwealth of Massachusetts will be required for the faithful performance of the contract, as well as a labor and materials bond in an amount equal to 100% of the total bid amount.

This Proposal must bear the written signature of the Contractor or that of his duly authorized agent. If the Contractor is a corporation or a partnership, the Bid must be signed by a duly authorized office of such corporation or by a Partner and the title of such officer must be stated. Satisfactory completion of the following data is an essential part of submission of this Proposal and is required. Bid must be embossed with corporate seal.

| (SEAL) | |
|----------------------|--|
| (Name of Contractor) | By: (Signature and title of authorized representative) |
| | Date: |
| (Telephone Number) | (Business Address) |
| (Fax Number) | (City and State) |

END OF SECTION 00300

SECTION 11201

PROCESS PIPING AND VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section of the Specifications includes the furnishing of all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the furnishing, installation, and testing of interior process piping systems, including piping, pipe fittings and specials, mechanical couplings, victaulic couplings, valves, flexible pipe connectors, strainers, jointing materials, pipe hangers and supports, and accessories of the various materials, sizes, classes, joints, and types, and appurtenant work, at the locations and to the general arrangements and details as indicated and/or as directed, complete in place, in accordance with the Drawings and Specifications.

B. Related Sections:

- 1. Division 1 General Requirements
- 2. Division 11 Equipment

1.2 SUBMITTALS

- A. Submit the following in accordance with the Conditions of Contract and Division 1 Specification Sections.
- B. Shop Drawings: Include materials lists, catalog cuts, and complete specifications for all piping materials including gaskets and connections. Shop drawings for all pumps, valves, valve operators, strainers, hangers and supports, wall pipes, wall sleeves, flexible connections, hydrants, nozzles, cleanouts, and other like manufactured items. Detailed piping layout drawings of all interior and exterior piping and valves including location, type, and number of proposed pipe supports. Drawings of exterior piping shall also show the relationship between the work included in this section and that included in others where in close proximity.
- C. Operation and Maintenance Manuals: Submit materials for inclusion in Operating and Maintenance Manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. The materials and equipment covered in this specification are intended to be standard materials and equipment of proven ability as manufactured by reputable concerns. Equipment shall be designed and constructed in accordance with the best practice of the industry and shall be installed in accordance with the manufacturer's recommendations and these Specifications. The Specifications call attention to certain

features but do not purport to cover all details entering into the construction of the equipment.

1.4 DESIGN CONDITIONS

A. Drawings are diagrammatic and do not attempt to show each and every offset or all fittings. All changes and adjustments to the drawing layouts as required for conformity of the work to the structures as constructed, to equipment, to approved shop drawings, or to fit work of other trades shall be as approved by the Owner, and shall be included as part of the work under this Section of the Specifications at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 PIPES

- A. Ductile Iron (DI) Pipe and Pipe Fittings. Flanged ductile iron pipe shall be classified by Underwriters Laboratories Inc., in accordance with ANSI/AWWA A21.15/C115. All interior piping shall be flanged.
 - 1. Ductile iron pipe with screwed-on flanges shall be centrifugally cast pipe conforming to ANSI Specification A-21.51 of latest editions. Flanges for flanged pipe shall conform to ANSI Specifications B16.1, latest edition, for American 125 Standard and, in addition, they shall have long hubs. After flanges have been screwed onto the pipe the face of the flange and end of the pipe shall be re-faced together in the shop and the flange shall be sealed with epoxy compound to prevent corrosion of threads from the outside. Flanges shall be faced and drilled to American 125 Standard and to match the facing and drilling of the equipment, valves, and to such other items to which they are attached. Ends of pipe connecting to flexible mechanical couplings shall be suitable for and properly prepared for making the joint with the flexible mechanical coupling. Pipe shall be lined as specified herein. All interior ductile iron pipe shall be a minimum of Class 53.
 - 2. Ductile iron pipe with mechanical grooved couplings shall be centrifugally cast pipe conforming to AWWA C606 of latest revision. The pipe shall be radius cut grooved conforming to Victaulic Company of America's specifications for rigid joints. Flexible joints may be used to design considerations, as shown on drawings or detailed elsewhere in these specifications. Installation shall be in accordance with Victaulic Company of America's recommendations. Grooving dimensions are the same for any one pipe OD regardless of pipe class and pressure. The outside surface of pipe between the groove and pipe end must be smooth and free from deep pits or swells to provide leak-tight seat for the Victaulic gasket. All rust, loose scale, oil, grease, and dirt shall be removed. Penned surfaces may require corrective action in order to provide leak-tight gasket seal.

- 3. Ductile iron or cast iron flanged joint fittings shall be of the types indicated or as required and approved, and shall conform to the requirements of ANSI Specifications A21.10, latest edition, Class 250. Flanges shall be cast integral with the pipe fittings and specials and shall be faced and drilled in accordance with ANSI Specifications B 16.1, latest edition, for American 125 Standard, and facing and drilling of all flanges shall match that of the equipment, valves, and such other items to-which they are attached. Blank flanges shall be provided as required. Flanged fittings not available under ANSI Specification 21.10 shall be provided as required and shall conform to the application ANSI Specifications B 16.1 or B 16.2. Pipe fittings and specials shall be lined as specified herein. Pipe fittings, specials, and adapters shall be of the sizes, dimensions, and types as indicated, as specified, as required for the proper fitting of the completed work, and as approved by the Owner.
- Fittings for mechanical grooved pipe shall conform to requirements of ANSI 4. Specification A-21.10 with the exception of the end preparation. The end preparation shall be radius cut grooved conforming to Victaulic, Company of America's recommendations for rigid joints. Coupling housings shall be ductile iron conforming to the requirements of ASTM Specification A-536. Sizes 3-inches through 12-inches shall be of two segments; sizes 14-inches and larger shall be four or more segments. Couplings shall be Style 31 as manufactured by Victaulic, or approved equal. Lightly coat pipe ends and all gasket surfaces with Victaulic lubricant or other non-petroleum base lubricant. Bolts and nuts shall be carbon steel heat treated and plated, conforming to ASTM Specification A-183 and A-449, minimum tensile I 10,000 psi. Bolts shall be of oval neck, track head design. Gaskets shall be of the mechanical grooved coupling design with short center leg (FlushSeal® design) to bridge pipe ends, and shall have properties as designated by ASTM Specification D-2000. Such gaskets shall be suitable for the required service. Victaulic Style 341 transition flanges shall be used for direct connection of 125 pounds cast iron flanged valves, pumps, or other equipment, directly to grooved pipe or fittings. Victaulic Style 341. Transition flanges shall be ductile iron conforming to the requirements of ASTM Specification A-536. Gaskets shall have properties as designated by ASTM Specification D-2000 and shall be suitable for the required service. Victaulic Style 307 transition couplings shall be used for transitioning between IPS steel pipe and AWWA ductile iron sized pipe. Couplings shall consist of two ASTM A536 ductile iron housings, pressure-responsive, synthetic rubber FlushSeal® gasket (grade to suit the intended service) having properties as designated by ASTM Specification D-2000, and plated steel bolts and nuts conforming to ASTM A 183 and A 449.
- 5. Cement-mortar linings: ductile iron pipe, cast iron and ductile iron pipe fittings, and specials, where indicated, shall be double thick cement-mortar-lined in accordance with ANSI Specification A 21.4. Thickness of the mortar lining shall be 1/8-inch for pipe 12-inches and smaller and 3/16-inch for pipe larger than 12-inches.

