

**Specification for Crosslinked Polyethylene “Double-Wall”
Storage Tank with Enclosed Secondary Containment**

**Note: Do not use this spec. for sodium hypochlorite, sulfuric acid or hydrochloric acid
These chemicals have specific design requirements.**

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install, field test, complete and make ready for service vertical high density crosslinked polyethylene double-wall storage tanks with enclosed secondary containment as shown on the Drawings and as specified herein and as shown on the attached tank schedule.

1.02 SUBMITTALS

- A. Submit to the Engineer as provided in Section _____ shop drawings showing details of construction and erection for each tank as follows:
 - 1. Dimensions of tank, fittings and attachments, with bolt and gasket material.
 - 2. Locations of fittings and attachments and size of manway openings.
 - 3. Wall thickness calculations for each tank. Calculations shall be per ASTM D 1998-99 using 600 PSI design hoop stress @ 100° F.
 - 4. Resin used and a complete manufacturers specification of the resin use.
 - 5. Knuckle radius.
 - 6. Weight of tank.
 - 7. Corrosion data for all materials in contact with the chemicals.
 - 8. Certificate of Compliance from the tank manufacturer stating:
 - A. All fittings, heat tracing, insulation, et cetera, have been installed by the tank manufacturer.
 - B. H₂O tests have been performed by the manufacturer and all fittings were installed prior to H₂O tests.
 - C. All tanks are designed and manufactured in accordance with ASTM-D 1998 Type 1.
 - 9. Details on tank packaging.

1.03 QUALIFICATIONS

- A. Tanks shall be manufactured by a firm with a nationally accepted quality standard (I.E. ISO 9001).

- B. The tank manufacturer must be capable of providing a list of customers using tanks for the same chemical applications and similar weather conditions. These locations must be provided where the tank can be visibly inspected. All tanks shall be supplied by one manufacturer.

PART 2: PRODUCTS

2.01 DESCRIPTION OF EQUIPMENT

- A. Furnish high density crosslinked polyethylene storage tanks as specified in this section. The HDXLPE tanks shall be vertical, cylindrical, flat bottom, dome top, and be double-wall with enclosed secondary containment.
- B. Tanks shall be as manufactured by Poly Processing Company, Monroe, LA; ; as represented by Northeast Fluid Control, Inc. North Reading, MA Tel. (978) 275-1500, Fax (978) 276,1501; nefc@nefluid.com; or approved equal.

2.02 PLASTIC

- A. The tanks shall be molded from Grade I high density crosslinked polyethylene. The molding powder used shall be Paxon 7004, as manufactured by Exxon/Mobil Chemical Company; or powders of equal physical and chemical properties.

2.03 FILLERS AND PIGMENTS

- A. The plastic shall not contain any fillers. All plastic shall contain a long term U.V. stabilizer. Pigments may be added as desired by customer or as designated by tank manufacturer, not to exceed .5% of dry blended or 2 percent if melt compound of the total weight of the tank.

2.04 POLYETHYLENE TANKS

- A. The high density crosslinked polyethylene storage tanks shall be as manufactured in accordance with the definitions given in ASTM-D 1998 Type I (Standard Specification for Polyethylene Upright Storage Tanks). The tanks shall be manufactured by the rotational molding process.
- B. The nominal values for the properties of the crosslinked plastic material shall be as follows, based on molded parts:

Test Procedure	Units	Value
Tensile Strength at Yield/ASTM D-638	MPa (psi)	21 (3,000)
Elongation at Break (%)/ASTM D-638	%	> 300
Tensile Modulus of Elasticity/ASTM D-638	MPa (psi)	793 (115,000)
Flexural Modulus/ASTM D-790	MPa (psi)	689 (100,000)
Impact Brittleness Temperature/ASTM D-746	°C (°F)	< -118 (< -180)
Crosslink Potential/Exxon Mobil		2.5
Environmental Stress Crack Resistance/ASTM D-1693	hrs.	F ₀ > 1,000
Notched Izod/ASTM D 256	joules/m (ft-lb/in)	907 (17)
Notched Izod (-40 °C)/ASTM D-256	joules/m (ft-lb/in)	240 (4.5)
Vicat Softening Temperature/ASTM D-1525	°C (°F)	121 (250)
Heat Deflection Temperature, 66 psi/ASTM D-648	°C (°F)	66 (150)
Bulk Density/ASTM D-1895	kg/m (lbs/ft)	370 (23)

- C. The double-wall tank capacity shall be as indicated on the tank schedule and consist of an inner and outer tank each molded separately. The inner tank shall be one piece molded with a domed top. The outer tank shall be open top style with an internal flange.
- D. The tanks shall be designed for 1.9 Specific Gravity using a hoop stress value of no greater than 600 psi at 100° F, with a safety factor of no less than 2, using the Barlow Formula for calculating wall thickness. For applications in excess of 100° F design conditions, lower values for the design hoop stress shall be used.
- E. All edges cut out for manway or other openings shall be trimmed to have smooth edges.
- F. The finished surface shall be as free as commercially practical from visual defects such as foreign inclusions, air bubbles, pin holes and craters.
- G. The knuckle radius at bottom to wall shall be a minimum of 1". The minimum thickness of the radius shall not be less than the maximum thickness of the cylinder wall.

