

Super Proline® PVDF Piping System Specification

PART 1: GENERAL

1.1 Summary

Furnish a complete PVDF piping system including piping, fittings, anchors, pipe supports, valves and associated pipe joining equipment.

1.2 References

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

- EN ISO 10931 supplement A
- DVS 2207
- ASTM D2657
- ASTM D3222

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.

1.3 System Description and Pressure Rating

A. System shall be a piping system of material and pressure rating as specified below. System product pipe shall be capable of transporting stated media under continuous exposure for 25 years.

1.4 System Performance Requirements

System performance requirements shall handle the following:

	Primary Pipe
Operating Pressure	
Operating Temperature	
Test Pressure	
Media	

1.5 Submittals

Submit the following:

- A. Product data for each type of piping system 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 PVDF piping. Firms must have 10 years of experience in the installation (fusion welding) and operation of a thermoplastic piping system.

1.6 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 and install piping to meet ASME/ANSI B31.3 where applicable manufacturer shall provide thermal stress analysis demonstrating the ability of the piping system to handle the stated piping conditions.

1.7 Delivery, Storage, and Handling

- A. Deliver 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 piping per manufacturer's recommendations.

1.8 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: Super Proline® piping system as supplied by Asahi/America, Inc., of Lawrence, Massachusetts, 800-343-3618. No equal.

2.2 Materials

- A. Product Pipe
ASTM D3222 Type II suspension grade homopolymer polyvinylidene fluoride (PVDF) resin.

2.3 Pressure Rated Pipes

Components shall be pressure rated in accordance with DIN9080. Pressure rating is based on continuous service life of 25 years at 68° F (20° C).

- A. Product Pipe
PVDF (Super Proline®) shall be SDR 21 pressure rated to 230psi at 68° F (20° C) for all diameter sizes 1/2" – 2-1/2" (20 - 75mm) SDR 33 pressure rated to 150psi at 68° F (20° C) for all diameter sizes 3" - 12" (90 - 315mm). SDR 21 pressure rated to 230psi at 68° F (20° C) is available for diameters sizes 3" - 10" (90 - 250mm) as an option.

2.4 Pressure Rated Fittings

- A. Product Fittings
Shall meet requirements of section 2.3.A.

2.5 Non-pressure Rated Fittings

Laterals, sanitary tees, etc. shall be pressure rated to a minimum of 10 feet H₂O.

- A. Product Fittings
SDR dimensions must meet requirements of section 2.3.A.

2.6 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.

2.7 Valves

- A. Pressure Rated
Valving arrangements shall be supplied preassembled and rated for 1.5 times the maximum operating pressures. Actuators, stem extensions, and other accessories shall be part of a preassembled package where appropriate.

PART 3: EXECUTION

3.1 Installation

- A. Install piping to comply with manufacturer's recommended procedures.
- B. Installers may be pre-qualified through sufficient training in butt fusion, socket fusion and IR fusion techniques according to ASTM D2657 and/or AWS B2.4.
- 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 PVDF piping system.

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) IR/Butt fusion welds: to have two beads, 360° around the joint.
 - b) Socket fusion welds: to have full insertion depth of pipe and fitting.
 - c) Electrofusion welds: to have full insertion depth of pipe and fitting.
7. Verify that all high points are provided with an adequate vent for hydrotesting.

B. Pressure Test for Pressure Systems

1. Pipe

Should be tested hydrostatically to 1.5 times the operating pressure per local code or ASME B31.3 Chapter VII, part A345. Pneumatic testing of PVDF piping is not recommended. If required by end user, please take all the necessary safety requirements. Only air test pressure to 10psi for PVDF.

C. Pressure Test for Non-Pressure Systems

1. Pipe

Product pipe shall be tested to 10 feet of H₂O or less.

PART 4: APPENDICES

Disclaimer: This information is provided for convenience. For additional information, please consult Asahi/America's engineering design guide or contact our engineering staff at 781-321-5409.

