

80% – 98% SULFURIC ACID STORAGE TANKS
Manufactured From Metallocene High Density Crosslinked Polyethylene (MHDXLPE)
With An Oxidation Resistant Polyethylene Liner.

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 (Quantity and Description) ---- vertical high density cross-linked polyethylene storage tank(s) designed for use with 80% - 98% Sulfuric Acid and approved containment system as shown on the Drawings and as specified herein.

Optional Section

- B. Cage ladder shall be furnished as a part of the work of this Section and shall be in accordance with OSHA standards. Tank shall be furnished with all lugs required for mounting the ladder as specified by the MANUFACTURER and rated by MANUFACTURER's for use with 80% -98% Sulfuric Acid.

Optional Section

- C. Leak detection system shall be furnished as a part of the work of this Section and shall be complete with tank system. The leak detection system shall be between primary and secondary walls and provided with associated fittings, down pipe, alarm, and control box.

1.02 SUBMITTALS

- A. Submit to the ENGINEER as provided in Section-----, shop drawings details of construction and erection as follows:
1. Dimensions of tank, fittings and attachments.
 2. Wall thickness calculations per ASTM D 1998-97 using 600 psi design hoop stress @ 100 degrees F.
 3. Locations of fittings and attachments.
 4. Resin used and a complete manufacturers specification of the resin used.
 5. Weight of tanks.
 6. Statement that fabrication is in accordance with these Specifications.
 7. Samples.
 8. Instructions for handling, storage and installation of tanks.
 9. Statement that materials and resin used are suitable for intended service.
 10. (Optional) Drawing details for ladder, platform, and safety cage as recommended by MANUFACTURER.

B. Drawing Approval

1. Shop drawings shall be approved by the ENGINEER prior to manufacturing of the tank(s). Approval of drawings by the ENGINEER shall not release the CONTRACTOR of responsibility of compliance with these specifications. All proposed changes to these Specifications shall be stated in writing

C. Samples.

1. Representative samples of the Metallocene High Density Crosslinked Polyethylene with an Oxidation Resistant Polyethylene Liner tank shall be furnished at the time of shop drawing review. These samples shall be from plant production and shall be representative of quality and impact resistance of tanks to be furnished. The ENGINEER may reject any tank which does not meet the standard of the representative samples.

D. References

1. Submit to ENGINEER list of previous 10 similar use site installations in the past 36 months.
2. Submit to the ENGINEER supporting information of UL tank manufacturing capabilities.
3. Submit to the ENGINEER supporting information of ISO 9001 certification.

1.04 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1. ANSI B16.5 – Pipe Flanges and Flanged Fittings.

B. American Society of Testing Materials (ASTM)

1. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
2. ASTM D746 – Brittleness Temperature of Plastics and Elastomers by Impact.
3. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D883 – Standard Definitions of Terms Relating to Plastics.
5. ASTM D1505 – Density of Plastics by the Density-Gradient Technique.
6. ASTM D1525 – Vicat Softening Temperature of Plastics.
7. ASTM D1693 – ESCR Spec. Thickness .125" F50 – 10% Igepal.
8. ASTM D1998 – Standard Specification for Polyethylene Upright Storage Tank: Section 11.3: Low Temperature Impact Test and Section 11.4: Oxylyene-Insoluble Fraction (Gel Test).

- C. Where reference is made to one of the above following standards, the revisions in effect at the time of the bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Tanks shall be constructed by a firm that has at least 10 years prior experience in construction of similar polyethylene tanks.
- B. The interior primary tank shall be of Metallocene High Density Crosslinked Polyethylene (MHDXLPE) and have an Oxidation Resistant Polyethylene Liner.
- C. Tanks shall be manufactured by a firm with a nationally accepted quality standard (i.e. ISO 9001)

1.06 SYSTEM DESCRIPTION

- A. The tank(s) will be used to store 80% -98% Sulfuric Acid liquid under normal operating conditions at ambient temperatures.
- B. Flange faces shall be protected from damage. All openings are to be covered to prevent the entrance of dirt and debris.
- C. Nozzles or other fittings shall not be used for lifting. Manway may be used for lifting only if recommended by manufacturer and only according to procedures submitted by manufacturer (See Paragraph 1.03 A). Handling of tank when filled is not recommended.
- D. Instructions shall be provided for unloading and installation of tanks.

Note: Horizontal tanks shall be mounted on horizontal tank support members constructed to provide easy handling for fork trucks or similar devices, and/or shall be provided with lifting lugs, cleats, etc., to permit handling by crane.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials, equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

Optional Section

- C. Hold-down devices shall be provided by the MANUFACTURER as specified by the certified ENGINEER.

Optional Section

- D. Each tank shall be supplied with an enclosed safety cage access ladder as specified by the MANUFACTURER.

2.02 MATERIALS

A. Plastic

- 1. The tanks shall be molded from Metallocene High Density Crosslinked Polyethylene. The resin used shall be Paxon 7004 as manufactured by Exxon/Mobil Chemical. Interior primary tank shall have an Oxidation Resistant Polyethylene Liner.

