Vertical Double Wall Captor™
Polyethylene Tank Specification

PART 1 - GENERAL

1.01 Scope

A. This specification covers upright, double wall, flat bottom storage tank assemblies. The assembly consists of one cylindrical inner primary tank and one blended form octagonal outer secondary tank. Each tank is molded in one-piece seamless construction by rotational molding (laminated or fabricated tanks will not be accepted). The tanks are designed for above-ground, vertical installation and are 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 conditions per IBC code requirements. The containment tank shall be designed to hold a minimum of 115% of the normal fill capacity of the primary tank. Included in this specification are requirements for material properties, design, construction, dimensions, tolerances, workmanship, and appearance. Tank capacities are from 550 gallons (2082 L) up to 12,500 gallons (47,313 L).

B. This specification does not cover the design of vessels intended for use at pressures above or below atmospheric conditions. It is also not for vessels intended for use with liquids heated above their flash points, temperatures above 140 degrees Fahrenheit for Type I materials, or temperatures above 130 degrees Fahrenheit for Type II materials. (Note: See 1.08 A.2. for chemicals being stored above 100 degrees F)

C. Contractor shall supply and install all materials, equipment, appurtenances, specialty items, and services required to provide an upright, double wall, flat bottom, closed top, polyethylene storage tank for storage of the chemical application(s) described in Table I. Each tank is to be molded in one-piece seamless construction according to ASTM D 1998 (laminated or fabricated tanks will not be accepted) and will be capable of storing the chemical application at atmospheric pressure.

1.02. Manufacturer

A. Tanks shall be manufactured by Snyder Industries Inc. or approved equal.

1.03 Applicable Documents

A. ASTM (American Society for Testing and Materials) Standards:

1. D618 Conditioning Plastics and Electrical Insulating Materials for Testing
2. D638 Tensile Properties of Plastics
3. D790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
4. D883 Definitions of Terms Relating to Plastics
5. D1505 Density of Plastics by the Density-Gradient Technique
6. D1525 Test Method for Vicat Softening Temperature of Plastics
7. D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
8. D1998 Standard Specification for Polyethylene Upright Storage Tanks
9. D2765 Degree of Crosslinking in Crosslinked Ethylene Plastics as Determined by Solvent Extraction
10. D2837 Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
11. D3892 Practice for Packaging/Packing of Plastics
12. 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. IBC CODE: International Building Code 2021 Edition

F. CBC Code: California Building Code 2022 Edition

G. NSF/ANSI Standard 61 – Drinking Water System Components (Type II resin)

H. 40 CFR-264.193

1.04. Submittals

A. Drawings and Data: The manufacturer's shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the tank(s). Data and specifications for the equipment shall include, but shall not be limited to the following submittals.

B. Contractor shall submit for review sufficient literature, detailed specifications, and drawings to show dimensions, materials used, design features, internal construction, weights and any other information required by the ENGINEER for review of storage tanks and accessories.

C. Information to be included with the submittals is specified below:

1. Shop drawings for the tanks shall include as a minimum the following:

    a. Service Conditions: Chemical environment and temperature.

    b. Statement that fabrication shall be in accordance with ASTM D 1998, where applicable.

    c. Sizing and description of the fittings and accessories for each tank that are to be supplied by the tank manufacturer.

    d. Layouts and assembly schedules for each tank identifying the location and elevation from the bottom of the tank for all connections and appurtenances supplied by the tank manufacturer.

2. Resin - A copy of the resin data sheet from the resin manufacturer for the tank is to be supplied and the tank manufacturer is to certify that it will be the resin used in the manufacture of the tank. Verification may be required if the resin is to be FDA or NSF 61 listed.

3. Wall thickness - Prior to the manufacture of the tank the designed wall thickness audit is to be supplied based upon ASTM D1998 @ 100 degrees F. (Note: See 1.08 A.2 for chemicals being stored above 100 degrees F)

4. Tank restraint – If supplied, the drawings and calculations for the system are to be provided. Note: Wet stamped or site specific drawings and calculations may be required.

5. Supporting information on fittings and accessories to be supplied; heat system, insulation, mastic coating, etc.

6. Technical Manuals: The tank manufacturer's "Guideline for Use & Installation" is to be submitted for review.

7. Installation certificate: Once installed the installer is to certify that the tank system has been installed according to the tank manufacturer's Guidelines for Use & Installation.

