SECTION 13200

GUM SPRINGS RESERVOIR NO. 1 REHABILITATION

PART 1 -- GENERAL

1.1. REFERENCES

A. American Water Works Association (AWWA) Standard

1. D100-21, Standard for Welded Steel Tanks for Water Storage

2. C151/A21.51-91, ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

B. American Welding Society (AWS)

1. Publication D1.1, Structural Welding Code, Steel

C. American Petroleum Institute (API)

1. API Standard 650, Welded Tanks for Oil Storage, Twelfth Edition, Includes Errata 1 (2013), Errata 2 (2014), and Addendum 1 (2014) and Addendum 2 (2016)

2. API Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction, Fifth Edition (2014)

D. American Society for Testing and Materials (ASTM)

1. A 36, Structural Steel

2. A 53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

3. A 325, Type 3, High-strength Bolts for Structural Steel Joints

4. A 516, Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service

5. A 537, Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel

6. A 563, Type C3 and DH3, Carbon and Alloy Steel Nuts

7. A 573, Structural Carbon Steel Plates of Improved Toughness

8. A 580, Stainless and Heat-Resisting Steel Wire

9. A 588, High-Strength Low-Alloy Structural Steel With 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick

10. A 633, Normalized High-Strength Low-Alloy Structural Steel

11. A 662, Pressure Vessel Plates, Carbon-Manganese, for Moderate- and Lower-Temperature Service

12. A 678, Quenched and Tempered Carbon Steel Plates for Structural Applications

13. F 436, Hardened Steel Washers

14. F 593, Stainless Steel Bolts, Hex Cap Screws, & Studs

15. F 594, Stainless Steel Nuts

E. American Society of Civil Engineers (ASCE)

1. ANSI/ASCE 7-16, Minimum Design Loads for Buildings and Other Structures

F. American National Standards Institute (ANSI)

1. Standard A14.3, Safety Code for Fixed Ladders

G. Occupational Safety and Health Administration (OSHA)

1. Regulation 1910.23, Ladders

2. Regulation 1910.28, Duty to have fall protection and falling object protection

3. Regulation 1910.29, Fall protection systems and falling object protection-criteria and practices

4. Regulation 1926.1053, Ladders

H. International Conference of Building Officials (ICBO)

1. International Building Code (IBC)

I. AMPP, The Association for Materials Protection and Performance (formerly SSPC, The Society for Protective Coatings and NACE, National Association of Corrosion Engineers)

1. Standard SP0178-2007-SG – Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service

2. Visual Comparator - Surface Finishing of Welds (Complements NACE Standard SP0178)

1.2. PROJECT CONDITIONS

A. Submittals: Submittals shall be submitted for review prior to performing any Work in accordance with Section 01300 - Submittals.

B. Air Sampling and Soil Sampling: See Section 01130 - Standards and Regulations

C. Repair Standards: See Section 01130 - Standards and Regulations.

D. Painting Standards: See Section 01060 - Standards and Regulations.

E. Welder's Certification: All welders and welding operators shall be certified to the procedures and processes required to accomplish the Work. Welder's certification papers shall be furnished to the ENGINEER for review prior to the commencement of welding on the tank. See Section 01130 - Standards and Regulations paragraph 1.1.H.

PART 2 -- PRODUCTS

2.1. MATERIALS:

A. All structural steel components shall be fabricated from new ASTM A 36 material.

B. All new steel pipe attached to the tank shall be ASTM A 53.

C. All steel plates, shapes, and bars shall be fabricated from new ASTM A 36 material if the tank is designed in accordance with AWWA D100-21. All steel plates, shapes, and bars shall be fabricated from new ASTM A 36, A 442, A 516, A 537, A 573, A 588, A 633, A 662, or A 678 material if the tank is designed in accordance with Section 14 of the AWWA D100-21. All steel plates and shapes shall be free from any laminations which bring questions as to the structural integrity of the member. Laminations exposed on the surface or edges of the steel shall be repaired or the member replaced. The CONTRACTOR shall be responsible for ultrasonically or otherwise investigating the extent of sub-surface laminations to the satisfaction of the ENGINEER. Members found to have internal laminations shall be replaced in a timely manner at the expense of the CONTRACTOR.

D. All stainless steel bolts and nuts shall conform to ASTM F 593 and F 594.

E. All bolts used for the roof structure shall be coated with Inorganic Coatings IC 531 high ratio inorganic zinc coating.

F. All aluminum used in the aluminum clog-resistant vent shall be fabricated from the following materials:

1. Structural Shapes: All aluminum structural shapes of the vent shall be alloy 6061-T6.

2. Plates and Sheets: All aluminum plates and sheets shall be mill finished alloy 3003-H16, 3004, 6061-T6 or 5052-H32 and shall a minimum nominal thickness of 0.050 in.