- 6. Exterior Coating: The exterior surfaces of all other pipe and fittings shall be thoroughly cleaned and given one shop coat of manufacturer's recommended primer. The coating used shall be compatible with the coats to be field applied. The shop coat shall be applied in accordance with the paint manufacturer's recommendations. Once installed, a finish coat of epoxy (5 to 7 mils) shall be applied. Final color to be selected by the Engineer.
- 7. Ductile iron pipe, cast iron or ductile iron pipe fittings, and specials shall have cast upon them the class, thickness designation, and initials of the manufacturer.
- 8. Pipe fittings with integrally cast bases shall be provided where indicated and as directed.
- 9. All flanged joints for ductile iron pipe shall be made with bolts or bolt studs with a nut on each end and SBR rubber gaskets extending at least to the inside of the bolts. SBR rubber gaskets shall conform to AWWA C111 latest revision. Bolts and nuts shall be carbon steel. Bolt studs and nuts shall be of the same quality as machine bolts. After fastening nuts to bolts or threaded rods, the threads of the bolt/rod shall extend a minimum of ½ inch outward from the face of the nut. A sample of the gaskets shall be submitted to the Engineer for approval.
- 10. Grooved joint piping systems shall be installed in accordance with the manufacturer's (Victaulic) guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for Contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

B. Stainless Steel Piping

- 1. Stainless Steel piping and tubing shall be 304L, ASTM A312/312M, seamless, annealed, pickled, and passivated, meeting the following thickness schedule:
 - a. Piping: 2-inch and less Schedule 40S.
 - b. Piping 2.5-inch to 8-inch Schedule 10S.
 - c. Tubing: Dimensions and materials shall conform to ASTM A269.
- 2. All piping 2-inches and larger shall be butt welded as per ASTM A403/A403A, Grade WP304L, conforming to ANSU B16.9 and MSS SP43, annealed, pickled, and passivated; fitting wall thickness to match adjoining pipe; long

- radius elbows unless shown otherwise. At valves and equipment all piping shall be flanged.
- 3. All piping 1 to 1-1/2-inch shall be threaded forged as per ASTM A182/A182M, Grade 304L. At valves and equipment all piping shall be threaded or flanged.
- 4. All piping 3/4-inch or smaller shall be threaded forged as per ASTM A182/A182M, Grade F304. At valves and equipment piping shall be either threaded or flanged.

5. Accessories:

- a. All flanges shall be forged, ASTM A182/A182A, Grade F304L, Class 150 or Class 300, slip on welding neck, 1/16-inch raised face, ANSI B16.5 standard.
- b. All gaskets for chemical service shall be EPDM.
- c. All bolts shall be Type 316 Grade B8M hex head bolts with Grade 8M hex head nuts for general conditions of service. In corrosive environments or applications, Type 304 stainless steel bolts Grade B8 with copper-silicon hex head nuts ASTM B98 Grade A shall be used.

C. Plastic Pipe and Fittings

- 1. Unplasticized polyvinylchloride (PVC) pipe and fittings shall be Type 1, high chemical resistance, normal impact, Schedule 80 pipe made of virgin polyvinylchloride and conforming to ASTM D 1785 latest edition.
- 2. Unplasticized polyvinylchloride (PVC) pipe and fittings shall be Type 1, high chemical resistance, normal impact, Schedule 40 pipe made of white or clear virgin polyvinylchloride and conforming to ASTM D 1784 latest edition.
- 3. Polyethylene tubing shall be clear and rated at 150 psi, 80° F.
- 4. Fittings used in chemical feed systems shall contain no Viton parts or components.
- 5. Pipe fittings shall be of the same material and shall be of the proper classification and wall thickness for use with Schedule 80 pipe, Schedule 40 pipe, or polyethylene tubing. PVC joints in piping shall be solvent weld connections. Tubing connectors/adaptors for polyethylene tubing shall be PVC. A sufficient number of unions and tubing connectors/adaptors shall be provided to allow for convenient removal of piping.
- 6. Connections to pipe of other materials, connections to equipment, and connections at such other locations, as indicated or directed, shall be made with flanges. All flanges shall be 150 pound pipe flanges and flanged connections shall be made using SBR rubber gaskets and carbon steel bolts and nuts. SBR rubber gaskets shall conform to AWWA C111 latest revision. Flanges shall be

- faced and drilled to American 125 Standard and as required to match the facing and drilling of the flanges to which they are to be connected.
- 7. Tubing Connection System: Adapters shall be supplied to connect 3/8-inch braided tubing to ½-inch PVC piping for chemical feed piping as shown on the Contract Drawings. Tubing shall be secured to the PVC pipe using a coupling nut, ferrule, o-ring, and threaded fitting. Hose clamps will not be accepted. The adapter shall be constructed of PVC. Tubing socket adapter shall be manufactured by LMI or Engineer approved equal.
- D. Braid-Reinforced Polyvinyl Chloride (PVC) Tubing
 - 1. Polyvinyl chloride clear embedded braid tubing and insert fittings shall be suitable for 150 psi service. Tubing shall be FDA-approved in accordance with CFR 21 for food packaging and NSF 61 approved. Tubing that becomes kinked during handling or installation shall not be used.
- E. Copper Piping: Copper Piping shall be of the thickness specified herein or as shown on the drawings, and shall be of the longest lengths commercially available.
 - 1. Copper pipe shall conform to ASTM B-42.
 - 2. Fittings shall be cast bronze for copper pipe and cast bronze or copper streamlined fittings for copper tubing conforming to ASTM B-30 UNS Alloy No. C83800.
 - 3. Unions shall be bronze with ground joints and shall be semi-finished.
 - 4. Joints for copper fittings shall be made with solder composed of 95 percent tin and 5 percent antimony.
 - 5. Contractor shall provide copper drain lines for air/vacuum and air release valves.

