SECTION 11252

chemical storage tanks – Double Walled

# general

## scope of work

### The CONTRACTOR shall provide high density cross-linked polyethylene tanks and accessories per section 2.05, complete and in place, in accordance with the Contract Documents.

### Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the double wall tank(s) and its accessories for chemical storage as indicated.

## references, codes and standards

* + 1. American Society of Testing Materials (ASTM).
       1. D638 – Tensile Properties of Plastics
       2. D883 – Standard Definitions of Terms Relating to Plastics
       3. D1505 – Density of Plastics by the Density-Gradient Technique
       4. D1525 – Test Method for Vicat Softening Temperature of Plastics
       5. D1693 – ESCR Specification Thickness 0.125" F50-10% Igepal
       6. F412 – Standard Terminology Relating to Plastic Piping Systems

### **ANSI Standards:** B-16.5, Pipe Flanges and Flanged Fittings

### **Building Code:** International Building Code - IBC 2009

### **ARM:** Low Temperature Impact Resistance (Falling Dart Test Procedure).

### NSF/ANSI Standard 61, AWWA – Drinking Water System Components

### ASTM D-1998, Standard Specification for Polyethylene Upright Storage Tanks

## submittals

### **Shop Drawings:** Shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the tank(s). Sufficient data shall be included to show that the product conforms to Specification requirements. Submit the following as a single complete initial submittal.

#### Tank and Fitting Material

##### Resin Manufacturer Data Sheet

##### Fitting Material

##### Gasket style and material

##### Bolt material

#### Dimensioned Tank Drawings

##### Location and orientation of openings, fittings, accessories, restraints and supports.

##### Details of manways, flexible connections, and vents.

#### Calculations shall be stamped and signed by a registered, third party engineer in the State of California.

##### Wall thickness. Hoop stress shall be calculated using 600 psi @ 100 degrees F.

##### Tank restraint system. Show seismic and wind criteria.

##### Concrete pad and concrete secondary containment berm

### Manufacturer’s warranty

### Manufacturer's unloading procedure

### Manufacturer's installation instructions

### Supporting information on Quality Management System.

### Supporting documentation of Manufacturer’s certification to NSF/ANSI Standard 61 – Drinking Water System Components for water treatment chemicals. *(Remove if not required)*

### **Manufacturer’s Qualifications:** Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.

### Electrical heat tracing and foam insulation data sheets as required.

### Factory Test Report

#### Material, specific gravity rating at 600 psi @ 100 degrees F. design hoop stress.

#### Wall thickness verification.

#### Fitting placement verification.

#### Visual inspection

#### Impact test

#### Gel test

#### Hydrostatic test

### A statement of chemical compatibility between material to be stored and all components and accessories of tank system.

## quality assurance

### Tanks shall be by a manufacturer with at least ten (10) years prior experience in construction of similar polyethylene tanks

### Tanks shall be manufactured from virgin materials.

### Tanks shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage, and submit form from NSF supporting chemical certification. *(Remove if not required)*

### **Warranty:** The warranty shall be provided upon request for the specific service application and shall be a minimum 5 year, full replacement warranty.

# products

## general

### Tanks shall be rotationally-molded, high density cross-linked polyethylene, flat bottom tanks. The assembly consists of one cylindrical, closed top inner primary tank and one cylindrical, open top containment outer tank. Each tank is a rotationally molded one-piece seamless constructed tank. The assembly shall be designed to prevent rainwater and debris from entering the containment tank. Tanks shall be adequately vented. Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the capacity, manufacturer, date of manufacture and serial numbers must be permanently embossed into the tank.

## manufacturer

### Polyethylene tanks shall be manufactured or supplied by Industries, Ine.; Poly Processing Company; Rotational Molding Inc.; Nalgene; or equal

## polyethylene storage tanks

### **Service:** Chemical storage tanks shall be suited for the operating conditions contained in this section

### High Density Cross-linked Polyethylene resin used in the tank manufacture shall contain ultraviolet stabilizer as recommended by resin manufacturer. Where black tanks are indicated, the resin shall have a carbon black compounded into it. The tank material shall be rotationally molded and be a resin that is commercially available at the time of tank manufacture.

### For sodium hypochlorite and sulfuric acid storage, resin shall include additional medium density polyethylene (OR-1000) with four times the antioxidant properties of a standard polyethylene bonded to the interior surface during the manufacturing process. Resin to be certified NSF/ANSI 61 for chemical storage.

### Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. Tanks shall be designed using a hoop stress no greater than 600 psi. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.