8. Manufacturer's warranty

9. Manufacturer Qualifications: The manufacturer is to have rotationally molded polyethylene tanks based upon ASTM D 1998 utilizing Type I and Type II resins for the last 10 years.

10. Factory Test Report: Upon completion of the tank the manufacturer's inspection report is to be supplied for each tank.

    a. Verification of wall thickness (See 1.09 E.)
    b. Impact test (See 1.09 C.)
    c. Gel test – (Type I resin only) (See 1.09 D.)
    d. Hydrostatic test (See 1.09 F.)
    e. Verification of fitting placement (See 1.09 B.)
    f. Visual inspection (See 1.09 G.)
    g. Verification of materials

1.05. Service Conditions

Note: The tank color will be based upon the chemical application and UV exposure of the installation. Tank color is to be natural, black or opaque white.

Table I – Service Conditions

Tank #	Chemical Stored	Concentration / Specific Gravity	Tank Location Inside/Outside	Operating Temperature	Fitting Material	Gasket Material	Bolt Material

1.06. Chemical Compatibility

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

Compass Publications -
Pruett, Kenneth M., “Chemical Resistance Guide for Plastics”
Pruett, Kenneth M., “Chemical Resistance Guide for Metals and Alloys”
Pruett, Kenneth M., “Chemical Resistance Guide for Elastomers III”

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.

Note: Contact the manufacturer for applications that are not listed below.

Chemical	Concentration	Tank Resin	Tank Design Info	Fitting Material	Gasket Material	Bolt Material
Acetic Acid	60	HDLPE & XLPE	1.5/ASTM	PP/PVC	EPDM	316SS/Hastelloy/Titan.
Acetic Acid	80	HDLPE	1.9/ASTM	PP	EPDM	316SS/Hastelloy/Titan.
Acrylic Emulsions	50	XLPE	1.9/ASTM	PVC	EPDM	316SS
Aluminum Sulfate	50	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Ammonium Sulfate	40	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Calcium Carbonate	Saturated	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS
Calcium Chloride	40	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Citric Acid	Saturated	HDLPE	1.9/ASTM	PVC/PP	EPDM	316SS
DEF (Diesel Exhaust Fluid)	32.5	HDLPE & XLPE	1.35/ASTM	316 SS	EPDM	316SS
Deionized Water	Up to 18.3 mΩ	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS
Ethylene Glycol	100	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS
Ferric Chloride	50	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	Hastelloy/Titan.
Ferric Sulfate	60	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Ferrous Chloride	Saturated	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	Hastelloy/Titan.
Ferrous Sulfate	20	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	Hastelloy
Hydrochloric Acid	37	HDLPE	1.9/ASTM	PVC	Viton	Hastelloy
Hydrofluoric Acid	48	HDLPE	1.9/ASTM	PP/PVC	Viton	Hastelloy
Hydrofluosilicic Acid	26	HDLPE/XLPE*	1.9/ASTM	PP/PVC	Viton	Hastelloy
Hydrogen Peroxide	50	HDLPE	1.9/ASTM	PVC	Viton	316SS/Hastelloy/Titan.
Magnesium Chloride	30	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Motor Oil	100	HDLPE & XLPE	1.9/ASTM	316SS	Viton	316SS
Peracetic Acid	30	HDLPE	1.9/ASTM	316SS	Aflas	316SS
Phosphoric Acid	85	HDLPE	1.9/ASTM	PVC	Viton	316SS
Polyaluminum Chloride		HDLPE & XLPE	1.9/ASTM	PVC	EPDM	Hastelloy.
Polymers (Deposition)		XLPE	1.5/ASTM	PVC	EPDM	316SS
Potable Water		HDLPE	1.5/ASTM	PVC	EPDM	316SS
Potassium Carbonate	50	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS
Potassium Hydroxide	Saturated	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS
Propylene Glycol		HDLPE & XLPE	1.9/ASTM	PP/316SS	EPDM	316SS
Sodium Bisulfate		HDLPE	1.9/ASTM	PVC/PP	EPDM	316SS
Sodium Bisulfite		HDLPE	1.9/ASTM	PVC/PP	EPDM	316SS
Sodium Carbonate	30	HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Sodium Carbonate	Saturated	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS**/Hastelloy/Titan.
Sodium Hydroxide	50	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS
Sodium Hypochlorite-in (Non-UV)	<16.5	HDLPE	1.9/ASTM	PVC	Viton	Titanium
Sodium Hypochlorite-out (UV)	<16.5	HDLPE #880059	1.9/ASTM	PVC	Viton	Titanium
Sodium Hypochlorite-out (UV)	<16.5	HDLPE Insulated	1.9/ASTM	PVC	Viton	Titanium
Sodium Thiosulfate	40	HDLPE & XLPE	1.9/ASTM	PVC	EPDM	316SS
Sulfuric Acid	98	HDLPE #880046*	1.9/ASTM	CPVC	Viton	Hastelloy
Sulfuric Acid	93	HDLPE #880046*	1.9/ASTM	CPVC	Viton	Hastelloy
Surfactants		XLPE	1.5/ASTM	PVC	EPDM	316SS
Urea Solution	50	HDLPE & XLPE	1.35/ASTM	PP/PVC	EPDM	316SS
Water w/Ozone up to 10 PPM		HDLPE & XLPE	1.5/ASTM	PVC	EPDM	316SS
Zinc Orthophosphate		HDLPE	1.9/ASTM	PP/316SS	EPDM	316SS

