PART 1 - GENERAL

A. Description

This section describes fabrication and erection of ground-supported flat-bottom bolted stainless steel water standpipe in accordance with the latest revision of AWWA D103. Concrete foundation with a 6" sand cushion or tank underdrain as detailed on the Drawings. All bolted stainless steel tank items shall be built by an experienced manufacturer and shall incorporate all necessary equipment. The manufacturer of the bolted stainless steel tank shall have unit responsibility for all materials and equipment incorporated into each tank.

Acceptable manufacturer of items based on past performance and compatibility to the system is Tank Connections or approved equal. The acceptable manufacturer is intended to constitute a standard for quality and performance desired. The Contractor's Base Bid shall be based upon the use of stainless steel bolted steel tanks to be supplied by manufacturers acceptable to the Owner and the Owner's Representative. Prior to bidding, the Owner, through the Owner’s Representative, will accept submission of data from other manufacturers requesting acceptance to provide quotes to Contractors. Such information shall be provided to the Owner’s Representative at least fourteen (14) calendar days prior to the bid opening date. Information received at the office of the Owner's Representative after the submission deadline will not be reviewed nor considered as an acceptable product for use on the project. The submission of information for the Owner’s Representative’s consideration shall be in accordance with Section 013300, part B, (except three copies shall be provided) and shall provide adequate data and documentation to demonstrate that the alternate manufacturer has suitable experience and has provided comparable equipment. Any deviations from the Contract Documents shall be clearly indicated in the letter of transmittal. Submission of product data for acceptance shall be of sufficient detail to allow the Owner's Representative to make a complete evaluation. Lack of sufficient information will be cause for rejection. The acceptance of equipment or alternate equipment manufacturer does not in any way relieve the Contractor of the responsibility for the performance of the equipment or ability of the manufacturer to meet the requirements of this section and the Contract Documents.

B. Related Work Specified Elsewhere

1. General Concrete Construction: 030500.
2. Earthwork: 312300.
5. Cleaning and Flushing System: 331301
6. Pressure Testing of Piping: 400515

C. Design Procedure

2. The Contractor is solely responsible for the design of the tank foundation. Foundation designs shall conform to Section 11 of AWWA D103. The foundation shall be designed in accordance with the recommendations and design parameters including foundation depth contained in the Geotechnical Investigation Report provided in the Appendix and as indicated on the drawings. The Contractor shall determine the adequacy of the soil investigation for design. Any additional data required shall be furnished or obtained by the tank Contractor.
3. Weir: The weir opening dimensions shown on the Drawings are intended to be the minimum size required. The Contractor shall verify the weir opening size based on the maximum overflow rate shown on the Drawings.

D. Design Information

1. The standard tank capacity in millions of U.S. gallons (MG) and dimensions are as follows:

<table>
<thead>
<tr>
<th>Nominal Capacity (MG)</th>
<th>Tank Bottom Elevation at Ringwall (feet)</th>
<th>Overflow Height Elevation (TCL) (feet)</th>
<th>Freeboard Above Overflow (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.28</td>
<td>2264.5</td>
<td>2324.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

2. Provide a self-supporting steel roof or an aluminum geodesic dome roof. No roof supporting member shall extend within 18-inches of the overflow (inside the tank). The tank shall extend at least 18-inches above overflow line.

3. Earthquake Design: Per Section 12, AWWA D103. Design location is in Seismic Zone 0 and no earthquake loading is required.


5. Design Wind Velocity: 175 mph for tank and accessories; 125 mph for foundation.

6. Design Snow Load: Add snow load to roof live load per local building code requirements.

7. Nominal Capacity and Dimensions: The dimensions shall be such that the tank contains no less storage volume above the low water line than available in the size specified.

E. Submittals

1. The drawing and accessory list of AWWA D103 is not required with the bid. Submit with detail drawings.

2. Provide a summary of the design calculations, including foundation, in sufficient detail to indicate the procedures used, signed by a civil engineer licensed to practice in the state of North Dakota.