4.1 Material Properties

Table 1 - Material Properties

				PVDF
	Specific density at 23° C	ISO 1183	g/cm ³	1.78
	MFR 190/5	ISO 1133	g/10min	
	MFR 190/2.16			
	MFR 230/5			6
	MFR 275/2.16			
	MFI range	ISO1872/1873	--	
Mechanical Properties	Tensile stress at yield	ISO 527	MPa	50
	Elongation at yield	ISO 527	%	9
	Elongation at break	ISO 527	%	80
	Impact strength unnotched at +23° C	ISO 179	kJ/m ²	124
	Impact strength unnotched at -30° C			
	Impact strength notched at +23° C	ISO 179	kJ/m ²	11
	Impact strength notched at 0° C			
	Impact strength notched at -30° C			
	Ball indentation hardness acc. Rockwell	ISO 2039-1	MPa	80
	Flexural strength (3.5% flexural stress)	ISO 178	MPa	80
	Modulus of elasticity	ISO 527	MPa	2000
	Resistance to rapid crack propagation	ISO 13477	bar	
Resistance to slow crack growth	ISO 13479	hours		
Thermal Properties	Vicat-Softening point VST/B/50	ISO 306	°C	140
	Heat deflection temperature HDT/B	ISO 75	°C	145
	Linear coefficient of thermal expansion	DIN 53752	K ⁻¹ x 10 ⁻⁴	0.2
	Thermal conductivity at 20° C	DIN 52612	W/ (m x K)	0.2
	Flammability	UL94	--	V-0
		DIN 4102	--	
FM 4910		--	yes	
Electrical Properties	Specific volume resistance	VDE 0303	OHM cm	>10 ¹³
	Specific surface resistance	VDE 0303	OHM	>10 ¹²
	Relative dielectric constant at 1 MHz	DIN 53483	--	7.25
	Dielectric strength	VDE 0303	kV/mm	22
	Physiologically non-toxic	EEC 90/128	--	Yes
	FDA	--	--	Yes
	UV stabilized	--	--	Yes
	NSF 61	--	--	
	Color	--	--	Natural

1) Resin is listed

4.2 Pressure Rating

Permissible operating pressure for various materials used in PVDF 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's engineering staff for chemical recommendations.

Permissible operating pressure for PVDF piping systems based on years of operation and temperature. These tables are for water and safety correction factor would need to be applied for various chemicals. Consult Asahi/America's engineering staff for chemical recommendations.

Temperature		1 Year PVDF		5 Year PVDF		10 Year PVDF		25 Year PVDF		50 Year PVDF	
° C	° F	230 SDR 21	150 SDR 33	230 SDR 21	150 SDR 33	230 SDR 21	150 SDR 33	230 SDR 21	150 SDR 33	230 SDR 21	150 SDR 33
20	68	258.2	161.4	252.1	157.6	249.6	156.0	246.2	153.9	243.7	152.3
30	86	232.8	145.5	227.0	141.9	224.5	140.3	221.3	138.3	218.9	136.8
40	104	208.6	130.4	203.0	126.9	200.7	125.4	197.6	123.5	195.3	122.1
50	122	185.6	116.0	180.3	112.7	178.1	111.3	175.2	109.5	173.1	108.2
60	140	163.9	102.4	158.9	99.3	156.9	98.0	154.1	96.3	152.1	95.1
70	158	143.5	89.7	138.9	86.8	137.0	85.6	134.4	84.0	132.6	82.9
80	176	124.5	77.8	120.2	75.2	118.5	74.0	116.1	72.6	114.4	71.5
90	194	106.9	66.8	103.0	64.4	101.4	63.4	88.2	55.1	76.4	47.8
95	203	98.6	61.7	95.0	59.3	88.4	55.2	73.0	45.6	63.1	39.5
100	212	90.8	56.7	85.0	53.1	73.4	45.9	60.4	37.8	52.2	32.6
110	230	76.1	47.5	58.8	36.8	50.6	31.6	41.5	25.9	35.7	22.3
120	248	58.3	36.4	40.8	25.5	35.0	21.8				
130	266	40.8	25.5	28.3	17.7	24.2	15.1				
140	284	28.6	17.9								

Table App. A-8. Purad® PVDF Support Spacing (Feet)

Nominal Diameter (inch)	68° F/ 20° C	86° F/ 30° C	104° F/ 40° C	122° F/ 50° C	140° F/ 60° C	158° F/ 70° C	176° F/ 80° C
1/2	3	2.5	2.5	2	2	2	2
3/4	3	3	2.5	2.5	2.5	2.5	2
1	3.5	3	3	3	3	2.5	2.5
1 1/2	4	3.5	3	3	3	3	3
2	4.5	4	4	3.5	3	3	3
2 1/2	5	4.5	4	4	3.5	3	3
3	5.5	5	4	4	4	3.5	3.5
4	6	5	5	4	4	4	4
6	7	6	6	5	5	4.5	4.5
7	7.5	7	6	6	5.5	5	5
10	8.5	7.5	7	6.5	6	6	5.5
12	9.5	8.5	8	7	7	6.5	6

* Above values are based on water with specific gravity = 1.0. Correction factors must be used for denser fluids as follows: 0.90 for S.G. = 1.5, 0.85 for S.G. = 2.0, 0.80 and for S.G. = 2.5.