

SECTION 337020

HIGH DENSITY LINEAR POLYETHYLENE (HDLPE) SODIUM HYPOCHLORITE STORAGE TANK

PART 1 - GENERAL

1.1 SCOPE

- A. The work includes the supply of **two** upright, double-wall, flat bottom high density linear polyethylene resin (e.g., HDLPE) 2,000-gallon bulk storage tank for storage of sodium hypochlorite. The assembly of the tanks will consist of one cylindrical inner primary tank and one blended form octagonal outer secondary tank. Each tank shall be a molded in one-piece seamless construction by rotational molding. The tanks shall be designed for above-ground, vertical installation and capable of containing chemicals at atmospheric pressure. The assembly shall be designed to prevent rainwater from entering the containment tank. The design shall allow direct primary tank base retention for up to seismic zone 4 conditions per UBC code requirements. The containment tank shall be designed to hold a minimum of 115% of the normal fill capacity of the primary tank, for transfer of chemicals. Included in this specification are requirements for material properties, design, construction, dimensions, tolerances, workmanship, and appearance. The tank shall have UV inhibitor in the resin material. The disposal of the existing tanks that are to be replaced is also required.
- B. 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. For the general configuration, the current items to be replaced are Snyder 2,000-gallon double walled tanks manufacture number 557000045.
- C. The 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.

1.2 GENERAL

1.3 METHOD OF MEASUREMENT AND PAYMENT

The work shall be measured, and the compensation determined in the following manner including all labor, materials, equipment, accessories, installation, and testing necessary to complete all the work in accordance with the contract documents.

- 1.4 REFERENCED STANDARDS (LATEST REVISION)
- A. ASTM (American Society for Testing and Materials) Standards:
D618 Conditioning Plastics and Electrical Insulating Materials for Testing
- D638 Tensile Properties of Plastics
- D790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- D883 Definitions of Terms Relating to Plastics
- D1505 Density of Plastics by the Density-Gradient Technique
- D1525 Test Method for Vicat Softening Temperature of Plastics
- D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
- D1998 Standard Specification for Polyethylene Upright Storage Tanks
- D2765 Degree of Crosslinking in Crosslinked Ethylene Plastics as Determined by Solvent Extraction
- D2837 Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- D3892 Practice for Packaging/Packing of Plastics
- F412 Definitions of Terms Relating to Plastic Piping Systems
- B. ARM (Association of Rotational Molders) Standards:
Low Temperature Impact Resistance (Falling Dart Test Procedure)
- C. ANSI Standards:
B-16.5 Pipe Flanges and Flanged Fittings
- D. OSHA Standards:
29 CFR 1910.106 Occupational Safety and Health Administration,
Flammable
and Combustible Liquids
- E. UBC CODE:
Uniform Building Code 1997 Edition

1.5 CHEMICAL COMPATIBILITY

- A. Chemical compatibility shall be according to the following chemical resistance guides:

Pruett, Kenneth M., "Chemical Resistance Guide for Elastomers", Compass Publications.

Pruett, Kenneth M., "Compass Corrosion Guide II", Compass Publications.

- B. These references shall be considered as general guidelines only. In many cases, combinations of these chemicals are used in such a way that only the customer (by testing molded product samples) can make a determination in regards to acceptability.

1.6 SUBMITTALS

- A. The Contractor shall submit in writing documentation to justify approval of these materials by NPU prior to the start of the project.

The Contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

For materials that the Contractor is requesting deviations from this specification and/or Standard details, the Contractor shall submit in writing a minimum of 60 days prior to construction, documentation to justify approval of these materials by Engineer and NPU.

No fabrication shall take place until the final shop drawings are reviewed by Engineer and NPU. Final approval is at the discretion of NPU.

PART 2 - PRODUCTS

2.1 GENERAL

The materials used in this work shall be all new and conform to the requirements for material and design requirements as specified below.

2.2 MATERIALS

- A. The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer. The tanks shall be made from linear polyethylene resin as manufactured by Exxon Chemical, or resin of

equal physical and chemical properties.

