

Poly-Flo® Co-Extruded Double Contained Piping System Specification

PART 1: GENERAL

1.1 Summary

Furnish a complete double containment piping system including piping, fittings, anchors, terminations, floor drains, cleanouts, access tees, carrier pipe supports and associated pipe joining equipment.

1.2 References

A. The following standards apply to products used within this section:

DIN 8077/8078 (PP)
DIN 8074/8075 (PE)
EN/ISO 15494 (PP and PE)
ASTM D4101 (PP)
ASTM D3350 (PE)
DVS 2207
ASTM D2657

B. The system design shall meet the requirements of ASME/ANSI B31.3 Chapter VII for design criteria where temperature and pressure fall within the limits of that code.

C. The system design shall meet the stated minimum requirements of Federal Regulations 40 CFR-280 and 281.

1.3 Definitions

Primary Pipe: inside pipe (carrier pipe)

Secondary Pipe: outside pipe (containment pipe)

Simultaneous Welding: Method of installing double contained piping by joining the primary and secondary pipe of a similar material system to a mating component at the same time.

Staggered Welding: Method of installing double containment piping by joining the primary pipe first to its mating component and then joining the secondary pipe. This method can be used using closure couplings to meet ASME B31.3 leak detection requirements if the owner does not make an allowance to close the containment prior to leak testing per 3.2A.

1.4 System Description and Pressure Rating

A. System shall be a double containment piping system of materials and pressure rating as specified below. All pipe shall be one-piece double-wall extruded simultaneously. The primary pipe shall be integral with the secondary pipe via connecting ribs, which are continuous down the entire length of each section of pipe. No centralizing clips, spiders, disks or supports shall be allowed. Double containment fittings shall be of unitary construction. Permanent alignment of the inner and outer fittings shall be maintained via integral ribs. System shall be designed for continuous exposure for 25 years.

B. System shall provide the ability to incorporate leak detection as specified within the leak detection section. Components shall be provided as specified by leak detection vendor and/or contract drawings.

C. System shall provide full containment of all accessories such as floor drains, cleanouts, valves and tanks, etc.

D. Termination of the double containment shall be conducted utilizing an end termination, Dogbone® or flanged end termination.

1.5 System Performance Requirements

System performance requirements shall handle the following (see next page):

	Primary Pipe	Secondary Pipe
Operating Pressure		
Operating Temperature		
Test Pressure		
Media		

1.6 Submittals

Submit the following:

- A. Product data for each type of double containment specified including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Welder certificates certifying that welders have been trained by the manufacturer of the piping system and comply with the installation procedures as outlined by ASME NM.1 and/or ASTM D2657 and/or AWS B2.4 and/or DVS 2207. All required training should be scheduled and completed at job start-up.
- C. Qualifications of firms supplying double containment piping. Firms must have a minimum of 10 years' experience in the design, installation and operation of a thermoplastic double contained piping system.

1.7 Quality Assurance

- A. Obtain components from a single source having responsibility and accountability to answer and address questions regarding proper installation, compatibility, performance, and acceptance.
- B. Design, fabricate and install double containment piping to meet ASME/ANSI B31.3. Where applicable, manufacturer shall provide thermal stress analysis demonstrating the ability of the double containment piping system to handle the stated piping conditions during the design phase of the project.

1.8 Delivery, Storage, and Handling

- A. Deliver double containment piping as a factory assembled unit with protective wrapping and/or coverings. All components shall be individually labeled for identification.
- B. Store products on elevated platforms in a dry location with protection from elements.
- C. Lift, support, and transport double containment piping per manufacturer's recommendations.

1.9 Warranty

The warranty period is one year after date of substantial completion for job installations lasting no longer than one year. Asahi/America is not responsible for failures due to installation error or neglect.

PART 2: PRODUCTS

2.1 Manufacturers

Subject to compliance with requirements, products which may be incorporated in the work include: The Poly-Flo® system as supplied by Asahi/America, Inc. of Lawrence, Massachusetts, 800-343-3618. No equal.

2.2 Materials

- A. The pipe and fittings shall be of the same material for both the inner and outer piping. The responsible designer shall exercise good engineering practice in all areas including the selection of the materials of construction.
- B. Component Materials
DIN PP Pipe Dimensions 8078 PP General Quality Requirements and Testing.

DIN 8074 PE Pipe Dimensions 8075 General Quality Requirements and Testing
ASTM D4101 Group 2, Class 1 polypropylene random copolymer (PPR) resin.
ASTM D3350 Cell Class PE445584C advanced polyethylene (PE) resin with slow crack \geq 8760 hours.

C. Elastomeric Materials

Elastomers shall be selected by the designer with regard to the compatibility of the fluid service anticipated. O-rings must be inspected during installation to verify surface quality, and as with all sealing materials, periodic inspections may be appropriate. Stainless steel bolts, nuts and washers are recommended for flange assemblies.

