

# Chem Proline® Advanced PE Piping System Specification

## PART 1: GENERAL

### 1.1 Summary

Furnish a complete advanced polyethylene piping system including piping, added components such as fittings, anchors, pipe supports, valves, and associated pipe joining equipment should be chemically compatible.

### 1.2 References

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

ISO 9080	Determination of the long-term hydrostatic strength of thermoplastic pipe
ISO16770	Determination of environmental stress cracking (ESC) of PE – Full notch test (FNCT)
DVS 2207-5 and -1	Welding of thermoplastic materials — Testing and assessing welded joints in PE casing pipes
EN ISO 15494 Supplement B	Plastics piping systems for industrial applications - (PE) - Metric series for specifications for components and the system
ASTM F1473	Standard Test Method for Notch Tensile Test to measure the resistance to slow crack growth of PE pipes and resins
ASTM D3350	Standard Specification for PE plastics pipe and fittings material
ASTM D2657	Standard practice for heat fusion joining of polyolefin pipe and fittings
AWS B2.4	Specification for welding procedure and performance qualification for thermoplastics
DVS 2205-1	Design calculations for containers and apparatus made from thermoplastics; characteristics values
EN 12201	Plastics piping systems for water supply, and for drainage and sewerage under pressure - polyethylene (PE)
DVGW guideline W270	Microbial enhancement on materials to come into contact with drinking water – testing and assessment
ASME NM.1	Thermoplastic piping systems
ASME B31.3	Process piping code
DVS 2210-1	Industrial piping made of thermoplastics – design and execution – aboveground pipe systems

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

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 50 years.

### 1.4 System Performance Requirements

System performance requirements shall handle the following relative to primary pipe:

- Operating Pressure
- Operating Temperature
- Test Pressure
- Media

### 1.5 Submittals

- 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 thermoplastic piping. Firms must have the appropriate experience in 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 and where applicable manufacturer shall provide thermal stress analysis demonstrating the ability of the piping system to handle the stated piping conditions.

### 1.7 Delivery and Handling

- A. Care shall be taken to prevent damage to the supplied components. Avoid scraping, denting, and gouging the components. Surface damage deeper than 10% of the wall thickness shall be rejected. Pipe shall have adequate support at all times to prevent sagging or distortion.
- B. Store products on elevated platforms in a dry location with protection from elements affecting product integrity
- C. Lift, support, and transport piping per manufacturers 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: Chem Proline® piping system as supplied by Asahi/America, Inc., of Lawrence, Massachusetts, 800-343-3618. No equal.

### 2.2 Materials

Pipe and fittings

Polyethylene (PE) pipe PE100-RC resin 15494 supplement B [Minimum Required Strength of MRS 10]

ASTM D3350 minimum cell class PE445586C (1/2" - 12") (20mm - 315mm), advanced polyethylene resin with a slow crack growth resistance of greater than 9,000 hours when conducted with the PENT test ASTM F1473, and greater than 8,760 hours with a full notch creep test (FNCT) according to ISO 16770. SDR 11 Pipe and fittings have been tested and confirmed by the DVGW Test Laboratory Energy of DBI-GTI for permeation and tightness, to be considered H2 Ready.

### 2.3 Pressure Rated Pipes

Components shall be pressure rated in accordance with ISO9080 and ISO15494. Pressure rating is based on continuous service life of 50 years at 68° F (20° C) for water.

These values contain a system reduction factor of 0.8 for installation technical influences such as welding, joints, flange and bending loads. If this is to be utilized in a chemical process, a derate factor is per industry standards needs to be applied. **(Consult Asahi/America engineering staff for chemical recommendation.)**

Pipe

- PE100-RC SDR11 pressure rated to a minimum of 150psi at 68° F (20° C) for water for all diameter sizes 1/2" - 12" (20mm - 315mm).

### 2.4 Pressure Rated Fittings

All pressure rated fittings will be per the piping SDR rating. Unless specifically identified on drawings or datasheet. Molded fittings shall be central injection gate molded PE100-RC rated to a minimum of the pressure pipe.

### 2.5 Non-pressure Rated Fittings

All fittings shall be pressure derated per industry standards. Specifically; laterals, sanitary tees, etc. shall be rated to a minimum of 10 feet of H<sub>2</sub>O.

All other fittings not meeting the piping SDR rating will be specifically identified on drawings and/or datasheets.

### 2.6 Unlisted Components

Any customer requiring non-standard components (non-standard geometry, welding or wall thickness) that are not supplied as part of our normal product offerings can request pressure testing for verification.