### The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation:

#### T = P x OD/2SD or 0.433 x SG x H x OD/2SD

Where: T = wall thickness, in

P = pressure, psi

SG = specific gravity, gm/cc

H = fluid head, ft

OD = outside diameter, ft

SD = hydrostatic design stress, 600 psi

#### The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187” thick.

### On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.

### The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

|  |  |
| --- | --- |
| **Tank Diameter, ft** | **Min Knuckle Radius, in** |
| less than or equal to 6 | 1 |
| greater than 6 | 1-1/2 |

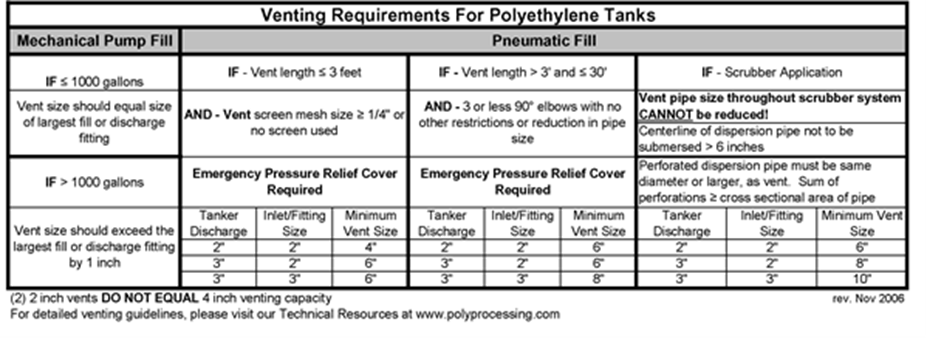
### Tanks with 3,000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty.

### Unless otherwise indicated by Contract drawings, for indoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with an emergency pressure relief device to prevent over-pressurization. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

### Unless otherwise indicated by Contract drawings, for outdoor pneumatic fill, manways shall be 24-in diameter or greater. Manway must be capable of relieving a volume flow rate of up to 2650 ACFM. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

### Unless otherwise indicated, tanks less than 2000 gallons in non-pneumatic applications shall have a manway cover 17-in or smaller. Gaskets shall be closed cell, cross-linked polyethylene foam, viton or EPDM materials.

### Tanks must be vented to allow for performance at atmospheric pressure, in accordance with the following matrix:



### Tank colors shall be natural (un-pigmented), black (compounded), or as specified by the ENGINEER with written agreement by the tank manufacturer.

## tank accessories

### All accessories affixed to or near the tank shall be chemically compatible with the material to be stored in the tank. The Contractor shall submit a statement of chemical compatibility as a part of the accessory submittal.

### Ladder: *(Populate if required)*

#### Fiberglass access ladders shall be provided with the polyethylene chemical storage tanks at locations as shown. FRP ladders to be constructed with 1 ¾” x ¼” square tube side rails and 1 ¼” fluted tube rungs. Ladders to have 18” rung width configuration with 12” rung spacing.

#### All FRP ladders systems shall be provided using premium grade polyester resins with flame retardant and U.V. inhibitor additives. All shall be colored safety yellow per the Approved Materials List.

#### Ladders must be secured to the tank and secured to the concrete to allow for tank expansion/contraction due to temperature and loading changes. Use proper chemical resistant materials when anchoring to tank dome or sidewall.

#### Safety cages shall be added to ladders as required by OSHA. All ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 2206; 1910.27; fixed ladders.

### Restraint System: *(Populate if required)*

#### Metal components to be galvanized edge softeners, and tension ring with galvanized cables and clamps.

#### Tank restraint system shall be supplied and the design of same certified by a Structural Engineer registered in the State of California. Design shall conform to the most recent edition of the IBC code for seismic and wind load. Anchor bolts as required by the calculations shall be supplied by the tank manufacturer.

### Leak Detection:

#### Each tank shall be installed with a leak detection system to detect a leak in the interstitial space of the double wall tank (area between the inner and outer tanks). Leak detection controls are mounted in a NEMA 4X fiberglass enclosure. System to include: power light, leak detection alarm horn, alarm silence push button with light and control relays. Alarm horn to have a sound output of 68-80 dB at 2 feet. Pilot devices are NEMA 4X rated. The leak detection sensor shall be a 4-wire, 24VDC, single point optical sensor molded of PFA Teflon material. The sensor will have a NEMA rating of NEMA 6 (IP68), and a process temperature rating from –40° F to 176°F.

[\*Note to the Engineer: Tank leak detection shall be tied to the District’s SCADA system. Incorporate language for SCADA into this specification. \*]

### Concrete Pad:

#### The tank shall sit on a minimum 18” raised concrete pad. The Contractor shall submit a concrete pad drawing submittal to be approved by the District prior to construction.

## tanks

* + 1. Tank Schedule: *(Populate tank and fittings schedule)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Tank Tag number** | **Qty.** | **Product stored** | **Tank capacity** | **Diameter** | **Height** | **Manway size** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**Note 1:** Approximate overall height is measured along the straight cylindrical portion of the tank and includes the dome top.