** Chemical may cause tank material to discolor.*
*** 316SS may pit upon drying.*
**** There are a wide variety of polymer chemical compositions. To confirm compatibility, secure an SDS and have it reviewed by Snyder For chemicals or chemical blends not listed on the above chart, please contact Snyder Industries*

1.07. Materials – Resin Classification

A. Tanks are classified according to the resin type. It is the responsibility of the purchaser to specify Type I or Type II.

1. Type I – Tanks molded from cross-linkable polyethylene resin (XLPE) with density between 0.942-0.946 g/cc.

2. Type II - Tanks molded from linear polyethylene resin (HDLPE) with density between 0.941-0.950 g/cc.

3. Rotationally molded tanks with a combination (liner or laminate) of Type I (XLPE) and Type II (HDLPE) resin are not allowed (would not meet ASTM D1998 standards).

B. The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer. Type I tanks shall be made from crosslinked polyethylene (XLPE) resin as manufactured by ExxonMobil Chemical, or resin of equal physical and chemical properties. Type II tanks shall be made from high density linear polyethylene (HDLPE) resin as manufactured by ExxonMobil Chemical, or resin of equal physical and chemical properties.

C. All polyethylene resin material shall contain a U.V. stabilizer as compounded by the resin manufacturer. Pigments may be added at the purchaser's request, but shall not exceed 0.25% (dry blended) of the total weight.

1.08 Design Requirements

Note: The designed specific gravity of the tank shall be based upon the actual chemical, its' concentration and temperature. From these factors it can be determined if polyethylene can be used and if so which family of polyethylene is to be used. There are chemical applications where both the (cross-linked - Type I) XLPE and HDLPE (high-density linear - Type II) resin will work. There are also applications where only one of these families of resin is recommended. If FDA or NSF 61 is required the Type II HDLPE resin will be required.

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/cm^3
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 would be ≤ 660 PSI at 73 degrees Fahrenheit for Type I and Type II materials based the resin density. In accordance with the formula in 1.08 A., the tank shall have a stratiform (tapered wall thickness) wall. In no case shall the wall thickness be less than the minimum allowed per calculation of ASTM D1998.

2. The hydrostatic design stress shall be derated for service above 100 degrees Fahrenheit and for mechanical loading of the tank.

3. The standard design specific gravity shall be 1.5 or 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 per the manufacturer's standard 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 with 550 or more gallons of capacity 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 with 550 or more gallons of capacity 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. Refer to section 2.02 H. for tank tie-down accessories.

Table II – Tank Schedule

Tank Reference #				
Quantity				
Capacity - Side Wall				
Specific Gravity– designed				
Diameter (nominal)				
Height (feet) maximum				
Tank Resin (primary/secondary)				
Type I XLPE				
Type II HDLPE				
Color				
Manway Type				
Fitting Material				
Gasket Material				
Bolt Material				

Note: Useable Volume is the height between the drain outlet and the "Full" line on the tank. Specified tank volume is larger than the useable volume. Check useable volume for tanks designed to take full truck loads.