3. Detail Drawings: Submit in accordance with SHOP DRAWINGS, General Requirements. Include:
   a. Dimensional drawing.
   b. Manufacturer’s erection manual
   c. Welding data tabulation.
   d. Joint bolting.
   e. Accessory list with fabrication details.
   f. Erection drawings.
   g. Catalog data and descriptions of standard manufactured items.
   h. Anchor bolt size and layout when required.
4. Mill test reports of all steel materials with a certification of which ASTM or other AWWA D103 required specification each material complies with.

5. Manufacturer's Standard Published Warranty.

6. Certificate of Compliance with AWWA D103 including Section 13, if applicable.

7. Provide for shop inspection by Owner or his representative.

8. Report per Sections 9.1 and 9.2 AWWA D103 at the conclusion of the work certifying the inspection.

F. Warranties

1. Structure

If within a period of two (2) years from date of acceptance by the Owner, the water storage tank, or any part thereof, shall prove to be defective in material or workmanship, provide an identical or substantially similar replacement.

2. Sealant System

If within a period of ten (10) years from date of acceptance by the Owner, the sealant system chips, cracks or is otherwise damaged or deemed defective during normal water service, the manufacturer will provide an identical or substantially similar replacement. The Contractor shall provide a yearly inspection of the tank to see that these requirements are met. The Contractor shall be responsible to repair any leaks that are discovered during yearly inspection.

G. Inspection and Testing

1. Obtain and provide the services of an independent qualified testing/inspection laboratory to inspect shop fabrication and field erection work. At the completion of the work, the independent laboratory shall submit a written report to the Owner stating that the fabrication and erection of the tank is in accordance with the manufacturer’s instructions, and materials are in accordance with the specifications, and that required testing has been performed and all deficiencies and leaks have been repaired.

H. Measurement and Payment

1. Payment for the steel water tank is included in the lump sum stated in the Bid Form for fabrication and erection of the bolted steel standpipe.

2. The lump-sum price paid for fabrication and erection of the bolted stainless steel standpipe includes full compensation for furnishing the labor, materials, tools, and equipment and performing work involved in constructing the bolted steel water tank except: Items detailed on the Bid Form.

PART 2 - MATERIALS

A. Horizontal Wind Stiffeners

1. Design requirements for intermediate horizontal wind stiffeners shall be of the “web truss” design.

2. Web truss stiffeners shall be of steel with hot dipped galvanized coating.

3. Rolled steel angle stiffeners are not permitted for intermediate stiffeners.
B. **Bolts, Gaskets, and Sealants for Seams, Joints, and Tank Panels**

Provide Type 304 or 316 stainless steel bolts, gaskets, and sealants per Section 2 of AWWA D103.

C. **Lap Joint Fasteners and Bolt Head Encapsulation for Tank Shell and Floor**

1. Install bolts on the vertical tank wall such that the head portion is located inside the tank and the washer and nut are on the exterior. Select lap joint bolts such that threaded portions will not be exposed to the "shear plane" between tank sheets. Size bolt lengths to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.

2. Provide high-impact polypropylene copolymer encapsulation of entire bolt head up to the splines on the shank. Provide encapsulated nuts to cover the bolt threads on the inside of the tank floor.

D. **Steel Plates and Sheets**

1. Plates and Sheets: Principles of design of the plates and sheets used in the construction of the reservoir shell, floor, and roof shall comply with the minimum standards of AWWA D103, Section 2.4, with the exception that the material shall be Type 304 stainless steel. The allowable tensile stress of 304 stainless steel shall be based on material properties prior to cold rolling.

All sheets shall be washed to remove greases and oils. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet to sheet abrasion during shipment.

2. Rolled Structural Shapes: All rolled structural shapes, including the base angle and foundation anchor plates, shall conform to the minimum standards of AWWA D103, Section 2.5, with the exception that the materials shall be Type 304 stainless steel.

