

VERTICAL HIGH DENSITY CROSSLINKED POLYETHYLENE STORAGE TANKS

PART 1-GENERAL

1.01 Requirements

1. The CONTRACTOR shall provide a vertical, high density crosslinked polyethylene tanks and accessories per section 2.05, complete and in place, in accordance with the Contract Documents.
2. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the vertical tank(s) and its accessories as indicated.

1.02 REFERENCES, CODES AND STANDARDS

A. American Society of Testing Materials (ASTM).

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| 1. D638 | Tensile Properties of Plastics |
| 2. D883 | Standard Definitions of Terms Relating to Plastics |
| 4. D1505 | Density of Plastics by the Density-Gradient Technique |
| 5. D1525 | Test Method for Vicat Softening Temperature of Plastics |
| 6. D1693 | ESCR Specification Thickness 0.125" F50-10% Igepal |
| 7. F412 | Standard Terminology Relating to Plastic Piping Systems |

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

C. Building Code: Uniform Building Code, [1997 J Edition] / IBC 2000

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

1.03 SUBMITTALS

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

1. Vertical tank and Fitting Material
 - a. Resin Manufacturer Data Sheet
 - b. Fitting Material
 - c. Gasket style and material
 - d. Bolt material
2. Dimensioned Tank Drawings
 - a. Location and orientation of openings, fittings, accessories, restraints and supports.
 - b. Details of manways, flexible connections, and vents.
3. Calculations shall be stamped and signed by a registered, third party engineer where required.
 - a. Wall thickness. Hoop stress shall be calculated using 600 psi @ 100 degrees F.
 - b. Tank restraint system. Show seismic and wind criteria.

4. Electrical heat tracing installation details if required. **(Required or delete section)**
 5. Insulation data if required. **(Required or delete section)**
- B. Manufacturer's warranty
 - C. Manufacturer's unloading procedure (see Poly Processing Company Installation Manual)
 - D. Manufacturer's installation instructions (see Poly Processing Company Installation Manual)
 - E. Supporting information of Quality Management System.
 - F. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.
 - H. Factory Test Report
 1. Material, specific gravity rating at 600 psi @ 100 degrees F. design hoop stress.
 2. Wall thickness verification.
 3. Fitting placement verification.
 4. Visual inspection
 5. Impact test
 6. Gel test
 7. Hydrostatic test

1.04 QUALITY ASSURANCE

- A. The vertical tanks of the same material furnished under this Section shall be supplied by Poly Processing Company or approved equal who has been regularly engaged in the design and manufacture of chemical storage tanks for over 10 years.
- B. Tanks shall be manufactured from virgin materials.

1.05 WARRANTY

- A. The warranty shall be provided upon request for the specific service application. For most chemical applications, Poly Processing Company offers a limited 5 year full replacement warranty. See Poly Processing Company's chemical specific positions and warranty statement.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Tanks shall be rotationally-molded, vertical, high density crosslinked polyethylene one-piece seamless construction, cylindrical in cross-section and vertical with flat bottoms. Tanks shall be adequately vented as prescribed in Poly Processing Company's Technical Bulletin, Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer, date of manufacture and serial numbers must be permanently embossed into the tank.

2.02 MANUFACTURER

- A. Tanks shall be manufactured by Poly Processing Company

2.03 POLYETHYLENE STORAGE TANKS

- A. Service: Chemical storage tanks shall be suited for the following operating conditions:
- B. High Density Crosslinked Polyethylene resin used in the tank manufacture shall be by Exxon Mobil Chemicals or equal and 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 meet or exceed the following properties:

Property	Type I XLPE	ASTM Test
Environmental Stress Cracking Resistance, F50, hours, 10% Igepal	>1,000	D1693
Tensile Strength, Ultimate psi, 2-inch/minimum	2,830	D638 Type IV Specimen
Elongation at Break, % ,2-inch minimum	700	D638 Type IV Specimen
Flexural Modulus, psi	86,780	D790

- C. **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.

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

$$T = P \times OD/2SD \text{ or } 0.433 \times SG \times H \times OD/2SD$$

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

- a. 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.
- 2. 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.
- 3. 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
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4. Tanks with 3000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty.
 - a. Unless otherwise indicated, manways shall be 19-in diameter or greater and equipped with an emergency pressure relief device or SAFE-Surge™ Manway.
 - b. Unless otherwise indicated, bolted sealed top manway shall be 19- inches or greater and be in locations easily accessible from the nearest worker access position. The sealed manway shall be constructed of polyethylene material. The bolts shall be chemically compatible with the chemical being stored. Gaskets shall be closed cell, crosslinked polyethylene foam, Viton, or EPDM materials. NOTE: If pneumatically filling, venting must be in accordance with the following:

Venting Requirements For Polyethylene Tanks									
Mechanical Pump Fill	Pneumatic Fill								
IF ≤ 1000 gallons	IF - Vent length ≤ 3 feet			IF - Vent length > 3' and ≤ 30'			IF - Scrubber Application		
Vent size should equal size of largest fill or discharge fitting	AND - Vent screen mesh size ≥ 1/4" or no screen used			AND - 3 or less 90° elbows with no other restrictions or reduction in pipe size			Vent pipe size throughout scrubber system CANNOT be reduced! Centerline of dispersion pipe not to be submersed > 6 inches		
IF > 1000 gallons	Emergency Pressure Relief Cover Required			Emergency Pressure Relief Cover Required			Perforated dispersion pipe must be same diameter or larger, as vent. Sum of perforations ≥ cross sectional area of pipe		
Vent size should exceed the largest fill or discharge fitting by 1 inch	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size
	2"	2"	4"	2"	2"	6"	2"	2"	6"
	3"	2"	6"	3"	2"	6"	3"	2"	8"
	3"	3"	6"	3"	3"	8"	3"	3"	10"

(2) 2 inch vents DO NOT EQUAL 4 inch venting capacity

For detailed venting guidelines, please visit our Technical Resources at www.polyprocessing.com

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- D. Tank colors shall be natural (unpigmented), black (compounded), or other (compound colors) as specified by the ENGINEER with written agreement by the tank manufacturer.

2.04 TANK ACCESSORIES

A. Ladder: (Choose one or delete section)

1. [Painted carbon steel], {fiberglass}, [galvanized carbon steel] or [stainless steel] access ladders shall be provided with the polyethylene chemical storage tanks at locations as shown. Use proper chemical resistant materials when anchoring to tank dome or sidewall. Safety cages shall be added to ladders as required. Ladders must be designed to OSHA standard 2206; 1910.27.
2. Ladders must be secured to the tank and secured to the concrete to allow for tank expansion / contraction due to temperature and loading changes. See Poly Processing Company's Tank Installation Manual.
3. All ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 2206; 1910.27; fixed ladders.

B. Restraint System: (Choose one or delete section)

1. Metal components to be galvanized, stainless steel, or painted clips, edge softeners, and tension ring with stainless steel or galvanized cables and clamps.

(Required or delete section)

2. Seismic system to be designed to meet the proper seismic zone and specified wind load. PE stamped calculations and or drawings may be required based on individual project requirements.

2.05 TANKS:

- A. Tank Schedule per the following specifications

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

- B. Fittings

1. Tank fittings shall be according to the fitting schedule below. Fitting, gasket and bolt material shall be per requirements in section A, or a material that is compatible with the product being stored and shall be a minimum of ¼-in thick. 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.
2. Double flange fittings shall be constructed of virgin polyethylene. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have a gasket to provide a sealing surface against the flange and tank surface. Bolt holes shall straddle the principal centerline of the tank.
3. Bolted flange bulkhead fittings shall be constructed with one 150-lb flange installed inside the tank and one flange ring installed outside the tank. The flange will be socket or threaded according to specific connection requirements. The head of the bolts shall be encapsulated with polyethylene preventing fluid contact with the metal material. Encapsulated heads shall have a gasket to provide a sealing surface against the flange. Bolt holes shall straddle the principal centerline of the tank.
4. 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.
5. 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 tank capacity by 1/3) in accordance with the venting schedule listed above.
6. Flange Adapters: Adapters may be used to adapt threaded or socket fitting components to 150-lb flange connections. Adapters shall be of material compatible with the chemical stored.

2.06 LEVEL INDICATION **(Choose one or delete section)**

- A. 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 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.
- B. Ultrasonic Level Indicator: The ultrasonic level indicator shall be, (to be specified), and suitable for service in a non-hazardous/hazardous environment.

2.07 TANK INSULATION AND HEAT TRACING **(Choose one or delete section)**

- A. To be installed by Poly Processing Company

2.08 FACTORY TESTING

A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.
2. Degree of Crosslinking. Use Method C of ASTM D 1998- Section 11.4 to determine the ortho-xylene insoluble fraction of crosslinked polyethylene gel test. Samples shall test at no less than 60 percent.

B. Tank Testing

1. 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. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.
2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking, and delamination.
3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1/2 an hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the contractor.
- C. Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred, Poly Processing Company shall be notified immediately.

3.02 INSTALLATION

- A. Install the tanks in strict accordance with Poly Processing Company's Tank Installation Manual and shop drawings.

3.03 FIELD TESTING

- A. Poly Processing Company recommends that all tanks be hydro-tested for 24 hours prior to commissioning.

End Of Section