Manufacturing Specification for Double Wall Vertical Storage Tanks

PART 1.0

**SCOPE**

Furnish (Qty) high density cross-linked polyethylene double wall storage tanks manufactured by Assmann Corporation of America, Garrett, IN (888) 357-3181 or approved equal, in accordance with the definitions given in ASTM D 1998 (polyethylene upright storage tanks). This specification covers polyethylene tanks manufactured in one-piece construction by rotational molding at our facility in Garrett, IN or Marshall, TX. The tanks within this specification are for above ground installation and are capable of containing contents at atmospheric pressure and temperature. Cross-linked tanks should not exceed 150 F during normal service. Tank capacity and model shall be listed within this specification.

PART 2.0

**MATERIALS**

**2.1 Plastics**

The tanks shall be molded from crosslinked polyethylene. The resin used for molding shall be Schulink XL350, as manufactured by A. Schulman, or approved equal. The plastic shall contain no fillers. All plastic shall contain a minimum of 0.3% U.V. stabilizers compound by the resin manufacturer. Pigments may be added as desired by the customer or as designated by the tank manufacturer, not to exceed 0.5%-dry blended and 0.2%-compounded in, of the total weight. The mechanical properties of the polyethylene shall include ESCR, condition A F50 results for 100% Igepal as defined in ASTM D1593 as well as the results using a 10% Igepal solution. Both test results must exceed 1000 hours of exposure without failure. The tank manufacturer must supply a copy of the mechanical property table as provided by the resin manufacturer for the resin used to manufacture the specified polyethylene tank.

PART 3.0

**TANK CONSTRUCTION**

**3.1 Design Parameters**

The tanks shall be designed with a hoop stress value no greater then 600 PSI at 100 degrees F, with a safety factor of no less than 2. The Barlow Formula shall be used to calculating the wall thickness at the bottom sidewall or at the area of the tank that experiences the greatest head pressure. The manufacture shall produce the crosslinked polyethylene tank with verifiable uniform wall thickness throughout the entire surface area of vessel. The cross-linked tank shall have a minimum 70% crosslinking throughout and Gel Test results shall be provided by the manufacturer using the test method as defined in ASTM D 1998. The sample used for the test shall come from the lowest point possible on the sidewall of the tank. The vessel shall be air cooled to ensure a consistent cure throughout the thickness of the part and reduce the stress caused by shrinkage.

**3.2 Appearance**

The finished surface shall be as free as commercially practical from visual defects such as foreign inclusions; air bubbles, pinholes, and craters. All edges where openings are cut into the tanks shall be trimmed smooth.

**3.3 Dimensions and Tolerances**

The tank diameter shall be measured externally. The tolerance on the outside diameter shall be plus or minus 3%. The measurement shall be taken with the tank in the vertical position. All tanks shall have a minimum 2” knuckle radius.

PART 4.0

**DESCRIPTION OF VESSEL**

**4.1 Tank Design**

The design of the vessel shall be vertical, flat bottom, closed top, and seamless in construction.  The dome of the primary tank shall be larger in diameter than the diameter of the straight shell sidewall. The diameter of the secondary tank shall be the same as the diameter of the dome on the primary tank. The dome of the primary tank sitting inside the secondary tank shall provide a weather shield for the secondary tank restricting the elements from entering.

The outer tank shall be vertical, flat bottom, open top, and seamless in construction and shall have a minimum of four flats on the bottom sidewall that extend towards the center of the vessel providing a means to center the primary tank. The flats shall also provide an area for the placement of bottom discharge fittings. The flats shall also provide stability for the primary tank for installations that require seismic restraint systems.

The two vessels shall be fastened together with stainless steel hardware for shipping and handling and shall provide lifting devices for tank placement.

Wall thickness for both primary and secondary vessels will be uniform throughout and verifiable via wall thickness testing procedures. Thickness of top sidewall will be consistent with bottom sidewall.

Part 5.0

**ACCESSORIES**

**5.1 Side Wall Fittings**

Fitting shall pass through the sidewall of both the primary and secondary tank on the flats provided by the secondary tank. 1 each (insert size required) fitting shall pass through the sidewall of the primary and the secondary tank. The fitting shall be a metallic double male bolted style fitting. The metallic fitting shall be constructed out of material compatible with the tank contents.  Fitting shall be constructed to an ANSI 150 LB flange bolt hole pattern. A single gasket shall be placed between the metallic fitting and the inside of the primary tank wall. A second gasket shall be installed between the outside of the primary tank and the inside of the secondary tank. All mounting hardware shall be compatible with the tank contents. The sidewall fitting shall be constructed in a manner as not to expose cross sections of walls as might otherwise result by installation of the fitting. Fitting shall be located on the lower sidewall of the storage tank on the recessed fitting placement flat. Tank shall be shipped with discharge nozzle installed. No additional fitting installation will be required onsite.

**5.2 Dome Fittings**

Tanks shall be equipped with three (3) molded in fitting placement flats. Molded in flats shall be at 90-degree increments from tank manway. Flats shall be 14" x 14" square. All dome connections shall be PVC bulkhead fittings with EPDM elastomers, manufactured by Hayward Industries. The use of Hayward Self-aligning dome fittings is permittable if the tank nozzle must be located off of a molded in flat. Fabricated self-aligning dome fittings are acceptable on sizes larger than 3”. All dome fittings shall be fume tight.