3. All bolts, nuts and washers shall be stainless steel for connection of plates and panels.

E. **Accessories**

1. Roof Columns, Rafters, Girders, and Accessories: Columns shall be circular with section properties not less than those of a 4-inch-diameter standard pipe section. The column baseplate shall not be welded to the floor plates but held in position by angles or other shapes fastened only to the floor plates at diagonal corners of the column base. Provide full filler plate seal welded under baseplate to provide uniform bearing where column baseplate overlaps a lap seam in the floor plates.

2. Shell Manholes: Two each, circular, 30 inches in diameter, with hinged cover.

F. **Pipe Connections**

1. Inlet and Outlet Pipes as detailed on the Drawings.

G. **Overflow**

Weir, weirbox and overflow pipe to ground as detailed on the Drawings. The components supplied shall be of no smaller dimensions than shown.

1. Weir box and overflow pipe, to the steel flexible coupling, shall be stainless steel.

H. **Ladders, Outside Vertical**

1. Conform to project, state, OSHA, and ANSI A14.3-74 requirements.

2. Provide exterior ladder with safety cage and downward opening hinged locking gate at the bottom.

3. Exterior ladder safety cage and off-setting platform: The cage shall extend a minimum of 3'-6"
above the top of the tank and shall be constructed with landings spaced no greater than 30 feet apart. Each landing shall be equipped with a railing.

4. Ladder landing, checkered plate with handrails conforming to OSHA extending from the outside ladder to the roof.

5. An interior ladder is not permitted.

6. All exterior ladders, safety cages, landing, and handrails shall be stainless steel Type 304

7. The ladder shall extend to a minimum of 6” above the foundation.

I. **Roof Hatches**

1. Roof hatch, as detailed on the Drawing. Roof hatch shall consist of aluminum frame and aluminum cover with 3” needle flange, neatly welded. Curb shall be 12-inches high with 3-1/2 inch wide flange. Scuttle shall be of double leaf design, completely assemble with heavy pintle hinges, compression spring operators and automatic hold-open arms with grip handle, padlock hasps outside, and neoprene draft seal. The cover shall overlap the curb by a minimum of two inches. All hardware shall be zinc plated and chromate sealed. Bilco Company Type E-50, Babcock Davis Associates, or approved equal. The opening for the rest hatch shall be factory cut. Field cutting of the rest hatch is NOT permitted.

J. **Roof Vent**

1. Frost-free roof vent containing removable panels with stainless steel screen and stainless steel insect mesh. Vent shall be of fail-safe operation in the event the insect screens frost over.

K. **Special Accessories**

1. Preformed expansion joint filler shall comply with ASTM D1751, nonextruding, nonextending, resilient bituminous type. Do not use strips utilizing cork. Use cane or other cellular fibers, uniformly saturated with asphalts.

2. Identification Plate: Include a manufacturer’s metal nameplate listing the tank serial number, tank diameter, height, maximum design capacity, intended storage use and date of installation. Affix to tank exterior sidewall adjacent to the ladder location and approximately five (5) feet from grade.

3. Inlet/Outlet Sumps: Sumps and flanged coupling adapters shall be as detailed on the Drawings. Materials of construction for the sumps only shall be stainless steel.

L. **Bituminous Mastic**

Bituminous sealant: Henry’s 204 as manufactured by Henry Company, APCO 100, Marvin, or equal.

M. **Materials**

1. Permeable Aggregate Base: Per Section 312300.

2. Permeable Aggregate for Underdrain: Per Section 312300.

3. Concrete for Foundation: Class A per Section 030500.

PART 3 - **EXECUTION**

A. **Concrete Foundation**

1. Place concrete so top surface is smooth and lies within 1/8 inch of a straight line in any 16-foot segment and all points are within 1/4 inch of design elevation.
2. If a subcontractor is used to construct the tank foundation, a superintendent employed by the Contractor shall be on-site at all times the subcontractor is performing the work. No assignments of authority for a superintendent from the Contractor to the subcontractor shall be made.

