INTEGRALLY MOLDED FLANGED OUTLET (IMFO®) - COMPLETE DRAIN
HIGH DENSITY CROSS-LINKED POLYETHYLENE STORAGE TANKS
NSF/ANSI 61 (Remove if not required)

PART 1-GENERAL

1.01 Requirements

1. The CONTRACTOR shall provide an integrally molded flanged outlet (IMFO®), high density cross-linked polyethylene tank 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 integrally molded flanged outlet IMFO® tank(s) and its accessories for chemical storage as indicated.

1.02 REFERENCES, CODES AND STANDARDS

A. American Society of Testing Materials (ASTM).

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. D1693	ESCR Specification Thickness 0.125" F50-10% Igepal
6. F412	Standard Terminology Relating to Plastic Piping Systems

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

C. Building Code: International Building Code - IBC 2018 / 2021

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

E. NSF/ANSI Standard 61, AWWA – Drinking Water System Components

F. ASTM D-1998, Standard Specification for Polyethylene Upright Storage Tanks

1.03 SUBMITTALS

A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the integrally molded flanged outlet, IMFO® 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. Integrally molded flanged outlet IMFO® 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 molded in fitting (IMFO®), openings, fittings, accessories, restraints and supports.

   b. Details of inlet and molded outlet fitting (IMFO®), manways, flexible connections, and vents.

3. Calculations shall be stamped and signed by a registered, third party engineer in the State of the installation.

   a. Tank restraint system. Show seismic and wind criteria.

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. Supporting documentation of Manufacturer's certification to NSF/ANSI Standard 61 – Drinking Water System Components for water treatment chemicals. (Remove if not required)

G. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.

H. Electrical heat tracing and foam insulation data sheets, as required.

I. Factory Test Report

1. Wall thickness verification.

2. Fitting placement verification including molded in outlet (IMFO®)

3. Visual inspection

4. Impact test

5. Gel test

6. Hydrostatic test

1.04 QUALITY ASSURANCE

A. The CONTRACTOR shall provide a vertical, high density cross-linked polyethylene tank with full drain capability and molded in flange. The integrally molded flanged outlet IMFO® 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.

C. Tanks shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage and submit form from NSF supporting chemical certification. (Remove if not required)

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. For Sulfuric Acid, Hydrochloric Acid, and Sodium Hypochlorite the warranty varies. See Poly Processing Company's chemical specific positions and warranty statement.

PART 2 – PRODUCTS

2.01 GENERAL

A. Tanks shall be rotationally-molded, integrally molded flanged outlet IMFO®, high density cross-linked polyethylene, one-piece seamless construction, cylindrical in cross-section and vertical with flat / sloping bottoms in axis. 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 or Engineer approved equal.

2.03 POLYETHYLENE STORAGE TANKS

A. Service: Chemical storage tanks shall be suited for the following operating conditions per this section.

B. High Density Cross-linked Polyethylene resin used in the tank manufacture shall be Poly CL™ 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 be a resin that is commercially available at the time of tank manufacture.

C. For sodium hypochlorite, sulfuric acid storage, and other oxidizing chemicals, tank resin shall include an antioxidant polyethylene system (OR-1000) with four times the antioxidant properties of a standard polyethylene bonded to the interior surface during the manufacturing process.

D. **Wall thickness** for a given hoop stress is to be calculated in accordance with ASTM D 1998. 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:

$T = P \times OD/2SD$ 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

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

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 by Contract drawings, for indoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with an emergency pressure relief device or SAFE-Surge™ Manway with pressure relief at 6" water column to prevent over-pressurization. The SAFE-Surge manway shall be chemically compatible with the chemical being stored. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

b. Unless otherwise indicated by Contract drawings, for outdoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with Poly Processing Company's F.S.2650® combined manway and vent to prevent over pressurization of tank. Manway must be capable of relieving a volume flow rate of up to 2650 ACFM. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

c. Unless otherwise indicated, tanks less than 2000 gallons in non-pneumatic applications shall have a manway cover 17-in or smaller of Polyethylene material with a coarse thread. Gaskets shall be closed cell, cross-linked polyethylene foam, viton or EPDM materials.

NOTE: Tanks must be vented to allow for performance at atmospheric pressure, in accordance with the following matrix:

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 rev. Nov 2006

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

E. Tank colors shall be natural (un-pigmented), or black (COMPOUNDED), or as specified by the ENGINEER with written agreement by the tank manufacturer.