1.09. Quality Assurance & Test Methods

A. The tanks of the same material furnished under this Section shall be supplied by a manufacturer who has been regularly engaged in the design and manufacturing of rotationally molded polyethylene chemical storage tanks using cross-linked and high density linear polyethylene tanks for over ten years.

B. Dimensions and Tolerances

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

C. Low Temperature Impact Test *(copy of the test report will be provided if ASTM documents are ordered)*

1. Test specimens shall be taken from fitting location areas.
2. Test specimens shall be conditioned at (- 40) degrees Fahrenheit for a minimum of 2 hours.
3. The test specimens shall be impacted in accordance with the standard testing methods as found in ASTM D1998. Test specimens < ½" thickness shall be tested at 100 ft. lb. Test specimens > ½" thickness shall be tested at 200 ft. lb.

D. Degree of Crosslinking Test (% Gel – Type I Resin Only)

1. The test method used is to be the o-xylene insoluble fraction (gel test) per ASTM D2765 Method C. This test method is for determination of the ortho-xlene insoluble fraction (gel) of crosslinked polyethylene. A Gel test will be conducted if ordered by the customer.
2. The percent gel level for Type I tanks on the inside 1/8 in. of the wall shall be a minimum of 65%.

E. Ultrasonic Tank Thickness Test *(copy of the test report will be provided if ASTM documents are ordered)*

1. All primary tanks 2000 gallons or larger 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.
2. Tanks smaller than 2000 gallons are only periodically measured at the start of a production run or after any design changes. Customers can place an order for tank wall thickness measurements on smaller tank sizes when placing the original order. A copy of the test report will be provided if ordered.

F. Hydrostatic Water Test

1. The hydrostatic water test shall consist of filling the primary 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.

G. Workmanship

1. 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 with Type II tanks to the degree in which they do not interfere with proper fusion of the resin melt.

2. All cut edges where openings are cut into the tanks shall be trimmed smooth.

Table III – Fitting and Accessory Schedule

Tank Number	**TNK -**	**TNK -**	**TNK -**	**TNK -**
Description	**Quantity / Size**	**Quantity / Size**	**Quantity / Size**	**Quantity / Size**
Inlet / Fill				
Outlet				
Drain				
Overflow				
Vent				
Surge Protection Lid				
Manway				
Ladder - FRP or Galv. Steel				
Lifting Lugs				
Tie-down Lugs				
Seismic/Wind Tie-down				
Ultrasonic Level Indicator				
Reverse Float Level Indicator				
Leak Detection System				
Heat System				
Maintenance Temperature				
Min. Ambient Temperature				
Insulation w/mastic coating				

PART 2 – FITTINGS & ACCESSORIES

2.01. Tank Fittings

A. Fittings – Threaded Bulkhead (Remove if not required)

1. Threaded bulkhead fittings are available for above liquid installation depending on the tank diameter and the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius' and flange lines. Consult manufacturer for placement questions. The maximum allowable size for bulkhead fittings placed on a curved cylindrical section of tanks 48 in. to 142 in. in diameter is 2 inch. Tank wall thickness must be considered for bulkhead fitting placement. The maximum wall thickness for each fitting size is shown below.

Fitting Size	Maximum Wall Thickness
1/2 in.	2 in.
3/4 in.	2 in.
1 in.	2 in.
1 1/4 in.	2 in.
1 1/2 in.	2 in.
2 in.	2 in.
3 in.	2.125 in. (Flat Surface Only)

2. The bulkhead fittings shall be constructed of PVC, PP, or other specified material. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton®, or other specified material.

B. Fittings - Self-Aligning Threaded Bulkhead (Remove if not required)

1. Self-Aligning fittings are available for installation in vapor phase applications on curved surfaces depending on the spherical dome radius and the placement of the fitting on the tank dome. Fittings must be placed away from tank radius'. Consult SII for placement questions. The maximum allowable size for self-aligning fittings placed on a spherical section of the tank is shown below.

Tank Diameter	Maximum Fitting Size Allowable
45 in. - 48 in.	2 in.
64 in. - 142 in.	3 in.

Tank thickness and fitting angle may need to be considered for self-aligning fitting placement. The maximum thickness and installation angles for each fitting size are shown below.

Fitting Size	Maximum Angle	Maximum Thickness
1 in.	27 degrees	1.000 in.
2 in.	25 degrees	0.750 in.
3 in.	20 degrees	1.000 in.