B. **Placing Joint Filler, Tank Reservoir Bottom to Ringwall**

Place preformed expansion joint filler on top of the ringwall under the tank bottom sketch plate. Cut the exposed edge of the strips to a radius 1 inch greater than the bottom and butt together adjacent strips.

C. **Permeable Aggregate Base or Tank Underdrain**

The aggregate base or tank underdrain is to be placed to the lines and grades shown on the Drawings. Place aggregate base so finished surface is true to grade and the edge is approximately ¼-inch above concrete ringwall.

D. **Erection of Tank**

1. Install the factory-coated, bolted steel tank in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks.

2. Use specialized erection jacks and building equipment developed and supplied by the manufacturer to erect the tank.

E. **Vacuum Test**

Test all the bolted seams of the tank bottom by observation for bubbles in a soap solution coating with a glass top metal testing box connected to equipment that produces a vacuum of at least 2 psi. Correct deficient seams.

F. **Temporary Closure of Tank Openings**

Provide and emplace with three or more bolts temporary covers of metal, 10 gauge minimum, or plywood (concrete form quality) cut to fit the tank openings that are not fitted with valves, hatches, or manhole covers at the completion of erection. The covers are intended to exclude dust, animals, and intruders before and after painting and after disinfection.

G. **Field Touch-Up of Interior and Exterior Coatings**

Repair damaged coatings. Apply new coating to same thickness as the factory-applied coating. Comply with AWWA D103, paragraph 10.2.

H. **Disinfecting**

1. Disinfect the tank in accordance with AWWA C652 and AWWA D103. Jets wash the interior of the painted and lined reservoir with a 300- to 500-ppm chlorine solution. Use a chlorine product free of acid components. Method of application and retention shall be in accordance with AWWA C652, Section 4.2. Provide the mixing water and remove the chlorine solution that accumulates in the bottom of the tank by pumping and mopping the same workday it is applied. Rinsing with clean water is not required.

2. After filling the tank with potable water from the Owner's system, the Contractor shall take and submit samples of the water for bacteriological tests to an approved laboratory, and satisfactory test reports shall be received before the tank is placed in service. The Contractor shall obtain approval of the Owner's Representative prior to placing the tank in service.

3. Water for testing and disinfection shall be furnished by the Owner. The Contractor shall purchase water as specified in Special Condition 15100 Part I.
I. Water Test of Steel Tank

1. Initial filling, testing, and draining shall be coordinated with the Owner. Following the completion of final cleanup and disinfection, the Contractor shall fill the tank for final inspection and leak testing with Owner furnished water through connected piping. Disposal of disinfection water or tank drain water will be in accordance with local discharge regulations. If no leaks or defects are detected, the test water may be placed into the connected system. Subsequent draining, repairing, and disinfection costs associated with defective work will be borne by the Contractor.

2. Repair any leaks disclosed as provided in AWWA D103, Section 9.

J. 2\textsuperscript{nd} Year, 5\textsuperscript{th} Year and 10\textsuperscript{th} Year Warranty Inspection of Tank

1. Warranty inspections will be conducted on 2\textsuperscript{nd} year, 5\textsuperscript{th} year and 10\textsuperscript{th} year of use after acceptance of the tank by the Owner, reinspect interior and exterior coatings and joints for proper performance. Repair failed coatings and repair joints or leaks as necessary. The Owner will drain the tank, establish the inspection date and notify the Contractor. The Contractor shall provide lighting and ventilation for the tank inspection. The tank surfaces will be reviewed by representatives of the Owner, Owner's Representative, and the Contractor. Inspection and remedial work shall be performed at no additional cost to the Owner. Perform the remedial work and provide inspection report.

2. Redisinfection cost associated with repairs to the tank will be borne by the Contractor including the disposal of system unacceptable water.

END OF SECTION