3. Bolts and Fasteners: All bolts and fasteners shall be Series 304 stainless steel, 2024-T4 aluminum, or anodized 7075-T73 aluminum. Only stainless steel fasteners shall be used to attach aluminum to steel.

PART 3 -- EXECUTION

3.1. REPAIRS AND ADDITIONS

A. Construction Drawing Submittals: Construction Drawings (or other information) of all fabricated and new items shall be submitted to the ENGINEER for review in accordance with Section 01300 - Submittals. Drawings submitted shall at a minimum include the following:

1. Details of the roof rafter brackets if different from that shown in Drawing RB.

2. Details of the nameplate mounting bracket if different from that shown in Drawing NP.

3. Details of the 36 in. diameter shell manholes and davits if different from that shown in Drawings SM1 and SM2.

4. Details of the new overflow pipe, weir box, and air break if different from that shown in Drawings OFP and OFW.

5. Details of the new ladder if different from that shown in Drawings LR, SR1, and SR2.

6. Catalog cuts, installation, operation and maintenance instructions for the new ladder safe-climbing device.

7. Details of the ladder vandal deterrent if different from that shown in Drawing LV.

8. Details of the platform and safety railing if different from that shown in Drawings SR1 through SR3.

9. Details of the new 30 in. square roof manhole if different from that shown in Drawing RM.

10. Details of the safety railings adjacent to the secondary roof manhole and flanged opening above the overflow weir box if different from that shown in Drawing SR4.

11. Details of the new aluminum roof vents and steel exhaust fan flanges if different from that shown in Drawing CRV, Sheets 1-4.

B. Man-Hours: For unit price work paid for per single man-hour, only time worked performing the specified action, i.e. welding or grinding, and only the time of the person performing the specified action shall be recorded as man-hours to be paid under the unit price item. Costs for all equipment, supplies, normal rigging and associated time required, supervision, Competent Person, overhead, insurance, and profit shall be included in the Base Bid or distributed within the unit price Bid Item to be based upon man-hours used in actual performance of the specified action.

C. Initial Abrasive Blast Cleaning for Evaluation of Pitting: All areas of apparent pitting shall be initially abrasive blast cleaned for evaluation of pitting by the ENGINEER. The cost of this initial abrasive blast cleaning shall be included in the **Base Bid**.

D. Initial Abrasive Blast Cleaning for Evaluation of Metal Loss Above Rafters: The roof plate shall be wedged to provide minimum 3 in. gap for access at the inner ends of the 26 rafters spaced around the center hub, and the rafter flange and roof plate shall be abrasive blast cleaned along the inner 15 ft of these 26 rafters for evaluation of metal loss. The roof plate shall be wedged to provide minimum 3 in. gap for access at the outer ends of 10 of the 52 rafters spaced around the perimeter, and the rafter flange and roof plate shall be abrasive blast cleaned along the outer 15 ft of these 10 rafters for evaluation of metal loss. The cost of this initial abrasive blast cleaning shall be included in the **Base Bid**.

E. Repair Welding: After the initial abrasive blast cleaning, any pits defined for pit welding by the ENGINEER shall be repaired by welding. All areas of apparent seam deterioration shall be initially abrasive blast cleaned, and any seam corrosion or undercut defined by the ENGINEER shall be repaired by arc-gouging or grinding the deteriorated weld seam (if determined necessary by the ENGINEER) and welding. **The number of man-hours of repair welding shall be paid for by the unit price per man-hour listed in Contract Item 2**.

F. Pit Filling and Surfacing: After the specified surface preparation, any pits, rough areas or seams defined for pit filling or surfacing by the FIELD OBSERVER shall be filled with solventless polyamide epoxy seam sealer of the type recommended by the supplier of the interior paint system. The epoxy seam sealer shall be applied neatly and smoothly to the steel surfaces and any rough areas of the seam sealer shall be sanded smooth prior to the application of the coating system. Costs for all labor, equipment, supplies, rigging, and other associated costs for application of the solventless polyamide epoxy seam sealer shall be included in the unit price per gallon. **The number of gallons of pit filling shall be paid for by the unit price per gallon listed in Contract Item 3**.

G. Interior Chipping and/or Grinding: Any irregular surfaces defined by the FIELD OBSERVER, including but not limited to surface protrusions, burrs, fitting scars, sharp edges or corners, weld spatter, weld overlap and rough weld beads shall be removed from all interior surfaces of the tank, including appurtenances, by chipping and/or grinding these irregular surfaces to a smooth curve. The protruding parts of lugs or brackets shall be removed and ground flush. The objective of chipping and/or grinding is to eliminate irregular surfaces to provide a surface that is sufficiently smooth for the application of a uniform thickness coating without voids and free from defects. This chipping and/or grinding is also intended to make it easier for the interior coating to pass the holiday test.

The number of chipping and/or grinding man-hours on the tank interior shall be paid for by the unit price per man-hour listed in Contract Item 4.