2. The self-aligning fittings shall be constructed of PVC or CPVC. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton®, or other specified material.

C. Fittings - Bolted Double 150 lb. Flange Fittings (Remove if not required)

1. Bolted double flange fittings are available for below liquid level installation for sizes 2 in. through 4 in. depending on the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius' and flange lines. Consult SII for placement questions. Bolted double flange fittings provide the best strength and sealing characteristics of any tank fitting available. Allowable fittings sizes based on tank diameter for curved surfaces are shown below.

Tank Diameter	Maximum Bolted Fitting Size Allowable
48 in. - 86 in.	3 in.
90 in. - 102 in.	6 in.
120 in. - 142 in.	8 in.

The bolted double flange fittings shall allow tank wall thickness up to 2 1/2 in.

2. The bolted double flange fitting shall be constructed with 2 ea. 150 lb. flanges, 2 ea. 150 lb. flange gaskets, and the correct number and size of all-thread bolts for the flange specified by the flange manufacturer. The flanges shall be constructed of PVC Type I, Grade I, or other specified material. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton® or other specified material. There shall be a minimum of 4 ea. full thread bolts. The bolts may have gasketed flanged metal heads or bolt heads encapsulated in Type II polyethylene material. The encapsulated bolt shall be designed to prevent metal exposure to the liquid in the tank and prevent bolt rotation during installation. The polyethylene encapsulation shall fully cover the bolt head and a minimum of 1/4" of the threads closest to the bolt head. The polyethylene shall be color coded to distinguish bolt material (white - 316 S.S., yellow - Hastelloy C276, green - Titanium). Each encapsulated bolt shall have a gasket to provide a sealing surface against the inner flange.

3. Standard orientation of bolted double flange fittings shall have bolt holes straddling the principal centerline of the tank in accordance with ANSI/ASME B-16.5 unless otherwise specified.

D. Fittings - Bolted Stainless Steel Fittings (Remove if not required)

1. Bolted stainless steel fittings are available for below liquid level installation depending on the tank diameter and the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius' and flange lines. Consult SII for placement questions. Allowable fittings sizes based on tank diameter for curved surfaces are shown below.

Tank Diameter	Maximum Bolted Fitting Size Allowable
48 in.	3 in.
64 in. - 142 in.	4 in.

The bolted stainless steel fittings shall allow tank wall thickness up to 2 1/2 in.

2. The bolted stainless steel fittings shall be constructed with a minimum of 4 fully threaded 3/8 in. studs. Each fitting shall have two gaskets and two flanges. One gasket shall be compressed between the inside of the tank wall surface and the inside flange of the fitting. The other gasket shall be compressed between the outside tank wall surface and the outside flange of the fitting. The stainless steel fittings come standard with female pipe threads on both the inner and outer flanges. Other threading arrangements may be specified. The fittings shall be constructed of Type 316 stainless steel. Gaskets shall be a minimum of ¼" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton® or other specified material.

E. Fittings – Unified Fitting Outlet (UFO™) (Remove if not required – no sidewall outlet/drain)

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 per sections 2.01 C and D 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 may be used for 2, 3, and 4 in. fitting sizes.

F. Fittings - Siphon Tube (Remove if not required)

1. Siphon tubes may be added to the fittings specified in sections 2.01 C and D. A siphon tube will allow these fittings, when used as drainage fittings, to provide additional tank drainage.

G. Vents

1. Each tank must be properly vented for the type of material and flow rates expected. Vents must comply with OSHA 1910.106 (f) (2) (iii) or other accepted standard. All tanks must be vented for atmospheric pressure as well as any pressure created by filling and emptying the tank. Some applications may require a sealed tank with a vent line going to a scrubber system for proper chemical safety. Venting equipment should be sized to limit pressure or vacuum in the tank to a maximum of 1/2" of water column (0.02 psi). U-Vents are offered in sizes from 1 in. to 6 in. with or without mesh insect screening. U-Vents with mesh screening may require additional sizing due to reduced air-flow rates. Consult the manufacturer for necessary venting and placement information.

2. All u-vents shall be constructed of PVC or other specified materials.

3. When a tank is being filled from a pressurized tanker truck or rail car steps need to be taken to avoid pressurizing the tank. The tank may require a secondary surge protection lid to avoid any pressure build up. The surge protection lid is to be a 14" or 18" hinged and be design that it is self-closing.