B. Fillers and Pigments

- 1. The plastic shall not contain any fillers. All plastic shall contain a minimum of 0.25 percent U.V. stabilizer and maximum of 0.60 percent. Pigments may be added as desired by the OWNER or as designated by the manufacturer, not to exceed 0.5 percent of dry blended or 2 percent if melt compound of the total weight of the tank.

2.03 METALLOCENE HIGH DENSITY CROSS LINKED POLYETHYLENE TANKS

- A. The Metallocene High Density Crosslinked Polyethylene tanks shall be designed for the following:

Tank Description

- 1. Tank Diameter: -- feet – -- inches
 - 2. Straight Wall Vertical Height: -- feet – -- inches
 - 3. Primary Tank: MHDXLPE with an Oxidation Resistant Polyethylene Liner.
 - 4. Straight Wall Capacity: ----- Gallons, not to exceed 6650 gallons.
 - 5. Chemical Stored: **80% -98% Sulfuric Acid.**
 - 6. Specific Gravity: **2.2**
 - 7. Tank Color: Natural or as specified
 - 8. Number of Tanks: -----
- B. The Metallocene High Density Crosslinked Polyethylene tanks shall be manufactured by Poly Processing Co. Inc., or approved equal. Unless otherwise indicated the plastics terminology used in this standard shall be in accordance with the design, manufacturing, and testing requirements found in ASTM D1998.

- C. The Metallocene High Density Crosslinked Polyethylene tanks shall be constructed by the rotational molding process.
 - D. The Metallocene High Density Crosslinked Polyethylene tanks shall be capable of storing Sulfuric Acids at 100 degrees F.
 - E. The Metallocene High Density Crosslinked Polyethylene tanks shall be constructed in the configuration listed below for optimal long term performance, safety, and environmental protection.
2. Metallocene High Density Crosslinked Polyethylene with Oxidation Resistant Polyethylene Liner up to 6650 gallons maximum with 2" maximum size sidewall fitting.

Note: IMFO outlet is NOT permitted.

- F. The nominal properties of the material are as follows based on molded parts:

Test Procedure	Units	Value
Density / ASTM D-1505	g/cc	.940 to .945
ESCR Cond. A, F50 / ASTM D-1693 10% Igepal	Hrs.	> 1000
Tensile Strength / ASTM D-638	Psi.	2,600
Elongation at Break 2-in/min. / ASTM D-638	Percent	400
Vicat Softening Temperature / ASTM D-1525	Degrees F.	240
Brittleness Temperature / ASTM D-746	Degrees F.	-130
Flexural Modulus / ASTM D-790	Psi.	100,000 to 110,000
Heat Distortion Temp. / ASTM D-648 At 66 psi	Degrees C.	67°
Low Temperature Impact ARM-Low Impact for 1/8" specimen	Ft. lbs.	75
Polyethylene Notch Test (PENT) ASTM F 1473 (176° F, 350 psi)	Hrs.	>1000
Long Term Hydrostatic (LTHS) (Creep) At 140° F	Psi.	900

Optional Section for Safe Tanks

- 3. Tanks shall consist of a MHDXLPE primary tank with a secondary containment. The primary tanks shall be vertical, cylindrical, flat bottom, dome top, and seamless in construction. The interior wall shall be lined with an Oxidation Resistant Polyethylene Liner. At the intersection of the sidewall and the dome of the tank, there shall be a molded section extending outwardly and perpendicular to the sidewall of the tank. The extension of the

dome of the primary tank shall be equal or larger in diameter than the barrel of the outer secondary tank. The dome extension shall extend to the outside diameter of the tank forming a weather shield for the outer tank. The secondary containment tank, outer tank, shall be a MHDXLPE, open top, vertical, cylindrical, flat bottom, and seamless in construction. The dimension details, and accessories shall be shown on drawings and specifications herein.

- F. The tank diameter shall be measured externally. Tolerance on the outside diameter including out of roundness shall be plus or minus 3 percent. Measurement shall be taken in a horizontal position. The knuckle radius at bottom to wall shall be a minimum of 1-in.
- H. The minimum wall thickness shall be ¼-inches in all places (or see 1.02A).
- I. All edges cut out, such as entrance manway, shall be trimmed to have smooth edges.

2.04 TANK TIE DOWN SYSTEMS - Optional Section

- A. 316 stainless steel or galvanized clips, bolts, and accessories shall be provided to securely anchor the tank to the cylindrical tank concrete pad in accordance with seismic zone _____ rating and/or _____ M.P.H. wind load rating.

2.05 ACCESSORIES - Optional Section

- A. The MHDXLPE tanks shall be equipped with the following accessories as shown on the Drawings:
 - 1. Top manway cover shall be at least____” inside diameter. The manway cover shall be a bolt on type or screw on type lid manufactured out of molded PE. Bolts used on the bolt on type lid shall be nylon or a compatible plastic material.
 - 2. Fittings: All openings (fittings) shall be in compliance with or better than the Poly Processing Company, Sulfuric Acid Position Statement (rev 3, August 11, 2000)

Sidewall

Sidewall fittings should only be installed on tanks 6650 gallons and below and must keep the Sulfuric Acid from contacting the tank wall cross section. Maximum fitting size is restricted to 2”.