H. Roof Patch Plates: After the initial abrasive blast cleaning, any length of holes or metal loss in the roof plates defined for patch plating by the FIELD OBSERVER shall be repaired by removal of the area of metal loss and covering the area with a 1/4 in. thick welded steel patch plate. Any areas of extensive metal loss or holes identified by the CONTRACTOR and agreed to by the FIELD OBSERVER shall be cut out and the edges of the hole shall be ground smooth prior to installation of the patch plate. No patch plate shall be smaller than 6 in. in diameter. Edges of the patch plate shall lap no less than 2 in. from the edge of a hole. Corners on the patch plate shall be rounded to 2 in. radius minimum or the plates shall be circular. All exposed edges of the patch plates shall be ground to 1/16 in. radius minimum. The plates shall be installed in accordance with API 653. Patch plates shall be a minimum of 3 in. from existing weld seams, or if an existing weld seam must be overlapped the patch plate shall be rectangular with radiused corners and extend a minimum of 6 in. beyond the existing weld seam. The patch plate shall be welded to the roof plate on the exterior only with continuous fillet welds all around. All welds shall be multi-pass welds. Note the tank steel is likely to be thin in the areas of the patch plates, and as such attachment welds and the weld procedures (e.g., electrode size and heat input) should account for this likelihood. **The cost of removal of roof plate section of metal loss, grinding of hole edges, and furnishing and installing patch plate, including material cost, and welding shall be paid for by the unit price per linear foot of patch plate listed in Contract Item 5. The linear foot unit price shall be based on an 8 in. wide area of roof plate removed and a 12 in. wide patch plate installed to cover the area.**

I. Roof Structure Bolts: After the initial abrasive blast cleaning of the interior, the CONTRACTOR shall replace any bolts and nuts, defined for replacement by the FIELD OBSERVER, in kind. The bolts are approximately 3/4 in. diameter. The size of the bolts shall be verified by the CONTRACTOR in the field prior to ordering. Washers shall be provided on each side of the bolt. **The cost for replacing a bolt and the associated nut and washers shall be paid for by the unit price per bolt listed in Contract Item 6**.

J. Rafter Bracing Replacement: After the initial abrasive blast cleaning of the interior, the roof rafter braces shall be evaluated, and those rafter braces which are deteriorated or bowed as defined by the OWNER and ENGINEER shall be replaced in kind. The existing rafter braces are approximately 4 in. x 2 in., channels. CONTRACTOR shall verify size prior to ordering. **The rafter braces shall be abrasive blast cleaned to SSPC-SP10 and primed prior to installation and shall then be coated in accordance with the interior coating specifications.** The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised. **The cost for roof rafter bracing replacement shall be paid for by the unit price per rafter brace listed in Contract Item 7**.

K. Main Roof Rafter Replacement: After the initial abrasive blast cleaning of the interior, the main roof rafters that extend from the center hub to the shell shall be evaluated, and those rafters which are deteriorated or bowed as defined by the OWNER and ENGINEER shall be replaced in kind. The existing inner rafters are approximately 14 in. x 6-3/4 in., I-beams. CONTRACTOR shall verify size prior to ordering. **The rafters**

shall be abrasive blast cleaned to SSPC-SP10 and primed prior to installation and shall then be coated in accordance with the interior coating specifications. The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised. **The cost for main roof rafter replacement shall be paid for by the unit price per rafter listed in Contract Item 8**.

L. Outer Roof Rafter Replacement: After the initial abrasive blast cleaning of the interior, the outer roof rafters that extend from the circumferential girder to the shell shall be evaluated, and those rafters which are deteriorated or bowed as defined by the OWNER and ENGINEER shall be replaced in kind. The existing outer rafters are approximately 10 in. x 4 in., I-beams. CONTRACTOR shall verify size prior to ordering. **The rafters shall be abrasive blast cleaned to SSPC-SP10 and primed prior to installation and shall then be coated in accordance with the interior coating specifications.** The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised. **The cost for outer roof rafter replacement shall be paid for by the unit price per rafter listed in Contract Item 9**.

M. Center Hub Braces Replacement: After the initial abrasive blast cleaning of the interior, the CONTRACTOR shall temporarily support the center hub, the center hub braces shall be evaluated, and those center hub braces which are deteriorated as defined by the OWNER and ENGINEER shall be replaced in kind. The existing twelve (12) center hub braces are approximately 2-1/2 in. x 2-1/2 in. x 1/4 in., angles. CONTRACTOR shall verify size prior to ordering. **The center hub braces shall be abrasive blast cleaned to SSPC-SP10 and primed prior to installation and shall then be coated in accordance with the interior coating specifications.** The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised. **The cost for center hub bracing replacement shall be paid for by the unit price per brace listed in Contract Item 10**.