4.. To avoid the air surge and over-pressurization from a tank being filled from a pressurized tanker truck or rail car, the 18" (26" x 11.7") polyethylene mushroom vent could be used. The mushroom vent is rotationally molded with Type II, HDLPE. The vent is to be attached to the tank with (8) screws and a bead of silicone sealant or threaded designs quarter-twist into an 18" threaded manway ring (replaces manway). The underside of the vent has 1/8" poly mesh insect screen. The mushroom vent requires a 19" diameter flat surface on the tank for installation or a tank with an existing 18" threaded manway.

H. Flange Adapters (Remove if not required)

1. Flange adapters may be purchased as optional equipment to adapt threaded or socket fitting outlets to 150 lb. flange connections for connection to piping system components. Flange adapters are available in PVC. Flange adapter construction shall utilize schedule 80 components in sizes ranging from ¾" to 8" depending on material required.

I. Flexible Connections

1. All tank fitting attachments shall be equipped with flexible couplers or other movement provisions provided by the tank customer. The tank will deflect based upon tank loading, chemical temperature and storage time duration. Tank piping flexible couplers shall be designed to allow 4% tank design movement. Movement shall be considered to occur both outward in tank radius and downward in fitting elevation from the neutral tank fitting placement.

2. The flexible connection is to be manufactured of the same material as the tank or a compatible material approved by the project engineer. If an elastomer flexible connection is used control bolts are required if recommended by the manufacturer. The flexible connection is to be designed for a minimum of 4% tank movement. The flexible connection is to be designed with 150# flange connections to allow for attachment to the tank and the piping system. The flexible connection is to be attached as close as possible to the tank to reduce stress.

2.02. Tank Attachments

A. Level Indication

1. Sight Level Gage (Remove if not required)

   a. The sight level gage shall be constructed of flexible PVC tubing to allow for tank contraction and expansion due to loading and temperature changes. The level gage shall be connected to the tank at the top of the tank with 1ea. appropriate 3/4" fitting as described in section 2.01 A, C or D and to a tee off of the drain / transition fitting. Each fitting can have valves installed for isolation or drainage purposes.

2. Reverse Float Level Gage (only available in tanks constructed with Type II resin) (Remove if not required)

   a. The float level gage shall be constructed of a guided float on the inside of the tank connected to a weight indicator on the exterior of the tank with a 1/4" rope. The weighted indicator shall move along inside a clear guide pipe and may be equipped with an optional gallonage indicator board. The gallonage indicator board is made of PVC material and may be attached to the clear guide pipe. If specified the board shall be stenciled with one hundred gallon marks and labeled every five hundred gallons. The level gage shall be connected to the tank at an appropriate tank flat on the tank dome with a 3" threaded bulkhead fittings and held along the tank sidewall with appropriate 1" fittings and stand-off connections.

   b. The float level gage rigid components shall be constructed of PVC. The rope shall be constructed of polypropylene or other specified material. Gaskets shall be constructed of EPDM, Viton® or other specified material.

3. Ultrasonic Level Indicator (Remove if not required)

   a. The ultrasonic enclosure is to be an all plastic design with a NEMA 4X rating. The ultrasonic transducer is to have a 12” dead band and beam with a 20 ft range. The supply voltage can be 110, 220 VAC or 24 VDC. The connection to the tank is to be 2” NPT.

   b. The ultrasonic level indicator shall provide a visual display of liquid level in the tank showing gallonage in measurement of hundreds of gallons along with 4-20 mA output for other alarm or control systems as well as four independent contacts capable of handling 10 amps each. Each contact can be programmed to operate in different opening and closing methods (7 modes). Contacts can be used to control pumps, valves, alarms, etc.

B. Leak Detector Unit (Remove if not required)

The leak detector unit shall consist of a proximity sensor, a welded 2 in. fpt connection, a 2 in. bung plug with a ¾ in strain relief, and an indicator box. The sensor is placed in the interstitial space between the primary and secondary tanks approximately 1 in. above the tank bottom. The indicator box shall be Nema 4 rated and factory pre-wired for 110 VAC power. All connections shall be labeled to prevent errors in field installation.

