Specification for Crosslinked Polyethylene Tank
with
Integrally Molded Flanged Outlet (IMFO)

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 storage tanks as shown on the Drawings an 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 @ 100º 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. H_20 tests have been performed by the manufacturer and all fittings were installed prior to H_20 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 have an Integrally Molded Flanged Outlet (IMFO) to achieve full drain.

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 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	ºC (ºF)	< -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 ºC)/ASTM D-256	joules/m (ft-lb/in)	240 (4.5)
Vicat Softening Temperature/ASTM D-1525	ºC (ºF)	121 (250)

Heat Deflection Temperature, 66 psi/ASTM D-648	ºC (ºF)	66 (150)
Bulk Density/ASTM D-1895	kg/m (lbs/ft)	370 (23)

C. The tanks shall be designed for 1.9 Specific Gravity using a hoop stress value of no greater than 600 psi at 100º F, with a safety factor of no less than 2, using the Barlow Formula for calculating wall thickness. For applications in excess of 100º F design conditions, lower values for the design hoop stress shall be used.

D. All edges cut out for manway or other openings shall be trimmed to have smooth edges.

E. The finished surface shall be as free as commercially practical from visual defects such as foreign inclusions, air bubbles, pin holes and craters.

F. 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. INTEGRALLY MOLDED FLANGED OUTLETS (IMFO's)

The IMFO shall be located at the bottom of the sidewall and allow the tank to be fully drained. The IMFO shall be integrally molded into the tank during the molding process. The IMFO shall be seamless, flanged, and manufactured from the same material as the tank. Inserts are not acceptable. A PVC companion flange assembly with a split back-up ring, SS bolts, and EPDM gasket shall be provided.

OPTION:
1. Titanium bolts
2. Alloy C-276 bolts
3. Alloy 400 (Monel) Bolts
4. Viton B Litharge Cured
5. Buna-N gaskets
6. Nitrile gaskets (FDA approved)

C. SIDE WALL FITTINGS

All fittings which are below the liquid level shall be bolted 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.

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)

D. 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)

E. 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)

F. SIGHT TUBE

A ¾" PVC sight tube with two (2) true union ball valves shall be furnished on all bulk storage tanks. The sight tube shall be teed off the IMFO and be piped into the dome of the tank. Dome fittings shall be per Part 2.05 D. A clear mylar strip adhesive backed calibrated in inches shall be

supplied for attachment to the sight tube. Tank manufacturer shall supply a calculated calibration chart with the submittal, showing gallons/inch of measurement. The sight tube shall be supported by a unistrut supplied by the general contractor.

G. 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

H. 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-inb, 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 a 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

Tank Designation	Chemical 1	Chemical 2	Chemical 3	Chemical 4	Chemical 5	Chemical 6	Chemical 7
Number of Tanks:	2	2	2	1	2	1	2
Dimensions:							
Diameter	10'-0"	10'	11'-11"	7'-1"	11'-11"	4'-0"	5'-4"
Height	12'-0"	16'-6"	16'-8"	11'-8"	6'-11"	6'-10"	6'-8"
Tank Design S.G.	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Wall Thickness:	.828	1.234	1.469	.656	.500	.250	.375
Tank Weight:	1290 Lbs	2895 Lbs	4275 Lbs	680 Lbs	1450 Lbs	135 Lbs.	245 Lbs
Volume, Gallons:	6400	8500	12,000	3000	4300	550	1000
Chemical Name:	Ferric Chloride	Cationic Polymer	Sodium Hypochlorite	Hydrofluosilicic Acid	Potassium Hydroxide	Corrosion Inhibitor	Hydrofluocilicic Acid
Concentration:	38 percent	20 percent	15 percent	30 percent	50 percent	20 percent	30 percent
Chemical Specific Gravity:	1.4	1.16	1.21	1.3	1.53	1.4	1.3
Tank Color:	Grey	Green	Gold	Black	Natural	Blue	Black
Full Drain:	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fitting Materials:							
Bolts, nuts, etc. (Sidewall)	Hastelloy C	316 SS	Titanium	Monel	316 SS	316 SS	Monel
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