N. Legal Disposal of Removed Steel or Appurtenances: Any existing steel plate, members, or appurtenances of the tank and/or tower specified to be removed or replaced shall be removed and legally disposed of by the CONTRACTOR. Any steel plate, members, or appurtenances that are coated with a lead-based coating shall not be disposed of, but shall be recycled. Documentation demonstrating that the material was properly recycled shall be provided to the Owner.

O. Temporary Construction Openings (Door Sheet): If the CONTRACTOR desires to cut a temporary opening through the permanent structure (including the roof) for equipment and personnel access, the CONTRACTOR shall submit the following information for review by the OWNER and ENGINEER **prior** to cutting or welding on the shell. If the submittal is favorably reviewed by the OWNER and ENGINEER, the CONTRACTOR shall remove and replace the shell plate in accordance with American Petroleum Institute (API) Standard 653, API Standard 650, and AWWA D100. All required temporary stiffening shall be installed by the CONTRACTOR prior to cutting the temporary shell opening. The CONTRACTOR shall remove the temporary stiffening after the door sheet is welded back in place and repair any surface imperfections prior to coating those areas of the tank surfaces. **The details of the opening and temporary stiffening shall be designed, stamped, and signed by a Professional Engineer registered in the Commonwealth of Virginia.** The CONTRACTOR shall submit for review the

following minimum information prior to performing any cutting or welding on the shell or pressure boundary and shall comply with following:

1. Unsightly dents, buckles, distortions, or localized flat spots in the tank shell after re-installation of the door plate as identified by the OWNER will not be accepted. The CONTRACTOR shall submit, to OWNER and ENGINEER for review, a detailed procedure for devising and utilizing necessary means and methods to produce closure of the temporary opening such that it meets these requirements.

2. Allowable shape tolerances for the completed door sheet after re-installation shall be 50% of that specified in AWWA D100 in sections 10.6.5 and 10.6.6.

3. The location of the temporary opening shall be subject to approval of the OWNER.

4. If the tank was originally designed and constructed to AWWA D100, Section 14, all welding, material requirements, modifications made to the tank, and testing shall conform to Section 14 of the current edition of AWWA D100.

5. A detailed drawing showing the size and configuration of the proposed opening, including details at the intersections with the existing weld seams, corners of the opening, and cut back of corner welds or girth seams.

6. Details of the location of the proposed opening relative to existing shell openings or penetrations, weld seams, or other attachments to the shell, such as anchor bolts chairs (if any).

7. A detail drawing of the proposed temporary stiffening along each side and across the top of the opening, including the weld details.

8. The proposed method (i.e. plasma arc, saw, flame cut, carbon arc-gouge, etc.) and sequence for cutting the opening in the shell and making cut backs. The corner weld between the shell and the bottom shall be gouged on each side at least 12 in. beyond the opening.

9. Details of the weld joint preparation for the shell and door sheet, including process for grinding and beveling (how the bevel will be made).

10. Description of weld procedures of all joints and attachment welds, including any preheating or post weld heat treating requirements, rod size, etc.

11. Description of weld sequence for reinstalling the door sheet.

12. Inspection of the welding of the door sheet installation shall conform to AWWA D100, including Section 14 if the tank was originally designed in accordance with Section 14, API 650, and API 653.

13. Details of the proposed non-destructive examination (NDE) plan with the number and location of x-rays, magnetic particle testing, visual testing, dye penetrant testing, etc. Note: For purposes of determining the extent of radiographic testing,

radiused corners shall be considered as intersections between vertical and horizontal welds or shall be identified as 'corners', as applicable.

14. Welder credentials and certifications.

15. Welding procedure qualification records.

P. Roof Rafter Brackets: New brackets for the rafter end connections to the shell shall be furnished and installed as shown on Drawing RB. The flat bar clips shall be welded to the rafters and to the shell with continuous fillet welds all around. The existing angle clips on the shell shall be completely removed and any remains ground flush. The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised. The replacement of all fifty-two (52) rafter brackets on the shell shall be included in the **Base Bid**.

Q. Seal Welding Column Members: The intermittently welded seams of the column constructed of I-beams located inside the tank shall be seal welded with continuous fillet welds all around.

R. Concrete Repair: Any chipped concrete corners (greater than 1 in. loss), cracks (greater than 1/16 in. wide), and other failed areas of concrete indicated by the ENGINEER shall be chipped to sound concrete so that the edge of the chipped-out area is at least 60° with the surface of the concrete. Then these areas shall be prepared by cleaning to remove all paint, coating materials, dust, laitance, grease, or other bond-inhibiting materials. The CONTRACTOR shall apply a patch of Emaco R350 from Master Builders, Euco Verticote from Euclid Chemical Company, SikaRepair 223 from Sika Corporation, or equal allowed in writing by the ENGINEER. The materials shall be prepared and applied in accordance with the manufacturer's instructions. The patched areas shall conform to the original contour of the concrete foundation $\pm$ 1/8 in. After the patching material has hardened sufficiently for the removal of any forms, etc., a water-based curing compound shall be applied to the surfaces of the repaired area. The curing compound shall be a water-based material such as Kure-N-Seal W, Aqua-Cure from Euclid Chemical Company, or equal allowed in writing by the ENGINEER. This concrete repair shall be performed a minimum of 28 days prior to the cleaning and painting of the concrete to allow the concrete patching material to cure in accordance with the manufacturer's recommendations. After repair and cure, concrete shall be cleaned and painted in accordance with Section 09880 - Concrete Coating of these specifications.