2.05 ACCESSORIES

All accessories shall be installed by the tank manufacturer only.

A. MANWAY COVERS

1. The manway openings for tanks 2000 gallons and over shall be a minimum of 19" for tanks under 2000 gallons and have a combination type fume tight manway cover. Covers shall be 16-bolt and have a 10" coarse threaded cover with a push plate and XLPE gasket. The 19" or the 24" cover shall have (2) XLPE foam gaskets and the bolts shall be polyethylene.
2. Fittings shall be sized as follows:

B. SIDE WALL FITTINGS

All fittings which are below the liquid level shall be two-flange style. There shall be a single 150 Lb. ANSI PVC flange and a ¼" EPDM gasket attached to the outside tank wall. The flange shall be bolted to the tank from the inside with a minimum of four (4) ½" diameter 316 S.S. all thread bolts with bolt heads encapsulated in green polyethylene. The encapsulation shall be a minimum 2" in diameter x .75" thick and fully cover the bolt head and a minimum of ¼" of the threads closest to the bolt head. Each bolt shall have a ¼" EPDM gasket which is on the inside of the tank. The outer tank shall have an Hdxlpe bellows type transition fitting designed to form a leak tight seal around the inner tank fitting nipple.

OPTION: All side wall fittings shall have PVC flanged adapter and be 150 Lb. ANSI.

OPTION: 1. Titanium bolts encapsulated in black polyethylene
 2. Alloy C-276 bolts encapsulated in red polyethylene
 3. Alloy 400 (Monel) bolts encapsulated in blue polyethylene

4. Viton B Litharge Cured
5. Buna-N gaskets
6. Nitrile gaskets (FDA Approved)

B. TOP SUCTION PIPE (*if sidewall fittings are not preferred*)

The tank shall be supplied with an internal suction pipe with a weighted pipe support in order to draw the chemical from the top of the tank. There shall be no sidewall penetrations allowed.

C. DOME FITTINGS

All dome fittings shall be two-flanged Universal Ball Dome style. There shall be a single 150 Lb. ANSI PVC flange a ¼" EPDM gasket attached to the outside tank wall. The flange shall be bolted to the tank from the inside with a minimum of four (4) ½" diameter 316 S.S. all thread bolts with bolt heads encapsulated in green polyethylene. The encapsulation shall be a minimum 2" in diameter x .75" thick and fully cover the bolt head and a minimum of ¼" of the threads closest to the bolt head. Each bolt shall have a ¼" EPDM gasket which is on the inside of the tank. Flanges on the inside of the tank are not acceptable. All dome fittings shall be fume tight.

OPTION: All dome fittings shall have PVC flange adapters and be 150 Lb. ANSI.

- OPTION:
1. Titanium bolts encapsulated in black polyethylene
 2. Alloy C-276 bolts encapsulated in red polyethylene
 3. Alloy 400 (Monel) bolts encapsulated in blue polyethylene
 4. Viton B Litharge Cured
 5. Buna-N gaskets
 6. Nitrile gaskets (FDA Approved)

D. VENT FITTINGS

The vent shall be a PVC bulkhead fitting which shall be located center line dome, where the dome is flat. The vent fitting shall be fume tight. The gasket material shall be EPDM of ¼".

OPTION: 150 LB. ANSI Flange Adapter

- OPTION:
1. Viton B Litharge Cured
 2. Buna-N gaskets
 3. Nitrile gaskets (FDA approved)

E. TIE DOWN SYSTEMS

Tie down systems shall be 316 S.S. and be provided by the tank manufacturer. There shall be no protrusions through the wall. Anchor bolts shall be supplied by the general contractor.

OPTION: Epoxy Coated Steel

F. LEAK DETECTION DEVICE

An electronic leak detection device shall be supplied with each tank. Controls shall be mounted in a NEMA 4X plastic enclosure with power light, alarm silence push button, control relay, alarm horn with sound output @ 2 ft. to be 68-80 dB. Leak detection sensor shall be a polypropylene optic sensor.

G. FLEXIBLE JOINT

All lower sidewall connections shall have flexible connections. An EPDM or Viton Flange x Flange "Flexi-Joint" shall be supplied. Flexi-Joint to be installed after the tank shut-off valve by the GENERAL CONTRACTOR.