### Fittings Schedule: (Populate fittings schedule)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tank tag number** | **Fill** | **Drain/outlet** | **Vent** | **Overflow** | **Level** | **Spare** | **Ladder** | **Restraints** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

### Tank fittings shall be according to the fitting schedule in 2.05B above. Threaded fittings shall use American Standard Pipe Threads. If tanks are insulated, fittings shall be installed at the factory prior to application of the insulation.

### Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

### For sodium hypochlorite and sulfuric acid storage, Bolted One-Piece Sure Seal (B.O.S.S.), double flange fittings constructed of virgin polyethylene shall be supplied. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have one full face gasket to provide a sealing surface against inside tank wall. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

### **Down Pipes and Fill Pipes:** Down pipes and fill pipes shall be supported at 6-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.

### **U-Vents:** Each tank must be vented for the material and flow and withdrawal rates expected. Vents should comply with OSHA 1910.106(F)(iii)(2)(IV)(9). U-vents shall be sized by the tank manufacturer and be furnished complete with insect screen if required (Insect screen lessens the vent capacity by 1/3) in accordance with the venting schedule listed above.

### On dual wall tank(s) greater than 1000 gallons, bottom fitting(s) must be designed to maintain 110% secondary containment integrity. Bottom containment fitting must include PTFE expansion joint designed to accommodate movement of primary tank in design accordance with ASTM-D 1998 tolerances. All secondary containment fittings and parts shall be resistant to chemical fume corrosion. Fitting shall include the option to connect a secondary containment pipe over primary pipe.

### All fittings on the 1/3 lower sidewall of tanks with capacities > 1000 gallons shall have 100% virgin PTFE Flexi-joint expansion joint. Expansion joint to have 3 convolutions, stainless steel limit cables, FRP composite flanges and meet the following minimum performance specifications. All hardware shall be chemically compatible. Galvanized parts will not be accepted.

* + 1. Expansion joint to meet the following minimum performance requirements:
       1. Axial Compression ≥ 0.67”
       2. Axial Extension ≥ 0.67”
       3. Lateral Deflection ≥ 0.51”
       4. Angular Deflection ≥ 14º
       5. Torsional Rotation ≥ 4º

## level indication (*populate if required)*

### **Float Indication:** The level indicator shall be assembled to the tank and shall consist of PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear UV resistant PVC sight tube and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time. Indicator shall be neon orange color for visual ease for onsite operators.

[\*Note to the Engineer: Coordinate with the District on whether float indication or magnetic indication is preferred for the specific application. Update section 2.06A accordingly.\*]

### **Visual Indication:** The level indicator shall be assembled to the tank and shall consist of clear UV resistant PVC sight tube and necessary pipe supports. Indicator shall be neon orange color for visual ease for onsite operators.

### **Ultrasonic Level Indicator:** The ultrasonic level indicator shall be a Flowline ultrasonic level transmitter, level controller with one 4-20 mA or 0-10 VDC continuous level input and NEMA 4X box to be supplied by tank manufacturer.

## factory testing

### Material Testing

#### Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.

#### Degree of Crosslinking. Use Method C of ASTM D 1998- Section 11.4 to determine the ortho-xylene insoluble fraction of cross-linked polyethylene gel test. Samples shall test at no less than 60 percent.

### Tank Testing

#### **Dimensions:** Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998-21. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.

#### **Visual:** Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking, and delamination.

#### **Hydrostatic test:** Following fabrication, the tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1 hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

# execution

## delivery, storage and testing

### The tank shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. AVOID sharp objects on trailers.

### All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the contractor.

### Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred, manufacturer shall be notified immediately.

## INSTALLATION

### Install the tanks in strict accordance with manufacturer’s Tank Installation Manual and shop drawings.

### Installation will be inspected by manufacturer to verify system flexible connections, venting and fittings are properly installed. In addition to on-sight inspection tank system(s) to be reviewed using tank manual check list as supplied by manufacture as listed below.

### Manufacturer to provide 1 hour training session to prepare operators to service and maintain the tank system. Included in training session will be (#) training manuals.

### Manufacturer’s trained technician to do an onsite inspection of installation. Inspection will verify chemical application, plumbing connections, venting, and applicable ancillary equipment such as ladders, restraints, etc. A verification of proper installation certificate will be supplied when equipment passes installation checklist.

### Tank manuals will consist of installation check lists, tank drawing(s) as built, fitting drawings referencing nozzle schedule on tank drawing, materials of construction, and recommended maintenance program.

## FIELD TESTING

### All tanks be hydro-tested for 24 hours prior to commissioning.

End of Section