S. Fiberboard Repair: Any damaged portions of the existing fiberboard shall be removed. Any voids or missing portions of the fiberboard shall be filled with a new 1/2 in. thick fiberboard material. The fiberboard shall be trimmed back a minimum of 1/4 in. from the edge of the bottom plate projection to provide a recessed joint for the application of sealant material.

T. Sealant Along Bottom Plate-to-Concrete Interface: The existing sealant along the bottom plate shall be removed. After curing of the exterior coatings, the bottom plate-to- concrete intersection shall be filled with a 3/8 in. (or the gap width if it is larger than 3/8 in.) 45° fillet of Sikaflex-1a from Sika Corporation, or equal allowed in writing by the ENGINEER, applied in a workmanlike manner.

U. Nameplate: The nameplate shall be removed by carefully grinding off the rivets. The existing bracket for the nameplate shall be removed, and any remains shall be ground flush. A new mounting bracket shall be furnished and installed on the tank exterior by welding with continuous fillet welds as shown in Drawing NP. The location of the new nameplate mounting bracket shall be the same as the original location of the tank nameplate. The area behind the nameplate and the new mounting bracket shall be cleaned and painted in accordance with the exterior painting section of these specifications. Any paint on the nameplate shall be removed by solvent cleaning or other methods which will not damage the surface of the nameplate. The nameplate shall be bolted to the mounting bracket with stainless steel stove bolts and nuts. The nameplate shall be protected from the application of paint on the exposed surface.

V. Two New 36 in. Diameter Shell Manholes: The CONTRACTOR shall furnish and install two (2) new 36 in. diameter shell manholes in compliance with AWWA D100-21 and Drawing SM1 with one manhole in place of the existing 18 in. x 24 in. double-crab shell manhole and one manhole at approximately 180° from the existing 42 in. diameter shell manhole which is to remain. Each manhole cover shall be supported by a davit in accordance with Drawing SM2. The locations of the new manholes shall be as directed by the OWNER and ENGINEER. The CONTRACTOR shall have each manhole reinforcing plate air leak tested at 15 psig maximum in accordance with API Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction, Fifth Edition (2014) and API Standard 650, Welded Tanks for Oil Storage, Twelfth Edition, Includes Errata 1 (2013), Errata 2 (2014), and Addendum 1 (2014) and Addendum 2 (2016). This testing shall be performed in the presence of the ENGINEER. The cost of this testing shall be included in the Base Bid. After the pressure test the tell tale holes shall be tapped and plugged with brass plugs.

W. New 16 in. Diameter Overflow Pipe and Weir Box: CONTRACTOR shall remove the existing 16 in. diameter overflow pipe from the interior and exterior of the tank, and shall furnish and install a new 16 in. diameter overflow pipe on the tank exterior. The existing pipe, brackets, and accessories shall be completely removed and remains ground flush. The existing overflow pipe and associated reinforcing plate shall be removed from the top shell ring, and the resulting opening in the shell ring shall be sealed with a circular steel insert plate the same thickness as the existing shell, approximately 5/16 in. thick. Clearance of the new insert plate welds from the new overflow pipe, reinforcing plate, and weir box welds shall be verified by CONTRACTOR prior to installation. The edges of the opening shall be beveled and prepared prior to welding, and the circular insert plate shall be welded in the shell with full-penetration butt-welds. CONTRACTOR shall have radiographs taken of the completed insert plate weld seam as required by API 653. All testing shall be performed in the presence of the FIELD OBSERVER. The cost of the radiographs and testing shall be included in the **Base Bid**. The CONTRACTOR shall furnish labor and material to design, fabricate, install, clean, and paint a new 16 in. diameter, standard schedule, welded steel overflow pipe on the exterior of the tank. The overflow pipe shall extend from the new overflow weir box inlet down the outside of the tank and terminate 22 in. ± 2 in. above the existing drain basin as shown in Drawing OFP. The new overflow weir box inlet shall be located to maintain the existing top capacity level/overflow level. A new weir box for the overflow pipe inlet shall be furnished and installed inside the tank as shown in Drawing OFW. The new overflow