**5.3 Manway Covers**

The standard manway shall be a 16” diameter opening molded integrally with the primary tank.  The design shall be such that the polyethylene cover for the standard opening snaps over the molded lip and is secured with a nylon lever-lock. The optional manway covers shall be either 22” bolted and gasketed with a ½” thick polyethylene plate, ½” thick XLPE gasket and PVC threaded bolts, or a 22” diameter hinged and weighted manway to allow for additional venting.  The optional manway covers shall be mounted on a raised flat molded integrally with the primary dome for structural support.

**5.4 Vents**

The vent size shall be directly related to the size of piping specified for discharge and filling. The size of vent shall also take into consideration product flow and air pressure experienced in normal fill and discharge operations. The standard vent shall be a schedule 40 PVC u-vent assembly.  Vents should be designed 2 times the largest inlet or outlet connection.

**5.5 Ladders (optional)**

All ladders for use with polyethylene tanks shall be FRP as required by the customer. Ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 2206; 1910.27; fixed ladders. All ladders shall be supplied with necessary assembly mounting hardware to mount to the storage tank. The ladder stand-off bracket shall be polyethylene material and conform to the tanks diameter to eliminate any stress point on the vessel. Concrete anchors shall be provided by the contractor. Ladders shall be designed to help deter personal from walking on tank roof. Top ladder rung or platform shall terminate 48" below tank roof.

**5.6 Heat Tracing and Insulation (optional)**

Tank shall be electrically heat traced to ensure that the contents are maintained at 50°/ 80° / 100° F Heat loss calculations shall be based upon a minimum ambient temperature of \_\_\_º F. The tank location is (indoors or outdoors) \_\_\_\_\_\_\_\_\_\_ and exposed to \_\_\_\_ mph wind. The tank shall be heated by using one or more Heating Panel. Sets are to be flat, flexible elements, 11" wide and may be up to 19 panels long. Up to five Panel sets, or a total of 95 panels of element, may be operated on one Control Unit. Each heating panel shall operate on 120 vac single phase. Each heating panel shall be of the low watt density design with a maximum power density of 40 watts/ Per Linear Foot. Over-temperature operation of the heating panel shall be prevented by the use of an over-temperature cut out switch that is an integral part of the heater construction. Heating panels shall be supplied with adhesive backing and “peel off” protection film, such that the heater can be directly bonded to the tank surface. One NEMA 4X digital controller shall control the tank heating system. The controller shall incorporate two thermostats, switching the heating system via one Solid State Relay. The primary thermostat shall be set to control the desired product temperature. The secondary thermostat shall be configured and wired to provide over-temperature protection for the total heating system. The entire area of the sides and top of the tank shall be insulated with a minimum 2” thick sprayed on 2.8 lb. density urethane foam. The urethane foam shall be coated for ultra violet protection with 20 mils of Grey acrylic elastomer.

**5.7 Seismic Restraint System (optional)**

Restraint systems are designed per IBC 2009 and ASCE wind-load and seismic conditions. Design calculations must include both tank and restraint systems loads. Finite analysis of tank must be provided during the submittal process. Anchor bolts and concrete requirements must also be provided. Restraint system will consist of polyethylene anchor points evenly spaced around the tank base. The restraint points shall be cabled to the tanks lifting lugs with either stainless steel or galvanized components. Restraint system calculations will be stamped by a registered engineering in either Indiana or the state of the systems installation.

**5.8 Name Plates**

Self adhesive, phenolic plastic engraved name plates shall include:

Type of vessel, total volume and working capacity, product being stored including percentage of concentration, date vessel manufactured, and name of facility owner.

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| 5.9 Tank Description & nozzle requirements |
| Tank |  |  |  |  |
| **Nozzle****Description** | **Nozzle Size** | **Nozzle Type** | **Nozzle Location** | **Special Equipment** |
| Assmann Model | Manway | 16” | Std. | Dome | Ladder |
| Diameter & Height | Outlet | 3” | Metallic | Sidewall 6” elevation | Nameplate |
| Chemical stored | Inlet | 2” | Bulkhead | Dome | Insulation |
| Temperature | Vent | 4” | Bulkhead | Dome |  |
| Indoors/Outdoors | Level | 2” | Self-Aligning | Dome |  |

**6.1 Inspection and Test Procedures**

Full ASTM testing & documentation shall include:

Gel Test (Crosslink only), Impact testing, Hydrostatic Test,

Light Test, Wall Thickness Report.

Hydrostatic testing shall be done on all tanks to ensure a leak proof seal on all installed fittings and a certificate of compliance shall be sent with the tank. Impact test shall be performed in accordance with ASTM D 1998. The degree of crosslinking shall be performed in accordance with ASTM D 1998. The minimum acceptable crosslink percentage shall be 70%. Tank wall thickness must be measured in increments of one foot elevations at 0°, 90°, 180° and 270°.  Measurements will record entire wall thickness from sidewall bottom to sidewall top and will include vessel dome and base.

**7.1 Interstitial Leak Detection System**

Each tank shall be installed with a leak detection system to detect liquids within the interstitial space between the primary and secondary tank. Leak detection control system shall be mounted in a NEMA 4X enclosure. The system shall include both audible and visual alarms, as well as an optional auxiliary relay output rated at 5A @ 120 VAC. The audible alarm shall have an output of approximately 95 dB at two feet distance. A flashing strobe light shall be mounted at the bottom of the enclosure as well a button to silence the audible alarm. The leak detection probe shall be conductance type and be provided with 16 feet of interconnection cable. The leak detection system shall be manufactured in the USA. Assmann Corporation of American shall provide a model LDA-1 or and approved equal.