2.06 INSPECTION AND TEST PROCEDURES

- A. Test samples shall be taken from the manway cut out area or where fittings are inserted in each tank.
- B. Impact Test: ASTM 1998-Section 11.3 shall be used for this test. Sample shall not shatter at 120 ft. lbs. with sample at minus 20 degrees F for a ½-in wall thickness. For a wall thickness less than ½-in, the sample shall not shatter at 100 ft. lbs. and minus 20 degrees F.
- C. Degree of Crosslinking Test: ASTM 1998-Section 11.4 shall be used in this test. A minimum of 70 percent Gel must be obtained.
- D. Hydrostatic Test: Each tank shall be filled with water and checked for leaks by the manufacturer. The hydrostatic test shall be done after the fittings are installed.
- E. A certified certificate of compliance shall be provided by the manufacturer for impact tests, degree of crosslinking and hydrostatic tests.
- F. At the engineer's request, wall thickness readings shall be provided. The wall thickness readings shall be done using an ultrasonic thickness gage.

2.07 TANK PACKAGING

- A. All tanks shall be individually wrapped in polyethylene to protect the tanks from dirt, grease, oil, etc., during shipment and storage.
- B. All tanks shall be shipped from the tank manufacturer with fitting properly installed. In addition to shrink wrapping the tanks, all fittings shall be covered to prevent the entrance of dirt in a manner which allows the tank to breathe.

2.08 EQUIPMENT MANUAL

- A. Equipment manuals shall be supplied with all polyethylene tanks, and shall give detailed, descriptive instruction on external piping procedures, heater kit use, accessory installation and use, and general tank use guidelines.
- B. Tank Installation and Use Instructions booklet shall be supplied.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install the high density cross-linked polyethylene tanks in accordance with the drawings and the manufacturers instructions.
- B. Install the process piping in such a manner which allows the tank to expand and contract when filled and drained, as per the manufacturer's recommendation. All piping must be supported in accordance with the pipe manufacturer's recommendations. The expansion joint shall isolate the tank from the rest of the piping.
- C. Upon successful completion of the field test, tanks and support members shall be anchored in their final position according to the manufacturer's recommendations.

3.02 FIELD TESTING

- A. After installation, each tank shall be field tested by filling with water. The tank and fittings shall hold water without loss, evidence of weeping or capillary action for a period of 24 hours prior to acceptance.

SAMPLE STORAGE TANK SCHEDULE

<u>Tank Designation</u>	<u>Chemical 1</u>	<u>Chemical 2</u>	<u>Chemical 3</u>	<u>Chemical 4</u>	<u>Chemical 5</u>	<u>Chemical 6</u>
<u>Number of Tanks:</u> 1 2	2	2	2	1	2	
<u>Dimensions:</u>						
Diameter	10'-0"	10'	11'-11"	7'-1"	11'-11"	4'-0"
Height	12'-0"	16'-6"	16'-8"	11'-8"	6'-11"	6'-10"
<u>Tank Design S.G.</u> 1.9 1.9	1.9	1.9	1.9	1.9	1.9	
<u>Wall Thickness:</u>	.828	1.234	1.469	.656	.500	.250
<u>Tank Weight:</u>	1290 Lbs	2895 Lbs	4275 Lbs	680 Lbs	1450 Lbs	135 Lbs
<u>Volume, Gallons:</u>	6400	8500	12,000	3000	4300	550
<u>Chemical Name:</u> Potassium Hydroxide	Ferric Corrosion Chloride Inhibitor	Cationic Hydrofluocilic Polymer Acid	Sodium Hypochlorite	Hydrofluosilicic Acid		
<u>Concentration:</u> percent	38 percent 20 percent	20 percent 30 percent	15 percent	30 percent	50	
<u>Chemical Specific Gravity:</u>	1.4	1.16	1.21	1.3	1.53	1.4
<u>Tank Color:</u>	Grey	Green	Gold	Black	Natural	Blue
<u>Full Drain:</u>	Yes	Yes	Yes	Yes	Yes	Yes
<u>Fitting Materials:</u>						
Bolts, nuts, etc. (Sidewall)	Hastelloy C	316 SS	Titanium	Monel	316 SS	316
Bolts, nuts, etc. (Dome)	Ryton	316 SS	Ryton	Monel	316 SS	
316 SS Monel						
Gaskets (Dome)	EPDM	EPDM	EPDM	EPDM	EPDM	
EPDM EPDM						
Gaskets (Sidewall)	EPDM	EPDM	EPDM or Viton	EPDM	EPDM	
EPDM EPDM						

Additional Information Available

1. Ladders (FRP and steel)
2. Heat tracing and insulation
3. FDA Linings(Integrally Molded)
4. FDA Tanks
5. Internal and external drop tubes
6. Tank stands
7. IMFO Pads (8', 10', & 12' diameter X 4" thk.)
8. Secondary Containment Tanks
9. 100 MPH wind restraints for outdoor applications
10. Seismic restraint systems (indoor and outdoor)
11. Electronic Leak Detection Devices (used w/secondary containment tanks)
12. CPVC, Polypropylene, and all 316 S.S. fittings