pipe shall be attached to the exterior tank shell with continuously welded steel brackets. The pipe shall be 3/8 in. minimum wall thickness. At the discharge end of the overflow pipe a flange shall be welded all around on the interior and exterior. A 316 stainless steel 4 x 4 mesh screen and a 316 stainless steel 24 x 24 mesh stainless steel screen shall be installed over the discharge end of the overflow pipe. A stainless steel retaining ring shall be installed to secure the screens to the flange at the discharge end of the overflow pipe, and gaskets shall be installed between the flange and screens and between the screens and retaining ring. The retaining ring, bolts, and nuts used to secure the screens and gaskets to the flange at the end of the overflow pipe shall be stainless steel and shall be equipped with isolation kits to isolate the stainless steel from the steel flange. The discharge end of the overflow pipe shall be centered over the existing drain basin and located so as to direct the effluent into the existing drain basin. A new galvanized steel grating with angle frame, Rockcrete USA Galvanized Grate with Angle Iron Frame (1- 877/99-1175) or equal allowed in writing by OWNER, shall be furnished and installed in the top of the existing approximately 4 ft 4 in. x 4 ft 6 in. concrete drain basin. The grating shall be hot dip galvanized welded bar grating, 1-1/4 in. x 3/16 in. bearing bars, 77% open area, with integral welded frame. The grating frame angle for support of the grating shall be secured to the existing concrete basin with eight (8) minimum 1/2 in. diameter x 4 in. wedge anchors, and the existing steel plate cover removed.

X. Conduits: OWNER will be removing instrumentation from the tank, prior to work. All conduits shall be demolished and replaced by the CONTRACTOR unless otherwise shown no the plan. Three (3) weeks prior to CONTRACTOR starting work on each tank, CONTRACTOR shall provide written request to OWNER for the removal of instrumentation. CONTRACTOR shall furnish and install conduits, enclosures, and accessories in accordance with the Drawings and Section 16111 of these Specifications. The CONTRACTOR shall install any brackets for the support of the conduits prior to field cleaning and painting. The galvanized steel conduits shall be cleaned and coated to match the finish color of the tank.

Y. Remove Interior Ladder: The CONTRACTOR shall remove the existing interior ladder from inside the tank and legally dispose of the ladder and all brackets. The brackets shall be completely removed and ground flush.

Z. New Exterior Shell Ladder: The existing exterior shell ladder and associated brackets shall be removed and legally recycled by the CONTRACTOR. Any remains shall be ground flush. A new ladder and brackets conforming to OSHA 1910.23, OSHA 1926.1053, AWWA D100-21, and Drawings LR, SR1, and SR2 shall be furnished and installed. Adequate clearance for the climber in accordance with OSHA 1910.23 Ladders (ANSI A14.3, Safety Code for Fixed Ladders) shall be provided. The ladder shall be secured to the adjacent structure with steel bar brackets welded to the side rail and to the structure with complete structural welds. **Any necessary temporary protective devices for compliance with Federal OSHA requirements, all state and local safety regulations, and safe working practices shall be furnished and maintained by the CONTRACTOR.** The approved ladder shall extend from 12 ft above grade to 48 in. above the new platform floor at the roof perimeter.

AA. Ladder Safe-Climbing Device: The existing ladder safe-climbing device shall be removed before cleaning and painting operations begin. After the finish coat of paint has cured, a new 3/8 in. diameter stainless steel cable-type safe-climbing device as manufactured by DBI-SALA, or equal allowed in writing by OWNER, shall be furnished and installed. Cable and mounting accessories shall be stainless steel. The cable shall be attached in such a manner to retain the specified tension of the manufacturer. Excess cable shall be trimmed off and not allowed to coil below the ladder. The CONTRACTOR shall submit catalog cuts, and installation, operation and maintenance instructions to the ENGINEER for written approval prior to construction. **Any necessary temporary protective devices for compliance with Federal OSHA requirements, all state and local safety regulations, and safe working practices shall be furnished and maintained by the CONTRACTOR.** The new 3/8 in. diameter stainless steel cable- type safe-climbing device shall be installed from the bottom of the ladder, between the first and second rungs, to 54 in. above the floor of the platform at the roof.

BB. Vandal Deterrent: The existing vandal deterrent and associated components should be removed and legally recycled by the CONTRACTOR. A new side-locking shield shall be furnished and installed on the lower portion of the shell ladder. The device shall be Ladder Gate Climb Preventative Shield, manufactured by R. B. Industries, Greensboro, NC, or equal allowed in writing by the ENGINEER. Additional plates, bars, and brackets shall be installed adjacent to the ladder gate in accordance with Drawing LV, so as to fill the area between the ladder side rails and the shell for the length of the ladder gate. Alternatively instead of the aluminum plates at CONTRACTOR'S option 3/16 in. steel plates may be welded to the ladder braces adjacent to the ladder gate, so as to fill the area between the ladder side rails and the shell for the length of the ladder gate. All intersections between these plates with the ladder side rails, ladder brackets, and shell shall be seal welded on all sides. Any holes in these side plates required for installation of the ladder gate shall be drilled and reamed smooth prior to cleaning and painting the exterior. CONTRACTOR shall coordinate with OWNER who shall remove and reinstall security switch. CONTRACTOR shall drill holes for attachment prior to cleaning and painting. Any drilling, welding, or grinding for security switch and sensors installation shall be performed prior to cleaning and painting operations.