1. Standard Moldel - The indicator box will show a green light when power is on and the sensor is not detecting a liquid. The light is a push to test light allowing the operator to test for power outage or malfunction. If the green light goes out there are two possibilities. The green light does not come on when the button is pushed. This would indicate a lack of power to the unit or the light bulb is burned out. If the green light comes on when pushed, then a possible leak condition is indicated.

2. Audible Model - Shall be supplied with audible and visual alarms. Additionally, it shall include a normally open (NO)or normally closed (NC) auxiliary outputs that can be wired to another alarm source such as a PLC or auto-dialer.

C. Threaded Manways and Fill Caps (Remove if not required)

1. Manways are available in an 18 in. vented or non-vented threaded design or hinged style (minimum opening diameter of 15 in.) and a 24 in. vented or non-vented threaded or hinged style (minimum opening diameter of 22 in.) on various tank sizes. Check the manufacture’s specification drawing for availability and position.

2. All caps and manways shall be constructed of polyethylene material.

D. Bolted Sealed Top Manway (Remove if not required)

1. Sealed manways are available in 14, 18, 20 and 24 in. sizes on certain tanks in selected positions. Consult the manufacturer for placement positions.

2. The sealed manway shall be constructed of polyethylene material. The bolts shall be polypropylene or other specified material. The gaskets shall be closed cell, crosslinked polyethylene foam and Viton® o-rings to seal the bolts.

E. Surge Protection Lid (Remove if not required)

1. The hinged lid is to be manufactured of polyethylene. The lid will be a 14 in. size with 11 in. access opening or 18” with 15” access. The opening of the lid is to be restricted by a tether. The lid is to be designed so that is will close when the pressure has been released. Check SII specification drawing for availability and position.

F. Down Pipes and Fill Pipes

1. External Fill / Down Pipes (Remove if not required)

   a. External fill pipes shall be prepared per the customer approved drawings and specifications. All external fill pipes shall be supported at 3 ft. maximum intervals with a support structure independent of the tank (ground supported). All designs shall be done according to the specific needs of the customer.

   b. All external fill pipes shall be constructed of PVC or other specified materials.

2. Internal Fill / Down Pipes (Remove if not required)

   a. Internal down pipes shall be prepared per the customer approved drawings and specifications. All internal down pipes shall be supported at 5 ft. maximum intervals with a support structure welded to the inside of the primary tank (only available in tanks constructed with Type II resin). The support design may utilize a PVC clamp or other specified materials for support. All designs shall be done according to the specific needs of the customer.

   b. All internal down pipes shall be constructed of PVC or other specified materials.

G. Ladders (Remove if not required)

1. Ladders shall be constructed of galvanized mild steel or FRP.
2. Safety cages shall be provided with ladders as optional equipment unless required by OSHA standards.
3. All ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 1926.1053; Ladders.
4. Ladders must be mounted to the tank to allow for tank expansion and contraction due to temperature and loading changes. All top ladder mounts shall be connected to integrally molded-in attachment lugs that allow for tank movement due to temperature and loading changes.
5. Mild steel parts shall be deburred and galvanized.

H. Tie Down Systems (Remove if not required)

1. The tie down system shall be designed to withstand 150 MPH wind loads. Tie down systems are based on requirements for nonbuilding structures and must meet seismic requirements per IBC 2021 / CBC 2022 code with seismic loads ≤ .445g (Seismic Design Category "D" - Fa=1.0, Fv=1.5, Ss=1.4, S1=0.5). Anchor bolts shall be provided by the contractor per the calculations and the base plates for the system. A registered engineer’s wet stamped calculations and or drawings may be required.
2. The tie down system shall be offered in either galvanized steel, 304 or 316 stainless steel.
3. Mild steel parts shall be deburred and galvanized.

I. Tank Heating Systems (Remove if not required)

1. Heating systems for use with polyethylene tanks shall be designed to meet specific requirements such as tank material type, tank size, low ambient temperature, and desired maintenance temperature.
2. All control components of the heating system shall be mounted in water tight, high impact plastic box(es) with a gasketed cover.
3. All heating system components shall be Nema 4X rated and factory pre-wired for 110 VAC. All connections shall be labeled to prevent errors in field installation.
4. Each control box shall carry a decal attached to the inside surface of the cover, on which an electrical wiring diagram will be printed.
5. Each control box shall contain two temperature controls. One control shall regulate the maintenance temperature setting and the other control shall regulate the high temperature setting. The maintenance temperature setting should be set at the desired maintenance temperature. The high temperature setting shall be adjusted to 10 degrees above the desired maintenance temperature to a maximum of 130 degrees Fahrenheit. All control systems must be designed with a power off failure mode.
6. The heating panels shall be designed to wrap around and lie flat against the surface of the secondary containment tank. The heating panels shall have a maximum heating density of 0.022 watts per square centimeter. All heating panels and sensor bulbs shall be attached to the tank with 2" wide duct tape. The high