2.3 Pressure Rated Pipes & Fittings

Components shall be pressure rated in accordance with ISO 15494. Pressure rating is based on continuous service life of 25 years at 68° F (20° C) for water. Sizes available: 1" x 1-1/2", 2" x 3", 4" x 6", and 6" x 9" – constructed as follows:

A. Carrier Pipe SDR11

PPR SDR11 shall be pressure rated to a minimum of 150psi at 68° F (20° C)
Advanced PE SDR11 shall be pressure rated to a minimum of 150psi at 68° F (20° C)

B. Containment Pipe SDR17

PPR SDR17 shall be pressure rated to a minimum of 90psi at 68° F (20° C)
Advanced PE SDR17 shall be pressure rated to a minimum of 90psi at 68° F (20° C)

2.4 Non-Pressure Rated Fittings

Laterals, sanitary tees, etc. shall be pressure rated to a minimum of 10 feet H₂O. Size and material shall match section 2.3.

2.5 Unlisted Components

Any special fittings, welded areas, etc. not supplied as part of the normal product offering shall be classified as unlisted components. Products falling into this category shall be pretested to twice the maximum operating pressure for a period of two hours minimum.

2.6 Valves

A. Pressure Rated

Valving arrangements that are to be double contained in molded tee's shall be supplied preassembled and tested to 1.5 times the maximum operating pressures. Actuators, stem extensions, and other accessories shall be part of a preassembled package where appropriate.

B. Non-Pressure Rated

Valving arrangements that are to be double contained in boxes shall be supplied preassembled and tested to 10 feet H₂O.

2.7 Anchors

Anchors shall be manufactured with the same material and pressure rating as the product and containment pipe 2.3. Anchors shall be Dogbone® style by Asahi/America, Inc.

2.8 Vents and Drains

High point vents and low point drains shall provide adequate flows to completely drain annular space. Vents and drains shall be located per contract drawings. Vents and drains shall be of same resin as product pipe.

2.9 Double Contained Flanges

All double contained flange connections shall be of unitary construction and consist of mating double O-ring flange and a flat faced flange. The flow-through flange design shall provide adequate flow of fluid through the annular space. All flanges shall be of the same material and SDR dimensions as the pipe 2.3.A and 2.3.B and shall have a 50psi pressure rating at 68° F (20° C).

PART 3: EXECUTION

3.1 Installation

- A. Install double containment piping to comply with manufacturer's recommended procedures.
- B. Installers may be pre-qualified through sufficient training in butt fusion techniques according to ASTM D2657 and/or AWS B2.4 and/or DVS 2207.
- C. Hot gas welding shall not be allowed for wetted components.
- D. Manufacturer/manufacturer's representative shall provide on-site training in the assembly, installation, and operation of double containment systems.

3.2 Testing

A. Inspection

Prior to pressure testing, the system shall be examined for the following items:

1. Pipe shall be completed per drawing layout with all pipe and valve supports in place.
2. Pipe, valves, and equipment shall be supported as specified, without any concentrated loads on the system.
3. Pipe shall be in good conditions, void of any cracks, gouges or deformation.
4. Pipe flanges shall be properly aligned. All flange bolts should be checked for correct torques.
5. All diaphragm valve bonnet bolts shall be checked for correct torques.
6. All joints should be reviewed for appropriate welding technique.
 - a) Butt Fusion: To have two beads, 360° around the joint.

B. Pressure Test for Pressure Systems

1. Carrier Pipe

Should be tested hydrostatically to 1.5 times the operating pressure per local code or ASME B31.3 Chapter VII, part A345. The owner may allow closure of the containment piping prior to pressure testing. All pressure testing should be done prior to burying any double containment piping system.

2. Containment Pipe

To avoid moisture in the containment space, an air test can be conducted on the containment pipe. Pressure test is recommended at 5psi and shall not exceed 10psi. The inner carrier pipe shall be full of water and under pressure to avoid any possible collapse. When testing with air, the ambient temperature should be above 45° F and extra safety precautions for personnel shall be put in place during the test.

Alternate testing: The containment piping shall be tested hydrostatically to 1.5 times the operating pressure per ASME B31.3 or per local codes. The product pipe must be pressurized to the same pressure as the test to prevent collapsing of product pipe.

C. Pressure Test for Non-Pressure Systems

1. Product Pipe

Product pipe shall be tested to 10 feet of H₂O or less. Compressed air or gas may be used at 5psi and shall not exceed 10psi where conditions warrant at temperatures above 45° F. Systems with elevational changes greater than 20 feet of H₂O shall be tested at 1.5 times the elevational head. Fabricated fittings shall not be used for these systems; pressure fittings should be used in their place.

2. Containment Pipe

Containment pipe should be tested per 3.2.C.

D. Pressure Testing with Sensitive Equipment

Equipment such as leak detection sensors or other sensitive equipment that is not to be tested shall be either disconnected from the piping or isolated by blinds or other means during the test. A valve may be used provided the valve (including its closure mechanism) is suitable for the test pressure.

PART 4: APPENDIX

Disclaimer: this information is provided for convenience. For additional information, please consult the Asahi/America, Inc. Engineering Design Guide or contact the engineering staff at 781-321-5409.