2.2 EXPANSION JOINTS

- A. Provide, where indicated on the drawings, specified or detailed, expansion joints of the single arch, rubber type for equipment and piping.
- B. Flexibility capacity (minimum), in inches or degrees,

| Nom. Dia (in) | Axial Comp. | Axial Ext. | Lateral Deflection | Torsional Deflection | Angular Deflection |
|------------------|----------------|------------|--------------------|----------------------|-----------------------|
| 1-3 | 7/16 | 1/4 | 1/2 | 3 | 13 |
| 4-6 | 7/16 | 1/4 | 1/2 | 3 | 8 |
| 8-18 | 11/16 | 3/8 | 1/2 | 2 | 3 |

- C. Provide joints of pressure ratings as follows:
 - 1. Plant water lines, water lines minimum 250 psi rating
- D. The temperature rating of the expansion joints shall be minimum 200 deg. F for water service.
- E. Expansion joints installed on solids laden lines shall be provided with filled arches. Movement capabilities of the filled arch joints shall be at least 50 percent of those hereinbefore specified for the unfilled arch joint.
- F. Construction for service other than chlorine solution
 - 1. Joint consists of arched body with steel retaining rings. Body wraps around retaining ring to act as flange face.
 - 2. Body Water Service
 - a. Inner tube: Neoprene
 - b. Reinforcement: Bonded polyester/neoprene plies, unexposed to atmosphere.
 - c. Outer cover: Hypalon coated neoprene
 - 3. Retaining rings: 304 stainless steel or hot-dipped galvanized steel, unless otherwise approved.
 - 4. The temperature rating of the joint shall be as noted above.
 - 5. Manufacturers
 - a. General Rubber Corp., S. Hackensack, NJ
 - b. Mercer Rubber Co., Toledo, OH
 - c. or Engineer approved equal

2.5 FLANGED COUPLING ADAPTERS

A. Flanged coupling adapter for jointing of plain ends of ductile iron pipe to flanges shall be of the proper size and suitable for use on the piping on which it is installed. The coupling shall be of cast ductile iron construction. Coupling shall have a bolt circle, bolt size, and spacing conforming to ANSI 150 lb. flange drilling. The coupling gasket shall be Grade 27 Buna S - NSF 61 listed and compounded to resist water. The temperature range of the gasket shall be -20°F to 180°F. Bolts and nuts shall be low alloy steel conforming to AWWA C111/ANSI A21.11. The coupling shall be provided with not less than four tie rods extending from flange connections on each side of the couplings. Follower rings shall be amply proportioned to take, without deformation, the strains imposed on the coupling by the installation. The ends of the pipes shall be prepared and the couplings installed in accordance with the printed recommendations of the manufacturer of the couplings. The Contractor shall be responsible for verifying dimensions of piping materials necessary to insure proper

fabrication, installation, and fitting of the contract work. Flange Coupling Adaptor shall be Dresser, Inc. Style 128-W with lock pins, or Engineer approved equal.

2.6 FILLER RINGS

A. Filler rings of the same materials, facing, and drilling as the flanges they are used with shall be provided in flanged piping where necessary and approved for the proper fitting and layout of the piping and to limit interference between wafer butterfly valves and ductile iron pipe lining or cast iron fittings.

2.7 TAPPED CONNECTIONS

- A. Tapped connections in pipe and fittings shall be made in such manner as to provide a water-tight joint and adequate strength against pullout. The maximum size of taps in pipe of fittings without bosses shall not exceed that listed in the appropriate table of the Appendix to the ANSI A 21.51 based on three full threads for ductile iron.
- B. Where the size of the connection exceeds that given above for the pipe in question, a boss shall be provided on the pipe barrel, the tap shall be made in the flat part of the intersection of the run and branch of tee or cross, or the connection shall be made by means of a tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, all as indicated or approved.
- C. All drilling and tapping of ductile iron pipe shall be done normal to the longitudinal axis of the pipe; fittings shall be drilled and tapped similarly, as appropriate. Drilling and tapping shall be done only by skilled mechanics. Tools shall be adapted to the work and in good condition so as to produce good, clean-cut threads of the correct size, pitch, and taper.
- D. Sample taps are to extend to the mid-point of the pipeline using injection type nozzle and corporation.
- E. Any pipe dope or tape used for tapped connections shall be PFAS free.

2.8 VALVES

A. Gate Valves. Gate valves, two inches and smaller, shall be 125-pound bronze with solid wedge, screwed-in bonnet, inside screw, non-rising stem, and screwed ends. Gate valves larger than two inches shall be resilient wedge gate valves. Resilient wedge gate valves shall meet the most recent version of the AWWA standard specification AWWA C509.

B. Swing Type Check Valves

1. Check valves shall be rubber seated dampened swing check with outside counterweight and lever and shall meet the requirements of AWWA C508. The valve shall permit flow in one direction only and close tightly without slamming. The valve shall be cast iron (ASTM A126-13) with cast iron disc of similar material. The hinge shaft shall be stainless steel with disc arm and

- counterweight arm keyed thereon. The body seat shall be all bronze or stainless steel. The valve shall be as manufactured by GA Industries, or Engineer approved equal.
- 2. The valves shall be compatible with 125-pound ANSI drilled flange. Valves shall be cleaned and shop primed on the outside with a rust inhibitive priming system.
- 3. Check valves (two inches and smaller) shall be 300-pound bronze curving design with screwed-in bonnet, re-grinding bronze disc, and screwed ends. Disc shall be suspended at the top with a stainless steel shaft. All check valves shall be horizontally mounted.