2.04 TANK ACCESSORIES

A. Ladder: (Remove if not required)

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. Safety cages shall be added to ladders as required, per OSHA.

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. Use proper chemical resistant materials when anchoring to tank dome or sidewall. 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: (Remove if not required)

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

2. Tank restraint system shall be supplied and the design of same certified by a Structural Engineer registered in the State of tank installation. Design shall conform to the most recent edition of the IBC code for seismic and wind load. Anchor bolts as required by the calculations shall be supplied by the tank manufacturer.

C. Heat Tracing: (Remove if not required)

1. Heat tracing system for temperature maintenance shall be SilcoPad® tank heating systems designed to maintain a desired product temperature, not to exceed 100 degrees F. Each system shall include tank heating pads and a temperature controller. The quantity and type of SilcoPad® is determined by the size of the tank, the desired temperature maintenance and environmental conditions. Systems shall be available in 30, 60 or 100 degrees F. Tanks are supplied with the heating panels and a controller installed by Poly Processing Company. Power supply to be the only field installation required.

    a. Pads to operate on 120 vac single phase with a maximum power density of 0.5 watts/sq.inch.

    b. Silicone pad heaters must fully comply with Article 427-23 (b) of the National Electric Code.

    c. Temperature controller to be supplied with two electronic thermostats switching the heating system via one solid state relay. Primary thermostat to control desired product temperature and secondary thermostat to provide over temperature protection at 150 degrees F.

D. Insulation: (Remove if not required)

1. Insulation used shall be polyurethane foam with a density of 2.5 lb/ft3 with a minimum an "R" value of 6.3/in. The foam shall be applied with a nominal thickness of 2" to the external tank surfaces except the tank bottom.

2. Upon completion of application and curing of the insulation, 2 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.

2.05 TANKS:

A. Tank Schedule per the following specifications

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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 in 2.05B above. 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. Integrally Molded Flanged Outlet Fittings (IMFO®). These outlets must be an integral part of the tank, molded from the same material as the tank and provide complete drainage of liquid through the sidewall of the tank. Metal and alloy inserts shall not be used.

3. Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

4. For sodium hypochlorite and sulfuric acid storage, Bolted One-Piece Sure Seal (B.O.S.S.), double flange fittings constructed of virgin polyethylene shall be supplied. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have one full face gasket to provide a sealing surface against inside tank wall. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

5. 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.

6. 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 vent capacity by 1/3) in accordance with the venting schedule listed above.

7. All fittings on the 1/3 lower sidewall of tanks with capacities $\geq$ 1000 gallons shall have 100% virgin PTFE Flexi-joint® expansion joint. Expansion joint to have a minimum of 3 convolutions, stainless steel limit cables and FRP composite flanges. Galvanized parts will not be accepted.

   Expansion joint to meet the following minimum performance requirements:

   Axial Compression ≥ 0.67”

Axial Extension ≥ 0.67”
Lateral Deflection ≥ 0.51”
Angular Deflection ≥ 14º
Torsional Rotation ≥ 4º

2.06 LEVEL INDICATION

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 UV resistant PVC sight tube EnviroKing® by C.F. Harvel, 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. Indicator shall be neon orange color for visual ease for onsite operators.

B. Ultrasonic Level Indicator: The ultrasonic level indicator shall be a Flowline ultrasonic level transmitter, level controller with one 4-20 mA or 0-10 VDC continuous level input and NEMA 4X box to be supplied by tank manufacturer.

2.07 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 Cross-linking. Use Method C of ASTM D 1998- Section11.4 to determine the ortho-xylene insoluble fraction of cross-linked 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

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 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.

B. Installation will be inspected by manufacturer to verify system flexible connections, venting and fittings are properly installed. In addition to on-sight inspection tank system(s) to be reviewed using tank manual check list as supplied by manufacture as listed below.

C. Manufacturer to provide 1 hour training session to prepare operators to service and maintain the tank system. Included in training session will be (#) training manuals.

D. Manufacturer's trained technician to do an onsite inspection of installation. Inspection will verify chemical application, plumbing connections, venting, and applicable ancillary equipment such as ladders, restraints, etc. A verification of proper installation certificate will be supplied when equipment passes installation checklist.

E. Tank manuals will consist of installation check lists, tank drawing(s) as built, fitting drawings referencing nozzle schedule on tank drawing, materials of construction, and recommended maintenance program.

3.03 FIELD TESTING

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

End of Section

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