Dome: No restrictions

Note: Fitting Material of Construction:

Concentration = 93%: 316SS or higher, Alloy C-276, schedule 80 PVC & CPVC.

Concentration 80% - 92%: Alloy C-276, schedule 80 PVC & CPVC.
Stainless steel not recommended.

Gasket Material of Construction: Litharge viton

Venting:

Atmospheric pressure must be maintained in tank at all times

Unrestricted vent size must exceed size of tank's largest fitting by 1"

Non-sealing lids recommended for additional pressure venting

If tank is filled pneumatically, 4" minimum *unrestricted* vent and *non-sealing lid* required.

B. Leak Detection System – Optional Section

1. Leak detection controls are to be mounted in a NEMA 4x plastic enclosure, (10"x8"x5"), with power on/off switch, power light, leak detection light, alarm silence push button, control relay, alarm horn with sound output at 2 feet to be 68-80 dB. Pilot devices are NEMA 4x rated. Leak detection sensor shall be a capacitive proximity switch of ABS plastic with a NEMA 4x rating and operate at a temperature of -25 degree to 70 degree C. (-13 to 158 degree F). The unit shall operate from 90 to 250 VAC, 50/60 Hz.

Load current = 5 to 200 mA AC

Leak current = 1.2 mA at 120 VAC, 2.4 mA at 240 VAC

On-state voltage drop = 20 volts max.

Operating frequency = 10 Hz

Inrush = 1.2 A (10 msec. Duration)

Sensing range = 3 – 25 mm

Sensor = 34 mm diameter, unthreaded plastic device with variable sensitivity adjustment capable of detecting metallic or non-metallic targets.

- C. All nozzles shall be in top of the chemical storage tanks if offered by the tank supplier as standard or optional. The flange attached to the tank wall shall be 150 lb ANSI and be constructed of PVC. There shall be a minimum of four ½-in diameter all thread bolts with bolt heads encapsulated in polyethylene. The polyethylene encapsulation shall fully cover the bolt head and a minimum of ¼-in of the threads closest to the bolt head. Each bolt shall have a gasket which is on the inside of the tank and each flange shall be comprised of material resistant to the chemical in storage.

- D. Furnish and install all precautionary labeling as recommended by the Manufacturing Chemists Association for each of the chemicals to be stored.

2.06 SHOP TESTING

- A. The tank manufacturer shall have quality control procedures adequate to insure that all fabrications comply with these Specifications. Quality control shall include in process inspections as well as a final inspection by the manufacturer and written record of these inspections. The objective of manufacturer's quality control and inspection procedure shall be to have the tank comply with the Specifications and Drawings at the time of the first inspection, thus eliminating any need for rework by the manufacturer or a second inspection by the ENGINEER.
- B. Inspection records shall be made for each tank. Inspection records shall be available to the ENGINEER. Upon request, manufacturer shall send a copy of his inspection records to the ENGINEER for review prior to inspection by the ENGINEER.
- C. Final acceptance by the ENGINEER may be contingent upon satisfactory inspection upon arrival, the delivery and installation at the job site.
- D. The tank manufacturer shall perform the tests described below prior to shipping. Test samples shall be taken from the cut out areas of where fittings are inserted in each tank. The Engineer or representative shall have the option of witnessing these factory tests.
 - 1. 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.
 - 2. Degree of Crosslinking Test: ASTM 1998-Section 11.4 shall be used in this test. A minimum of 70 percent Gel must be obtained.
 - 3. Hydrostatic Test: Each tank shall be filled with water and checked for leaks no less than one hour after filling.
 - 4. Wall Thickness: Each tank shall have an actual wall thickness measurement taken at every 90 degrees, at each one foot elevation, up to three feet from the bottom of the tank.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install the MHDXLPE tanks in accordance with the Drawings and the manufacturer's instructions.

- B. All fitting connections must be installed with flexible type connections as per the Manufacturers recommendations.
- C. Make all pipe connections to tanks as shown on the Drawings.
- D. Following 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 connecting pipes, and valving 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. The ENGINEER may also inspect each tank for defects, damage, and conformance with the Specifications.
- B. After testing, the tanks shall be thoroughly cleaned and dried.
- C. Should any defects become evident during inspection, testing, or within the guarantee period, the CONTRACTOR shall repair or replace the defective tank or fitting as approved by the ENGINEER.

3.03 WARRANTY

- A. The CONTRACTOR shall warrant the tanks to be free from defects in materials and workmanship and to be suitable for the applications and chemicals as specified in these Contract Specifications.
- B. The MHDXLPE tanks shall have a warranty equal to the Poly Processing Company Limited Warranty for the storage of 80% - 98% Sulfuric Acid (REV. C / April 15,2000).

END OF SECTION