C. Bronze Ball Valves

1. Bronze ball valves shall be of bronze construction. The shaft and packing nut shall be constructed of brass and the ball shall be constructed of hard chrome plated brass. Shaft packing shall be glass reinforced PTFE. Packing shall be tightened by means of a gland bearing strip. Replacement of the packing shall be accomplished without removing the actuator. The handle shall be stainless steel with vinyl insulator. Ball shall have a straight-through passageway, and shall be of the full port design. Valves shall be rated for 150 psi service.

D. Cam-and-Grove Couplings

1. Cam-and-Groove hose couplings for stainless steel chemical fill pipes shall be provided where shown on the Contract drawings. The female coupling material shall be compatible with each chemical application and sized as specified on the Contract Drawings. The couplings shall be provided with a cap. The couplings shall be attached to the process piping with NPT threads. Contractor shall coordinate the coupling with the Owner and Engineer.

E. Plastic Valves

- 1. Polyvinylchloride (PVC) valves shall be manufactured of the same PVC Type I Grade I molding compound used for the fittings to assure proper compatibility of system components. Seats, seals, and other components shall be suitable for the intended service.
- 2. Ball valves for PVC lines shall be true union PVC valves with fully serviceable, replaceable valve component design. Valve design shall allow for entire valve body removal by turning back the union nut at both ends of the valve without disturbing the pipe. Valves shall have self-adjusting floating teflon seats, and EPDM packing. Valves shall carry a pressure rating of 150 psi at 75° F water. Valve shall be manufactured to ASTM F 1970.
- 3. Diaphragm valves for PVC lines shall be true union PVC valves. The valves shall come standard with position indicator, travel stop, and bonnet O-ring sealing arrangement. The valve shall be weir type with a hand wheel

operator, square body/bonnet sealing design, and 1/4 turn bayonet style diaphragm/compressor connection. All PTFE diaphragms shall be 3-layer style with PTFE wetted diaphragm, PVDF gas barrier and EPDM backing cushion. The PVDF gas barrier shall be between the EPDM and PTFE layers and prevent against gas migration outside of the valve. Valves shall carry a pressure rating of 150 psi at 75° F water. Valves shall be manufactured by Asahi/America Corp, or Engineer approved equal.

- 4. Air Release/Degassing Valve: An air release/degassing valve shall be installed on chemical transfer piping at the highest point prior to entering the day tank as shown on the Contract Drawings. The valve shall release any air built up in the pipe during chemical transfer and the outlet port being piped back to the day tank. The valve shall be constructed of PVC with a polypropylene float and EPDM seals. All wetted parts shall be compatible with its intended chemical application. Valves shall have a pressure rating of 100 psi. Air release/degassing valves shall be manufactured by Plast-O-Matic, or Engineer approved equal.
- 5. Ball check valves for PVC lines shall be true union with full serviceable, replaceable valve component design. Valve design shall allow for entire valve body removal by turning back the union nut at both ends of the valve without disturbing the pipe. All valve components shall be replaceable and valve shall be suitable for either horizontal or vertical installations. Valves shall have self-adjusting floating teflon seats, and EPDM packing. Valves shall carry a pressure rating of 150 psi at 75° F water. Valve shall be manufactured to ASTM F 1970.
- 6. Strainer: Strainers shall be Y-pattern type, PVC body with EPDM seals. All materials in the strainer shall be compatible for the service intended. Strainers shall be installed so as to allow for removal of screens without disconnecting piping. Strainer shall be true-union design and constructed of transparent PVC. Standard screens shall be 20 mesh PVC. Strainer shall carry a pressure rating of 150 psi at 75° F water and shall have NSF-61 Certification for use in drinking water applications. Strainer shall be manufactured by Asahi/America Corp, or Engineer approved equal.
- 7. Pressure Relief Valve: Pressure relief valve shall be installed on chemical piping as shown on the Contract Drawings. The valve shall release any pressure built up in the pipe and vent back to the day tank. The valve shall be constructed of PVC. All wetted parts shall be compatible with its intended chemical application. Valves shall have a pressure rating of 150 psi.

F. Stainless Steel Valves

1. Stainless steel ball valves shall be of Type 304 or 316 stainless steel construction, as shown on the Contract Drawings. Body shall be of rigid construction and symmetrically cast. The shaft and ball shall be integrally cast and shall be Type 304 or 316 stainless steel. Seats shall be recessed in a machined groove. Shaft packing shall be a braided band. Packing shall be

tightened by means of a gland bearing strip. Replacement of the packing shall be accomplished without removing the actuator. Ball shall have a straight-through passageway, and shall be of the full port design. Valves shall be rated for 150 psi service. For chemical service applications, valve wetted parts shall be suited for the intended service.

G. Butterfly Valves - Manual Actuator

- 1. Butterfly type valves shall be flanged cast iron, long- or short-body, resilient seat, tight closure, vertical seating valves. Valves shall conform to American Water Works Association, Specification C504, latest edition, Class 150B. The Contractor shall furnish the services of a valve manufacturer's representative who shall check all valve installations and make all necessary adjustments to assure proper and satisfactory operation of the valves. All valves shall be open right and shall have a position indicator permanently cast on the valve operator. Acceptable valve manufacturers are Pratt, DeZurik, M & H, or equal.
- 2. Valve bodies and flanges: Laying lengths for valves shall be as given in Table 1 of AWWA C504-06. Valve bodies shall be constructed of cast iron conforming to ASTM Designation: A-126, Class B, or ASTM Designation: A-48, Class 40. Cast iron waterways surfaces shall be epoxy coated. Valve body flange drilling shall conform to ANSI Specification B 16.1, Class 125 with full through drilled holes.
- 3. Valve shafts shall be made of stainless steel Type 304, in accordance with Table 3 of AWWA C504.
- 4. Valve discs shall be of cast design. Valve disc material shall be of cast iron conforming to ASTM Designation: A-48, Class 40 or A-126, Class B with all exposed cast iron surfaces coated with an approved epoxy base coating applied to a dry film thickness of not less than 12 mils.
- 5. Valve seats for all valves shall be designed to provide tight shut-off at a pressure differential of 150 psi upstream, zero psi downstream. Rubber seats shall be applied to the cast iron valve disc and clamped thereon using a retaining ring and the mating seat surface shall be Type 304 stainless steel applied to the cast iron body. Subject to the review of the Engineer, the rubber seat may be molded and bonded into the valve cavity and the disc shall be of cast iron, ASTM A-126 Class B with 316 stainless steel seating edges. Valve seats, valve seat assemblies, and materials shall be subject to the review of the Engineer.
- 6. Valve bearings shall be of the permanently self-lubricating sleeve type. Valves shall be equipped with a 2-way thrust bearing permanently set at the factory which will permit the valve to be mounted in any position. Each valve shall have a self-lubrication sleeve type bearing for the valve operator. The housing for the bearing shall be rigidly attached to the valve body. All valve bearings shall be non-metallic throughout and of approved types.