- B. All polyethylene resin material shall contain a minimum of a U.V. 8 stabilizer as compounded by the resin manufacturer. White pigments shall be added to provide UV protection on the inner tank, but shall not exceed 0.25% (dry blended) of the total weight.
- C. Mechanical Properties of Type II tank material:

<u>PROPERTY</u>	<u>ASTM</u>	<u>VALUE</u>
Density (Resin)	D1505	0.940-0.947 g/cc
Tensile (Yield Stress 2"/min)	D638	2700 PSI
Elongation at Break (2"/min.)	D638	350%
ESCR (100% Igepal, Cond. AF50)	D1693	400-1000 hours
ESCR (10% Igepal, Cond. A, F50)	D1693	200-500 hours
Vicat Softening Degrees F. Temperature	D1525	235
Flexural Modulus	D790	97,000 – 103,000 PSI

2.3 DESIGN REQUIREMENTS

- A. The minimum required wall thickness of the cylindrical shell at any fluid level shall be determined by the following equation, but shall not be less than 0.187 in. thick.

$$T = P \times O.D. / 2 SD = 0.433 \times S.G. \times H \times O.D. / 2 SD$$

T = wall thickness
 SD = hydrostatic design stress, PSI
 P = pressure (.433 x S.G. x H), PSI
 H = fluid head, ft.
 S.G. = specific gravity, g/cm³
 O.D. = outside diameter, in.

1. The hydrostatic design stress shall be determined by multiplying the hydrostatic design basis, determined by ASTM D2837 using rotationally molded samples, with a service factor selected for the application. The hydrostatic design stress is 600 PSI at 73 degrees Fahrenheit for Type I and Type II materials. In accordance with the formula in 6.1, the tank shall have a stratiform (tapered wall thickness) wall.
2. The hydrostatic design stress shall be rated for service above 100 degrees Fahrenheit and for mechanical loading of the tank.
3. The standard design specific gravity shall be 1.9.

- B. The minimum required wall thickness for the cylinder straight shell must be sufficient to support its own weight in an upright position without any external support. Secondary containment tanks shall be designed to meet this same containment thickness requirements. The secondary

containment shall be configured to allow shipment of the primary tank inside of the secondary tank. The shipment shall be done without the aid of additional spacer blocks, which can be lost during shipment causing tank damage.

- C. The top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall. The primary tank top shall be configured to prevent rain water from entering the secondary containment tank. The top head of tanks shall be designed to provide a minimum of 1300 square inches of flat area for fitting locations. The primary tank shall be keyed to the secondary tank preventing primary tank rotation. The secondary containment shall have 115% of the normal fill capacity of the primary tank.
- D. Tanks shall have a minimum of 3 lifting lugs integrally molded into the top head. The lifting lugs shall be designed to allow erection of empty primary and secondary tanks. Tanks shall be capable of being lifted into position as a unit (primary and secondary tanks).
- E. The tank shall be designed to provide a minimum of 4 tie-down lugs integrally molded into the top head. The tie-down lugs shall be designed to allow tank retention in wind and seismic loading situations without tank damage. The primary/secondary tank unit shall be configured to allow direct primary tank base retention for seismic load conditions. The base retention unit shall be anchor bolted to an appropriate structure and not require additional spacer blocks.

2.4 DIMENSIONS AND TOLERANCES

- A. All dimensions will be taken with the tank in the vertical position, unfilled. Tank dimensions will represent the exterior measurements.
 - 1. The tolerance for the outside diameter of the primary tank, including out of roundness, shall be per ASTM D1998.
 - 2. The tolerance for fitting placements shall be +/- 0.5 in. in elevation and 2 degrees radial at ambient temperature.

PART 3 – EXECUTION

3.1 TEST METHODS

- A. Test specimens shall be taken from fitting location areas or piggy-back test molds.
- B. Low Temperature Impact Test

1. Test specimens shall be conditioned at -40 degrees Fahrenheit for a minimum of 2 hours.
2. The test specimens shall be impacted in accordance with the standard testing methods as found in ASTM D1998. Test specimens < 1/2" thickness shall be tested at 100 ft.-lb. Test specimens > 1/2" thickness shall be tested at 200 ft.-lb.

C. Ultrasonic Tank Thickness Test

1. All tanks shall be measured for tank wall thickness at 6", 1ft., 2ft. and 3ft. on the tank sidewall height at 0° and 180° around the tank circumference with 0° being the tank manway and going counter-clockwise per ANSI standard drafting specifications. A copy of this test report can be ordered when placing the original tank order. All tanks shall meet design thickness requirements and tolerances.

D. Hydrostatic Water Test

1. The hydrostatic water test shall consist of filling the tank to brim full capacity for a minimum of four hours and conducting a visual inspection for leaks. A hydrostatic water test will be conducted if ordered by the customer.

E. The tank shall be visually inspected to determine such qualities as are discussed in below under section 3.2 Workmanship.