4.1 Material Properties

Table App. A-1 Material Properties

				PP-R	Advanced PE
	Specific density at 23° C	ISO 1183	g/cm ³	0.91	0.96
	MFR 190/5	ISO 1133	g/10min	0.5	0.25
	MFR 190/2.16				
	MFR 230/5			1.25	
	MFR 275/2.16				
	MFI range	ISO1872/1873	--		T003
Mechanical Properties	Tensile stress at yield	ISO 527	MPa	25	25
	Elongation at yield	ISO 527	%	12	9
	Elongation at break	ISO 527	%	>300	>600
	Impact strength unnotched at +23°C	ISO 179	kJ/m ²	no break	no break
	Impact strength unnotched at -30° C			no break	no break
	Impact strength notched at +23° C	ISO 179	kJ/m ²	22	16
	Impact strength notched at 0° C			4	n/a
	Impact strength notched at -30° C			2.5	6
	Ball indentation hardness acc. Rockwell	ISO 2039-1	MPa	45	46
	Flexural strength (3.5% flexural stress)	ISO 178	MPa	20	24
	Modulus of elasticity	ISO 527	MPa	900	1100
	Resistance to rapid crack propagation	ISO 13477	bar		> 10
	Resistance to slow crack growth	ISO 13479	hours		> 8,760
Thermal Properties	Vicat-Softening point VST/B/50	ISO 306	°C	65	77
	Heat deflection temperature HDT/B	ISO 75	°C	70	75
	Linear coefficient of thermal expansion	DIN 53752	K ⁻¹ x 10 ⁻⁴	1.6	1.8
	Thermal conductivity at 20° C	DIN 52612	W/(m x K)	0.24	0.4
	Flammability	UL94	--	94-HB	94-HB
		DIN 4102	--	B2	B2
FM 4910		--			
Electrical Properties	Specific volume resistance	VDE 0303	OHM cm	>10 ¹⁶	>10 ¹⁶
	Specific surface resistance	VDE 0303	OHM	>10 ¹³	>10 ¹³
	Relative dielectric constant at 1 MHz	DIN 53483	--	2.3	2.3
	Dielectric strength	VDE 0303	kV/mm	70	70
	Physiologically non-toxic	EEC 90/128	--	Yes	Yes
	FDA	--	--	Yes	Yes
	UV stabilized	--	--	No	Yes
	NSF 61	--	--	Yes	Yes
	Color	--	--	Grey	Black

1) Resin is listed

4.2 Pressure Rating

Permissible operating pressure for Poly-Flo® double contained piping systems based on years of operation and temperature. These values contain a system reduction factor of 0.8 for installation technical influences such as welding, joints, flange and bending loads. These tables are for water and safety correction factor would need to be applied for various chemicals. Consult Asahi/America Engineering staff for chemical recommendation; typically, a maximum factor of 1.6 for compatible chemicals.

Table App. A-1 Permissible Operating Pressures for PP Pipe and Fittings (psi)

Temperature		1 Year	5 Year	10 Year	25 Year	50 Year
° C	° F	PP-R SDR 11	PP-R SDR 11	PP-R SDR 11	PP-R SDR 11	PP-R SDR 11
10	50	246	231	226	218	213
20	68	210	197	192	185	180
30	86	178	167	163	157	152
40	104	151	141	137	132	128
50	122	128	119	116	111	108
60	140	108	100	97	93	90
70	158	91	84	81	71	
80	176	76	67	57	46	
90	194	64	44	38		
95	203	54	36	31		
100	212	44	30	25		
110	230	31				

Table App. A-2 Permissible Operating Pressures for Advanced PE Pipe and Fittings (psi)

Temperature		1 Year	5 Year	10 Year	25 Year	50 Year
° C	° F	Advanced PE SDR 11	Advanced PE SDR 11	Advanced PE SDR 11	Advanced PE SDR 11	Advanced PE SDR 11
10	50	244	234	230	224	220
20	68	205	196	193	189	185
30	86	174	167	164	160	157
40	104	149	143	141	138	135
50	122	130	124	122		
60	140	113	90			
70	158	85				
80	176	57				

4.3 Support Spacing

Support spacing is based on media with specific gravity of 1.0 at 20° C (68° F). Correction factors must be used for denser media and elevated temperatures. See Table A-4 and Table A-5 for correction factors.

Table App. A-3 Poly-Flo® External Support Spacing (inches)

Containment Size (nominal inch)	Poly-Flo®	
	Pro150	Advanced PE
1 x 1½	48	46
2 x 3	66	65
4 x 6	84	70

Table App. A-4 Poly-Flo® Support Spacing Temperature Correction Factors

Material	SDR	Operating Media Density [g/cm³]			
		< 0.01 (gases)	1	1.25	1.5
PP & Advanced PE	SDR 11	1.47	1	0.96	0.90

Table App. A-5 Spacing Specific Gravity Correction Factors

Specific Gravity	Correction Factor
1.0	1.00
1.5	0.90
2.0	0.85
2.5	0.80

4.4 Leak Detection

Low point leak detection shall be supplied by the manufacturer with single source responsibility for piping and leak detection. Leak detection shall be Liquid Watch by Permalert utilizing Poly-Flo® low point stations for buried systems or Poly-Flo® outer wall flanged adapter.