- 7. Shaft seals: All valves shall be provided with shaft seals designed for use by stuffing boxes with pull-down packing. Stuffing boxes shall be of cast iron conforming to ASTM Designation: A-126, Class B, with cast bronze gland assemblies and flax packing or may be the split v chevron type.
- 8. Manual Operators: Operators shall conform to AWWA Standard C504 and shall be designed to hold the valve in any intermediate position between full open and fully closed without creeping or fluttering. Valve operators shall be open right and of the traveling nut type, self locking without uni-directional sustained force from the valve, self lubricating, rated for operation when submerged at a water pressure of 10 psi, and shall be equipped with a position indicator. Multi-position hand-lever actuators shall be provided where indicated. The operators shall be fully enclosed and designed to produce the specified torque with a maximum pull of 80 pounds on the handwheel or chain wheels. Chainwheels shall be provided on all valve operators when the centerline of the valve is more than **four (4) feet above the finished floor** level. Operator components shall withstand an input of 300 foot-pounds at extreme operator position without damage.

H. Air Release Valve, ½- to 2-inches

- 1. Suitable for water service, automatically exhaust small amounts of entrained air that accumulates in a system. In CLOSED position, seat against resilient seat to prevent water leakage.
- 2. Rated 150 psi working pressure, cast iron or ductile iron body and cover, stainless steel float and trim, NPT threaded inlet and outlet, built and tested to AWWA C512. Contractor shall provide copper drain line for air release valves.
- 3. Manufacturers and Products:
 - a. Pipeline Air Release Valves:
 - 1) APCO Valve and Primer Corp.; 200A
 - 2) Val-Matic Valve; Model 22.4
 - 3) Or Engineer approved equal

2.9 VALVE TAGS

- A. All valves in piping except individual valves provided with equipment shall be tagged with an aluminum or brass disc, wired to the valve, and die-stamped with identifying numbers or letters.
- B. A flow diagram, identifying number and duty of each tagged valve, framed under safety glass, shall be furnished and mounted by the Contractor in the Electrical room, at major equipment, or as directed by the Engineer.

2.10 STATIC MIXER

- A. Static mixer shall be installed downstream of the sodium hypochlorite injection point in a horizontal orientation and shall be Model 8-10S-3-3-AWD as manufactured by Koflo, or approved equal.
 - 1. Housing:

a. Size: 8 inches

b. Material: ASTM A312 TP316/L Stainless Steel

c. Wall Thickness: 0.148 inches

2. Mixing Elements

a. Number: 3

b. Material: 316/L Stainless Steel

c. Type: Koflo Blade, or approved equal

d. Retention: Fixed, welded

3. Finish: Brushed/Polished

4. End Connections: AWWA C228 Class SD Ring-Type Flanged, 316/L Stainless Steel

2.11 PIPE SUPPORT SYSTEMS

- A. All supports, and parts required for the installation of the piping systems shall conform to the requirements of Chapter 1, Section 6 of the ANSI Code for Pressure Piping (B-31.1), except as modified and supplemented by the requirements set forth herein. All piping shall be supported in such a manner to fulfill this specification. Pipe supports and restraints shall be adequate for the maximum test pressure specified herein or 1.5 times the apparent working pressure, whichever is greater. General Contractor shall provide and install all pipe supports for piping, valves, equipment, and ancillary items described within Division 11.
 - 1. Supporting appurtenances shall be arranged to prevent undue stress on equipment to which piping is connected. Supporting system shall be arranged without causing damaging deflection to the support member. Supporting appurtenances shall provide the desired pitch, as specified or required, for proper drainage of the piping. The pipe suspension shall prevent excessive stress, excessive variation in supporting force, and possible resonance with imposed vibration while the system is in operation. Supporting appurtenances, when used with copper piping, shall be copper, bronze, or PVC-dipped galvanized steel.
 - 2. All piping shall be supported independent of the equipment to which it is connected. All equipment shall be removable without needing temporary supports for adjacent piping. Any anchors for all supporting appurtenances shall be drilled expansion bolt type, power driven. Stud anchors are not

- acceptable. Expansion bolts shall be stainless steel, similar and/or equal to Kwik-Bolt.
- 3. All metallic supporting appurtenances, except those used for copper piping, and as otherwise noted, shall be galvanized conforming to ASTM A-153 for threaded items, and ASTM A-123 for all other items. Supporting appurtenances in the high humidity areas shall be stainless steel. Normal humidity service shall be defined as all spaces where there are no water-containing open tanks or channels. High humidity service shall be defined as any spaces near open water-containing tanks or channels. Hangers shall not become disengaged by movements of the supported pipe. Lock nuts shall be used on all hangers. All piping systems shall be supported by hangers that can vertically adjust for the leveling of lines after piping is in place. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing. All hanger rods, except those that are stainless steel, shall conform to ASTM A-575. Hanger rod diameters shall be as recommended by pipe hanger manufacturers for the type of pipe, hanger size, and spacing used.
- 4. Piping shall be supported according to the Spacing Schedule below, and/or the MSS Standard Practice SP-69, (Manufacturers Standardization Society of the Valve and Fitting Industry), whichever spacing is closer. A support shall also be located within four inches of each side of all fittings and valves. Vertical runs of pipe shall be supported independently of the connected horizontal runs. All vertical pipes shall be supported at each floor or at intervals not greater than ten feet, by approved pipe collars, clamps, brackets, or wall rests. Hangers shall be placed on each side of a flexible coupling, as close to the coupling as possible. At expansion joints, hangers supporting the flexible couplings shall be placed on either side of the joint. Hangers shall prevent transverse movement.