CC. Platform and Safety Railing: The existing railings on the roof, including the railing extending to the center of the roof, shall be removed and the remains ground flush. The CONTRACTOR shall furnish and install a platform and safety railing with handrails and two intermediate rails on the roof adjacent to the primary roof manhole and shell ladder access to comply with present OSHA standards. The platform access from the shell ladder shall be equipped with a spring-operated safety gate, FabEnCo Safety Gate model XL71-24, or equal allowed in writing by the ENGINEER. The platform shall be supported by angle and pipe members as shown in the drawings. The platform shall extend to a point on the roof where the roof slope is less than 2 in 12. The CONTRACTOR shall verify dimensions and slope prior to fabrication. In addition, sections of safety rails of nearly the same design shall be installed on the roof adjacent to the platform. The platform and safety railing installation shall be in accordance with Drawings FW-03 and SR1 through SR3.

DD. New 30 in. Square Primary Roof Manhole: The existing 24 in. diameter roof hatch and neck shall be replaced with a new 30 in. square roof manhole. The manhole, and its installation, shall be per Drawing RM. The existing conduit penetration through the roof manhole curb shall be protected and reinstalled through a new welded coupling furnished and installed in the new roof manhole curb. CONTRACTOR shall coordinate with OWNER who is to install alarm sensors for the manhole. Any drilling, welding, or grinding for sensors installation shall be performed prior to cleaning and painting operations.

EE. Secondary Roof Manhole Safety Railing: The existing railings at the perimeter of the roof shall be removed and the remains ground flush. The CONTRACTOR shall furnish and install one approximately 9 ft long section of safety railing, with handrails, two intermediate rails, and toe bars on the roof adjacent to the existing secondary roof manhole to comply with present OSHA standards. The pipe railings shall turn ninety degrees and extend 4 ft 10 in. toward the center of the tank on both ends. The safety railing installation shall be in accordance with Drawing SR4. Toe bars shall be 1/4 in. thick flat bars. Toe bars shall be secured to the handrail posts with 5/8 in. diameter galvanized steel bolts and nuts. Bottom of toe bars shall be located with not more than 1/4 in. clearance above the roof, and top of toe bars shall be 4 in. minimum above the roof. All handrails, intermediate rails, and toe bars shall be rolled to match curvature of the tank. The railings shall be installed adjacent to the secondary roof manhole and shall be located to allow for the opening of the roof manhole cover.

FF. New 6 in. Diameter Blind Flange in Roof: A new 6 in. diameter blind flanged opening shall be furnished and installed in the roof above the overflow inlet in accordance with Drawing FW-10. After the completion of the application and curing of the paint, a new 1/4 in. thick gasket shall be furnished and installed for the new blind flange. The gasket shall be made from commercial grade neoprene, meeting ASTM D2000-86E, Type BC, with a 70A durometer rating, and black color.

GG. Safety Railing at the New Flanged Opening Above Overflow Weir Box: The CONTRACTOR shall furnish and install one approximately 9 ft long section of safety railing, with handrails, two intermediate rails, and toe bars on the roof adjacent to the new flanged opening in the roof above the overflow weir box to comply with present OSHA standards. The pipe railings shall turn ninety degrees and extend 4 ft 10 in. toward the center of the tank on both ends. The safety railing installation shall be in accordance with Drawing SR4. Toe bars shall be 1/4 in. thick flat bars. Toe bars shall be secured to the handrail posts with 5/8 in. diameter galvanized steel bolts and nuts. Bottom of toe bars shall be located with not more than 1/4 in. clearance above the roof, and top of toe bars shall be 4 in. minimum above the roof. All handrails, intermediate rails, and toe bars shall be rolled to match curvature of the tank.