temperature sensor shall directly sense the temperature of the heating panels on the secondary containment tank. The maintenance temperature sensor shall directly sense the temperature of the inner primary tank. Under no circumstances shall cable type heaters be used with polyethylene tanks.

7. Insulation used shall be polyurethane foam with a density of 2.0 - 3.0 lb./ft^3 with a "R" value of 8.33/in. The foam shall be applied with a nominal thickness of 2" to all external tank surfaces except the tank bottom shell.

8. Upon completion of application and curing of the insulation, two full coverage coats of latex mastic coating shall be applied to the surface of the insulation in such manner as to seal the insulation from the outside environment.

2.03 Warranty

A. The tank shall be warranted for three years in regards to defects in materials and workmanship. The warranty on fittings and accessories supplied by the tank manufacturer will be for one year. The warranty will begin at time of shipment.

B. Snyder Industries may offer extended warranties on tanks (up to a maximum of 5 years) in regards to defects in materials and workmanship in certain applications or as a purchased option. Please consult Snyder Industries if you have any questions regarding extended warranty coverage and/or requirements.

2.04 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. Customer specified labeling is available.

E. Tank shrink wrapping and bagging is available upon customer request.

F. All fittings that do not interfere with tank shipment shall be installed unless otherwise specified. Fittings and accessories that interfere with tank shipment or could be broken during shipment are shipped separately.

G. Permanent Labels:
   1. Engraved stainless steel identification plate. Must be ordered by customer. (remove if not required)
   2. National Fire Protection Association label specifically coded for the tank contents in accordance with NFPA 30. (to be supplied by the contractor).
   3. Stencil the chemical label on to the tank wall to be clearly visible from outside the tank enclosure. Must be ordered by customer. (remove if not required)

PART 3 - EXECUTION

3.01 Shipping, Delivery & Storage

A. Since there are variations in methods of shipping, SII's instructions shall be followed in all cases.

B. Transportation, handling, storage of the tanks, and installation shall be in accordance with the manufacturer's printed instructions.

C. Upon receipt of the tank and accessories the purchaser and/or his agent shall be responsible for inspection for damage and to verify that the system is complete. If damage has occurred, a claim should be filed with the carrier by the purchaser, and the manufacturer should be notified prior to the tank being put into service. All fittings and accessories need to be installed and adjusted in the field according to the manufacturer's Guidelines for Use & Installation.

D. Consult the manufacturer's "Guideline for Use and Installation" booklet included with your tank for unloading instructions on specific tanks. This booklet can be found attached to the cap or manway area on the inside of the tank. Tanks with capacities of 550 gallons or more have molded-in lifting lugs provided to assist with handling the empty tank. Shipping cables are attached to secure the primary and secondary tank together to be moved assembled and must remain intact while moving the tank. Once the tank is in position, the shipping cables shall be removed from the tank.

E. If tank shall be stored for over one month before being put into service, it should be stored in an upright vertical position. If outdoors it shall be secured to prevent movement or overturn during high wind situations.

3.02 Installation & Field Testing

A. Install the tanks in strict accordance with Snyder Industries' Guidelines for Use and Installation and shop drawings.

B. Snyder Industries recommends that all tanks be hydro-tested (water test) for 24 hours before introduction of chemical. Once completed, if necessary, remove all test water to prevent any possible reaction with chemical to be stored.

C. All tank fitting attachments shall be equipped with flexible couplers or other movement provisions provided by the tank customer. The tank will deflect based upon tank loading, chemical temperature and storage time duration. Tank piping flexible couplers shall be designed to allow 4 percent tank design movement. Movement shall be considered to occur both outward in tank radius and downward in fitting elevation from the neutral tank fitting placement.

D. The installer is to certify in writing that the tank system has been installed according to the tank manufacturer's Guidelines for Use & Installation

End of Section