SPACING SCHEDULE*, **

| PIPE SIZE (INCH) | STEEL PIPE SCH. 20-80 (FEET) | STAINLESS STEEL (FEET) | COPPER PIPING (FEET) | DUCTILE IRON PIPE (FEET) | C/PVC PIPE (FEET) |
|------------------------|------------------------------------|------------------------------|----------------------------|--------------------------------|----------------------|
| 1/2 | 5 | - | 5 | - | 3 |
| 3/4 | 6 | - | 6 | - | 3 |
| 1 | 7 | 1 | 6 | - | 3.5 |
| 1 ½ | 9 | 1 | 8 | - | 3.5 |
| 2 | 10 | 10 | 9 | 6 | 4 |
| 2 1/2 | 11 | 1 | 10 | - | 4.5 |
| 3 | 12 | - | 10 | 6.5 | 4.5 |
| 3 1/2 | 13 | - | 11 | - | - |
| 4 | 14 | 10 | 12 | 8.5 | 5 |

| PIPE SIZE (INCH) | STEEL PIPE SCH. 20-80 (FEET) | STAINLESS STEEL (FEET) | COPPER PIPING (FEET) | DUCTILE IRON PIPE (FEET) | C/PVC PIPE (FEET) |
|------------------------|------------------------------------|------------------------------|----------------------------|--------------------------------|----------------------|
| 6 | 17 | 10 | 14 | 9 | 6 |
| 8 | 19 | 10 | 14 | 10.5 | 6.5 |
| 10 | 22 | 10 | 15 | 12 | - |
| 12 | 23 | 10 | 17 | 13 | 6.5 |
| 14 | - | 10 | - | 14 | - |
| 16 | - | 10 | - | 15.5 | - |

- * Additional supports and restraints at bends shall be installed for all pump system piping as necessary to prevent deformation and movement of the pipe under maximum flows and pressures.
- ** C/PVC pipe spacing schedule based on uninsulated pipe carrying liquid having a specific gravity of 1.0 and a temperature of 120° F.
 - 5. If the pipe to be supported is not listed, then the spacing for the next smaller pipe size shall be used. There shall be a minimum of one support per pipe lay length on uninterrupted horizontal runs. This support shall be placed within one foot of the joint. If the pipe manufacturer recommends a smaller spacing interval than specified herein, then the manufacturer's spacing shall be used.
 - 6. All supports, saddles, bearing plates, and hangers shall provide by direct contact, a minimum of 80° support around the pipe, except as specified herein. Where continuous concrete inserts are used, the maximum concentrated load on the end two inches of inserts, with laying lengths of eight inches or longer, shall not be more than 50 percent of the maximum recommended channel loading.
- B. Concrete pipe saddles shall cradle horizontal piping when it is supported from below. Where space limitation prevents using concrete pipe saddles, steel pipe saddles shall be used.
- C. Base elbows, tees, and concrete pedestals shall be provided at all vertical runs of pipe and shall be supported on a base elbow and/or concrete pedestal. All concrete supports shall be formed up to the spring line of the pipe. After completion of curing, piping shall be adjusted to the proper grade.
- D. Pipe support framing system shall be designed by a qualified engineer retained by the Contractor and installed according to the design and per pipe manufacturer's recommended procedure. Pipe support and restraint system shall be designed to support the pipe's weight, pipe reaction from the flow, and lateral seismic forces stipulated in the applicable provisions of the Massachusetts State Building Code, 8th edition.
 - 1. All pipe support and restrain framing system shall be hot-dipped galvanized in conformance with ASTM A-123.

- 2. All structural steel wide flanges, channel, angles, and plate materials shall conform to ASTM A-36. All structural steel tubing shall conform to ASTM A-500 Grade B.
- 3. Steel fasteners to conform to ASTM A-307 or A-325.
- 4. Fittings shall be hot rolled steel, conforming to ASTM A-307 or ASTM A-575.
- 5. All welding shall be performed by qualified welders and in conformance with applicable provisions of the AWS.
- 6. When condition allows, metal framing system as manufactured by Uni-strut, Globe-Strut, Power Strut, or equal, may be used for supporting the piping system.

E. Restraints

- 1. All valves and fittings shall be restrained, so that all thrusts shall be supported independent of the piping system. Thrust shall not be supported by walls unless specifically designed for and indicated on Drawings. All restraints shall conform to pipe manufacturer's recommendation.
- 2. For interior piping, restraints shall be located as follows:
 - a. Anchors shall be placed so all forces will be balanced.
 - b. Tie downs shall be used to hold the pipe in position where velocity and surge forces will cause pipe movement. They shall control stress due to thermal expansion at wall pipes, sleeves, and equipment.
- F. Guides shall be used to prevent transverse motion at flexible couplings used as expansion joints.
 - 1. Tie Rods: On piping, where flexible couplings are located near fittings or valves, stainless steel tie rods shall span the coupling from the two adjacent flanges. Such restraints can be deleted at the discretion of the Engineer, if both pipe ends are anchored in a concrete structure with no fitting or valve within the span. Where the Engineer intends to have flexible couplings used as expansion couplings, tie rods may be omitted. All tie rods shall be sized, spaced, and installed according to the manufacturer's recommended procedure, or as directed by the Engineer.
 - 2. Restrained Joints: Where indicated on Drawings, restrained joints shall be installed. Restraints shall be Megalug as manufactured by Ebaa Iron Co., or approved equal. Restraints for push-on joints shall be series 800 coverall as manufactured by Ebaa Iron Co., or equal.

2.12 FLUSHING CONNECTIONS

A. Flushing connections shall be provided where indicated on the Contract Drawings. Flushing connections shall be ¾-inch female threaded hose connection with ¾-inch

isolation ball valve. Flushing connection shall be compatible with the intended service.

2.13 QUICK DISCONNECT ADAPTERS

- A. The rinsewater discharge line shall have a quick disconnect adapter installed on the exterior wall of the building as shown on the Drawings. This connector shall be a 6" Quick Disconnect Adaptors with cap constructed of aluminum as manufactured by Dover Corp. as Kamlock connectors or equal.
- B. Two (2) 20-foot lengths of hose with necessary Kamlock fittings shall be furnished for the Owner's use. Contractor shall provide hooks or other satisfactory means for securing individual sections of hose to inside wall of the treatment facility.