HH. Three (3) New Aluminum Roof Vents and Steel Exhaust Fan Flanges: The one (1) present center clog-resistant roof vent, flange, and neck shall be removed, any remains ground flush. The two (2) present outer 16 in. diameter roof vents shall be removed and the present vent openings modified to 24 in. diameter. A new 24 in. diameter combination aluminum clog-resistant screened vent assembly and 24 in. diameter steel exhaust flange shall be installed in each of these three (3) openings. Each new 24 in. diameter combination aluminum clog-resistant screened vent assembly and 24 in.

diameter steel exhaust flange shall conform to the dimensions and installation details shown in Drawing CRV, Sheets 1-4. The aluminum vents shall be removable from the steel manhole/exhaust flanges. Each vent screen shall be supported to not produce a gap greater than 1/16 in. Each vent shall have a minimum of 450 square inches of free vent area. The bolts and nuts utilized in the tank vents shall be of stainless steel or silicon- bronze material. Each vent shall be designed to prevent clogging over and have provision for release of or prevention of any subsequent vacuum or pressure formed in the tank, prior to structural damage or deformation of the tank. The vent screens and pallets shall be designed to return to their original design locations without human effort after the release of any pressure or vacuum and the screens shall continue to provide screening of the vent during subsequent tank operation. Each vent cap shall be designed with a vertical overhang to prevent the entrance of wind driven debris and precipitation. Each new exhaust flange assembly shall be welded with 3/16 in. fillet welds around its circumference on the outside and inside of the tank. Each exhaust flange neck shall be welded to an annular eight bolt flange with continuous 1/4 in. fillet welds on the exterior and interior surfaces. Rough edges and weld spatter shall be ground smooth prior to cleaning to properly receive paint.

II. Existing Roof Couplings: The plugs for the eighteen (18) existing threaded outlets located in the roof shall be removed for the cleaning and painting and reinstalled after coating has cured. The existing couplings are approximately 2 in. diameter in size (CONTRACTOR shall verify size). Any damaged threaded outlets and plugs shall be replaced. Plugs shall be malleable iron pipe plugs (hot-dipped galvanized with the threads wiped). The threads on the plugs shall be covered with teflon tape or teflon paste prior to threading into the couplings.

JJ. Cathodic Protection System: The CONTRACTOR shall remove and legally dispose the existing cathodic protection system anodes, wiring, and all associated equipment from the tank prior to any cleaning, repairing or painting operations. The CONTRACTOR shall have Corrpro (1055 W. Smith Road, Medina, OH 44256, P.O. Box 721, Medina, OH 44258, telephone 330/725-6681, FAX 330/723-6065); Freeman Industries Inc. (2061 State Route 193, P.O. Box 10, Dorset, OH 44032, 440/858-2600, FAX 440/858-2006);
or equal allowed in writing by OWNER, furnish and install a new ice-resistant, submerged cathodic protection system, with an automatic rectifier, in compliance with the American Water Works Association (AWWA) D104-17 "Standard for Automatically Controlled, Impressed-Current Cathodic Protection for the Interior of Steel Water Tanks" and the National Association of Corrosion Engineers (NACE) Standard RP0388-01 Recommended Practice "Impressed Current Cathodic Protection of Internal Submerged Surfaces of Steel Water Storage Tanks." The automatic rectifier shall be T.A.S.C. automatic rectifier, MACPU Digital automatic rectifier, or equal allowed in writing by OWNER. All welded brackets and fittings required shall be furnished and installed prior to the cleaning and painting. The new cathodic protection system shall be installed after the finish coat has cured. However, the cathodic protection system shall not be energized until after the First Anniversary Inspection of the painting has been conducted. The CONTRACTOR shall assume liability for any and all damages to the system while transporting or installing the anodes and wiring. After the First Anniversary Inspection, the CONTRACTOR shall have cathodic protection supplier calibrate the cathodic protection system for proper operation. The CONTRACTOR shall forward the certified

results of the calibration to the OWNER and ENGINEER. The cathodic protection supplier shall provide the OWNER with a written two year warranty, which shall begin upon receipt of the acceptable certified calibration results, that the system is controlling corrosion. Copies of the warranty shall be submitted to the ENGINEER at the time the system is energized. A physical inspection of the controller/rectifier, anode system, and protected surfaces shall be conducted at the end of the first year of the two year warranty period. Any defective components shall be replaced by the cathodic protection supplier at no cost to the OWNER. If revision in design is necessary to perform the intended function, said revisions shall be incorporated into the system at no additional cost to the OWNER.

KK. Shell Manhole Bolts: The CONTRACTOR shall remove and legally dispose the existing bolts and nuts from the flanged and bolted shell manhole. 48 new 3/4 in. diameter x 3 in. long stainless steel bolts and nuts shall be furnished and installed in the existing 42 in. diameter flanged and bolted shell manhole (CONTRACTOR shall verify bolt sizes). In addition, stainless steel washers shall be furnished and installed between the bolt and the manhole, and between the nut and the manhole.

LL. Manhole Gasket: After the completion of the application and curing of the interior paint, a new 1/4 in. thick gasket shall be furnished and installed in the existing approximately 42 in. diameter flanged and bolted shell manhole. The gasket shall be made from commercial grade neoprene, meeting ASTM D2000-86E, Type BC, with a 70A durometer rating, and black color.

MM. Locking Manholes and Ladder Vandal Deterrent: The roof manholes entering the container and the ladder vandal deterrent shall be locked at the completion of the Work, using padlocks furnished by the OWNER.

END OF SECTION

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