3.2 WORKMANSHIP

- A. The finished tank wall shall be free, as commercially practicable, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking and delaminations that will impair the serviceability of the vessel. Fine bubbles are acceptable to the degree in which they do not interfere with proper fusion of the resin melt.
- B. All cut edges where openings are cut into the tanks shall be trimmed smooth.

3.3 TANK FITTINGS (NOZZLES)

- A. Top Fittings - Threaded Bulkhead
The bulk storage tanks shall be supplied with a 3" bulkhead fitting on the top for a vent and shall include a 3" U-vent with a vinyl mesh bug screen glued on the end of the vent pipe, a 2" fitting for a fill line and a 6" fitting on the top for an ultrasonic detector. The bulkhead fittings shall be constructed of PVC. Gaskets shall be a minimum of 1/4"

thickness and constructed of 60-70 durometer Viton.

B. Fittings – Unified Fitting Outlet (UFOTM) for Bulk Tanks Only

1. The UFO shall provide a flexible containment seal between the inner primary tank and the outer secondary containment tank. This fitting outlet when used in combination with fittings as described below provides access for connecting piping to the inner primary tank while maintaining containment integrity between the inner primary tank and the outer secondary containment tank. This fitting outlet shall be used for the 2-inch fitting sizes.
2. The fitting outlet shall consist of 1 ea. flexible polyethylene containment boot, 1 ea. appropriate fitting gasket, 1 ea. UFO gasket, 1 ea. solid 304 stainless steel UFO flange, 1 ea. split 304 stainless steel UFO flange, and 12 ea. 3/8 in. 304 stainless steel bolt assemblies. Gaskets shall be a minimum of 1/4" thickness and constructed of 60-70 durometer Viton.

C. Fittings - Siphon Tube Fittings for Bulk Tanks Only

Siphon tubes shall be added to the UFO fittings specified above. A siphon tube will allow these fittings, when used as drainage fittings, to provide better tank drainage.

3.4 TANK ATTACHMENTS

A. Tank Attachments – Ultrasonic Level Indicator

1. The Contractor shall transfer over the existing ultrasonic level sensor from the existing tank to the new tank.

B. Tank Attachments - Manway

1. Manways shall be a 24 in. vented threaded style (minimum opening diameter of 22 inches) for the bulk sodium hypochlorite tank. All manways shall be constructed of polyethylene material.

C. Tank Attachments – External Fill Pipes for Bulk Storage Tanks Only

1. An external 2" Schedule 80 PVC bulkhead fitting shall be supplied to attach 2" fill pipe. A 2" Schedule 80 PVC fill line shall be attached to the bulkhead fitting with a 2" isolation ball valve and male chemlock fitting on the end.

D. Tank Attachments - U-Vents

1. A 3" PVC Vent shall be supplied with the tank with a vinyl bug screen on the end. Vents must comply with OSHA 1910.106 (F) (iii) (2) (IV) (9)

normal venting for atmospheric tanks or other accepted standard and shall be as large as the filling or withdrawal connection, whichever is larger but in no case less than 1 in. nominal inside diameter. The vent line shall be run outside the building.

3.5 TANK ACCESSORIES

A. TANK ACCESSORIES – TIE DOWN SYSTEMS

1. The existing tie down system is in poor shape and shall be replaced. The tie down system shall be designed to withstand 110 MPH wind loads. Tie down systems must meet seismic zone 4 requirements per UBC 1993 code. Any anchor bolts shall be provided by the customer per the instruction and the base plates for the system.
2. The tie down system shall be galvanized steel as it holds up best to sodium hypochlorite exposure.

B. TANK ACCESSORIES – LADDER

1. The Contractor shall transfer over the existing ladder to the new tank. The existing ladder is designed for a Snyder tank. If the Contractor uses another brand it is the Contractor's responsibility to fabricate an appropriate attachment for the existing ladder to the tank.

3.6 MARKING, PACKING AND PACKAGING

- A. The tanks shall be marked to identify the product, date (month and year) of manufacture, capacity, and serial number. The tank shall be shipped with a 3 of 9, HRI bar code label containing tank description, manufacturing order number, part number, serial number, manufacturer, and date.
- B. The proper caution or warning signs as prescribed by OSHA standard 29 CFR 1910.106 shall be customer determined and supplied.
- C. All packing, packaging, and marking provisions of ASTM Practice D3892 shall apply to this standard.
- D. All fittings shall be installed, removed and shipped separately.

END OF SECTION