PART 3 - EXECUTION

3.1 GENERAL

- A. Handling of Pipe. The loading, hauling, unloading, and handling of pipes and appurtenances shall be accomplished without damage to same. Dropping of pipe and appurtenances directly to the ground or floor will not be permitted. Suitable buffers or runners shall be provided. The Contractor shall be liable for any damage to the pipe or appurtenances until they are accepted in the completed work. Each pipe section shall be handled into its final position only in such a manner and by such means as the Engineer approves as satisfactory, and these operations will be restricted to those considered safe for the workmen and such as to cause no injury to the pipe or to any property. As far as practicable, the Contractor shall be required to furnish slings, straps, and/or approved devices to provide satisfactory support of the pipe when it is handled.
- B. Tools for Pipe Installation. The Contractor shall furnish all tools, torque wrenches, materials, and labor necessary to make the joints in pipe in strict accordance with the manufacturer's specifications. Proper and suitable tools and appliances for the safe and convenient handling and installation of pipes shall be used. The Contractor shall exercise reasonable precaution during his operation in order to avoid damaging the material. All pipes, fittings, or appurtenances which are so damaged shall be replaced by him at his sole expense.
- C. Installation. All materials and equipment shall be installed in a neat, workmanlike manner, and as recommended by the manufacturer. All piping shall be installed true to line and grade and rigidly supported. Before setting wall sleeves and pipes to be cast-in-place, the Contractor shall check all plans and figures which may have a direct bearing on his pipe location and he shall be responsible for the proper location of his pipes during the construction of the buildings. All interior piping shall have sufficient number of unions or their equivalent to allow convenient disassembly and removal of piping. All valves and appurtenances shall be installed in accordance with manufacturer's directions at locations shown on the drawings. All in-line devices provided under instrumentation shall be installed as part of the work of this section.

- D. Cleaning and Plugging Pipe. The pipes and fittings shall be thoroughly cleaned before being installed and shall be kept clean until accepted in the finished work. The ends of all uncompleted lines shall be tightly closed with temporary plugs at all times when pipe installation is not in progress to prevent foreign material from entering the pipe.
- E. Screwed Connections. All threads shall be clean, machine cut, and all pipe shall be reamed before erection. Screwed joints shall be made up with good quality thread compound (PFAS free) applied to the male thread only. After having been set up, a joint must not be backed off unless the joint is completely broken, in which case the threads shall be cleaned and new compound applied. Teflon tape or teflon compound shall be PFAS free and may be used for steel, polyvinyl chloride, chlorinated polyvinyl chloride, and copper threaded connections.
- F. Arrangements. Except as otherwise required, changes in direction shall be made using proper fittings, and unless shown otherwise piping shall run parallel and at right angles to walls and floors. Systems shall be arranged with low points and drains to permit complete drainage of the system. Control piping may be arranged with unions or union connections at low points to permit draining. Unions or flanges shall be provided close to main pieces of equipment and in branch lines to permit ready dismantling of piping without disturbing main pipelines or adjacent branch lines.
- G. Penetrations. All penetrations in walls, floors, and ceilings shall be sealed watertight to the satisfaction of the Engineer.
- H. Prior to installation, protect stored valves and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.
- I. Clean all debris, dirt, gravel, etc, from inside of piping before placing valves in place.
- J. Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material. Clean out debris and foreign material from valve openings and seats, test operating mechanisms to check proper functioning, and check nuts and bolts for tightness. Repair valves and other equipment which do not operate easily or are otherwise defective.
- K. Set plumb and support valves adequately in conformance with instructions of manufacturer. Shim valves mounted on face of concrete vertically and grout in place. Install valves in control piping for easy access.
- L. Provide sleeve type coupling or flexible type grooved coupling on downstream side of buried valves to assist in valve removal.
- M. Provide valves with extension stems where required for convenience of operation. Provide extension stems for valves installed underground and elsewhere so that operating wrench does not exceed 6 feet in length.

- N. Provide chain wheel operators on all valves 2-inches and larger where handwheel or lever **exceeds 4 feet above floor** or operating platform. Provide geared operator where required to position chainwheel in vertical position.
- O. Chain of chain operators to extend within 3 feet of operating floor. Provide two S-shaped hooks for each chain to enable chain to be hooked away from personnel traffic.

3.2 PLASTIC PIPING (PVC)

- A. The installation of plastic pipe for pressure service shall be strictly in accordance with the manufacturer's technical data, printed instructions, and as follows:
- B. General. The solvent welding procedure detailed herein applies to all Polyvinyl Chloride (PVC) pressure piping systems including molded fittings and socket type pump and valve connections.
- C. Cement. Shall be a grade specifically recommended by the piping manufacturer for the size and schedule of pipe specified.
- D. Pipe Preparation.
 - 1. Cutting. Pipe shall be cut in accordance with the recommendations of the pipe manufacturer.
 - 2. Deburring and Beveling. All burrs, chips, filings, and the like shall be removed from both the pipe inside diameter and outside diameter before joining. All pipe ends shall be beveled approximately 1/16-inch to 3/32-inch back from the edge at an angle of 10 to 15 degrees.
- E. Fitting Preparation. Prior to solvent welding, all fittings and couplings shall be removed from their cartons and exposed for at least one hour to the same temperature conditions as the pipe in order to assure that they are thermally balanced before joining.
- F. Cleaning. Pipe and fittings shall be clean of all loose dirt and moisture from the inside diameter and outside diameter of the pipe end and the inside diameter of the fitting. DO NOT ATTEMPT TO SOLVENT WELD WET SURFACES.
- G. Priming. Apply primer to the pipe approximately one-half (1/2) of the pipe diameter and in accordance with the manufacturer's recommendations. Apply primer freely in the socket keeping surface wet and applicator wet and in motion 5 to 15 seconds. Avoid puddling in socket. For checking penetration, you should be able to scratch or scrape a few thousandths of the primed surfaces away. Repeated applications to either or both surfaces may be necessary. Weather conditions do affect priming action. In cold weather more time is required for proper penetration.

- H. Solvent Cement Application. Solvent cement application shall be in accordance with the manufacturer's recommendation with a minimum of two coats. All excess cement shall be cleaned from the surfaces of the pipe and fittings.
- I. Joining. Joining of PVC pipe and fitting shall be in accordance with the manufacturer's recommendations and only at the below solvent welding joining temperatures and joint drying times:
 - 1. THE ACTUAL JOINING SHOULD NOT BE DONE IN ATMOSPHERIC TEMPERATURES BELOW 40° F OR ABOVE 90° F, OR WHEN EXPOSED TO DIRECT SUNLIGHT.
 - 2. NOT LESS THAN 48 HOURS OF JOINT DRYING TIME SHALL ELAPSE FOR ALL SIZES OF PIPE AND DRYING TEMPERATURES BEFORE THE JOINT IS MOVED OR SUBJECTED TO ANY APPRECIABLE INTERNAL OR EXTERNAL PRESSURE.

Note: Joints for plastic pipe shall be solvent welded except flanged or screwed where required. For plastic to steel, cast iron pipe, or ductile iron pipe connections, complete metal pipe assembly first. Use flanged connections and tighten bolts evenly to prevent warping of rigid plastic pipe. A torque wrench may be used for a tight seal on gasket. Joints shall conform to manufacturer's recommendations for installation of valves and fittings and shall be strictly in accordance with manufacturer's instructions. In making solvent weld connections, the solvent should not be spilled on valves or allowed to run from joints. All completed pipe lines shall remain undisturbed for 48 hours to develop complete strength at all joints.

3.3 STAINLESS STEEL PIPING

A. Cleaning: For items cleaned prior to shipment to the construction site, they shall be properly packaged and stored to protect from contamination. Precleaned items shall be provided a final cleaning/purge with all piping and appurtenances installed.

B. Welding

- 1. Perform in accordance with Section IX, ASME Boiler and Pressure Vessel Code, and ASME A: B31.1 for Pressure Piping, and if recommended by piping or fitting manufacturer.
- 2. Weld Identification: Mark each weld with symbol identifying welder.
- 3. Pipe End Preparation:
 - a. Machine Shaping: Preferred.
 - b. Oxygen or Arc Cutting: Smooth to touch, true, and slag removal by chipping or grinding.
 - c. Beveled Ends for Butt Welding: ASME B16.25.

4. Surfaces:

- a. Clean and free of paint, oil, rust, scale, slag, or other material detrimental to welding.
- b. Clean stainless steel joints with stainless steel wire brushes or stainless steel wool prior to welding.
- c. Thoroughly clean each layer of deposited weld metal, including final pass, prior to deposition of each additional layer of weld metal with a power-driven wire brush.

5. Alignment and Spacing:

- a. Align ends to be joined within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness.
- b. Root Opening of Joint: As stated in qualified welding procedure.
- c. Minimum Spacing of Circumferential Butt Welds: Minimum four times pipe wall thickness or 1 inch, whichever is greater.

6. Climatic Conditions:

- a. Do not perform welding if there is impingement of any rain, snow, sleet, or high wind on the weld area, or if the ambient temperature is below 32° F.
- b. Stainless Steel and Alloy Piping: If the ambient temperature is less than 32° F, local preheating to a temperature warm to the hand is required.
- 7. Tack Welds: Performed by qualified welder using same procedure as for completed weld, made with electrode similar or equivalent to electrode to be used for first weld pass, and not defective. Remove those not meeting requirements prior to commencing welding procedures.
- 8. Surface Defects: Chip or grind out those affecting soundness of weld.
- 9. Weld Passes: As required in welding procedure.
- 10. Weld Quality: Free of cracks, incomplete penetration, weld undercutting, excessive weld reinforcement, porosity slag inclusions, and other defects in excess of limits shown in applicable piping code.

3.4 TESTING OF PROCESS PIPING AND VALVES

A. General. All piping and piping systems shall be leak tested by the Contractor in the presence of the Engineer. The Contractor shall provide typed and witnessed test reports for all such tests. All piping and piping systems not complying with the leak test shall be repaired or replaced by the Contractor to the satisfaction of the Engineer and be re-tested all at no additional cost to the Owner.

- 1. After the pipelines have been completed and all supports and restraints have been installed, the Contractor shall perform all pressure tests. The Contractor shall be responsible for furnishing all labor, materials, and equipment so that such tests can be accomplished at the time locations necessary.
- 2. All lines shall be hydrostatically tested for a period of two consecutive hours. The test pressure shall be that of the pipe design pressure or 1.5 times the apparent working pressure, whichever is the greater. The piping and piping system shall withstand the test pressure with a maximum loss of ten percent of the test pressure.
- 3. Piping, valves, and those items contacting process water shall be disinfected as specified under AWWA Standards C651 Disinfecting Water Mains, latest version. Refer to Section 02615 Ductile-Iron Pipe and Fittings.

3.5 VALVE FIELD TESTING

- A. All valves tested in conjunction with hydrostatic testing of the respective piping.
- B. Test all valves' smoothness of operation after installation, and make any necessary adjustments, repairs or replacements.

3.6 SHOP PAINTING

- A. Both the inside and outside surfaces of all ferrous materials, equipment, and devices shall be thoroughly cleaned at the shop.
- B. All ferrous parts/components, except machine surfaces and others obviously not to be painted, and as otherwise specified hereinbefore (including referenced AWWA Standards), shall be furnished with primer coats of rust inhibitive primer compatible as specified in Division 9 Finishes. Where applicable, surface preparation and primer coating shall be as specified in Division 9 Finishes. All machined surfaces subject to corrosion shall be coated with a rust preventer/inhibitor prior to shipment. Contractor shall follow Manufacturer's recommendations for preventing corrosion prior to installation and operation.

3.7 PAINTING

A. As specified in Division 9.

3.8 PIPING IDENTIFICATION

A. All other piping shall be stenciled as specified in Division 9.

3.9 FIELD QUALITY CONTROL FOR WELDING

- A. Minimum Duties of Welding Inspector:
 - 1. Job material verification and storage.

- 2. Qualification of welders.
- 3. Certify conformance with approved welding procedures.
- 4. Maintenance of records and preparation of reports in a timely manner.
- 5. Notification to Engineer of unsatisfactory weld performance within 24 hours of weld test failure.

B. Required Weld Examinations:

- 1. Perform examinations in accordance with Piping Code ASME B31.1.
- 2. Perform examinations for every pipe thickness and for each welding procedure, progressively, for all piping covered by this section.
- 3. Examine at least one of each type and position of weld made by each welder or welding operator.
- 4. For each weld found to be defective under the acceptance standards or limitations on imperfections contained in the applicable Piping Code, examine two additional welds made by the same welder that produced the defective weld. Such additional examinations are in addition to the minimum required above. Examine, progressively, two additional welds for each tracer examination found to be unsatisfactory.

END OF SECTION 11200