### 2.7 Valves

Pressure rated valves to be supplied-rated for the service or specified lower pressure/temperature rating as pipe.

## 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 and socket fusion techniques according to ASME NM.1 and/or ASTM D2657 and/or AWS B2.4 and/or DVS 2207.
- C. Hot gas and extrusion 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 the Chem Proline® 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 pipes 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 welds: to have two beads, 360° around the joint.
  - b) Socket fusion welds: To have full insertion of pipe and fitting.
  - c) Electrofusion welds: To have full insertion of pipe and fitting.
- 7. Verify that all high points are provided with an adequate vent for hydro testing.

#### B. Pressure Test for Pressure Systems

- 1. Pressure systems should be tested hydrostatically to 1.5 times the operating pressure per local code or ASME B31.3 Chapter VII, part A345.

#### C. Pressure Test for Non-Pressure Systems

- 1. Non-pressure systems can be hydrostatically tested to 10 feet of H<sub>2</sub>O or less.

**PART 4: APPENDICES**

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

**4.1 Material Properties**

**Table 1 - Material Properties**

	Properties	Standard	Unit	PE100 -RC
Mechanical Properties	MRS Classification	ISO 9080	N/mm <sup>2</sup>	10
	Specific density at 23° C	ISO 1183	g/cm <sup>3</sup>	0.96 <sup>2)</sup>
	Melt Flow Rate (MFR) 190/5	ISO 1133-1	g/10min	0.3 <sup>1)</sup>
	Tensile stress at yield	ISO 527	MPa	≥ 23
	Elongation at yield		%	≥ 9
	Elongation at break at 20° C		%	≥ 350 <sup>2)</sup>
	Impact strength unnotched at -30° C	ISO 179	kJ/m <sup>2</sup>	no break
	Impact strength notched at +23° C			≥ 13 <sup>3)</sup>
	Impact strength notched at -30° C			10
	Shore D - hardness (3 sec)	ISO 868	1	60
	Flexural strength (3.5% flexural stress)	ISO 178	MPa	≥ 21
	Young's Modulus of elasticity	ISO 527	MPa	≥ 1000
	Stress cracking resistance (FNCT)	ISO 16770 EN 12814-3	hours	>8760 <sup>3)</sup>
Thermal Properties	Heat deflection temperature HDT/B	ISO 75	°C	75
	Linear coefficient of thermal expansion	ISO 11359-2	K <sup>-1</sup> x 10 <sup>-4</sup>	1.8 <sup>4)</sup>
	Thermal conductivity at 20° C	DIN EN 12667	W/ (m x K)	0.4
	Flammability	UL94	--	94-HB
		DIN 4102	--	B2
Application temperature	--	°C	-40 up to +60*	
Electrical Properties	Volume Resistivity	DIN EN 62631-3-1	Ω x cm	≥ 10 <sup>16</sup>
	Surface Resistivity	DIN EN 62631-3-2	Ω	≥ 10 <sup>13</sup>
	Dielectric coefficient at 1 MHz	DIN 53483	--	2.3
	Electric Strength	DIN IEC 60243	kV/mm	70
General	FDA	EU 10/2011	--	Yes
	UV stabilized	--	--	Carbon Black
	Color	--	--	BLACK

Guidelines from: 1) DVS 2207-1, 2) EN 12201, 3) DVS 2205-1 suppl.1, 4) DVS 2210-1

\*Depending on the application area and operating time

**4.2 Pressure Rating**

Permissible operating pressure for Chem Proline® (PE100-RC) piping systems based on years of operation and temperature. These tables are for water, a safety correction factor is recommended to be applied for chemical service. Consult Asahi/America engineering staff for chemical recommendation; typically, a factor of 1.6 for compatible chemicals on PE100-RC. Additionally, a system reduction factor of 0.8 shall be used for influences such as welding, joints, flange, and bending loads for aboveground installations and 1.0 should be used for below ground installation.

**Table 2 - Permissible Operating Water Pressures for Chem Proline® [PE100-RC] (psi)**

Temperature		1 Year	5 Year	10 Year	25 Year	50 Year
° C	° F					
		<b>SDR 11</b>	<b>SDR 11</b>	<b>SDR 11</b>	<b>SDR 11</b>	<b>SDR 11</b>
10	50	305	292	287	280	276
20	68	256	246	241	236	231
30	86	217	209	205	200	197
40	104	187	179	176	172	169
50	122	162	155	153	*	*
60	140	142	112	*	*	*

**Table 3 – Support Spacing for Chem Proline® (inch)**

Size OD (inch)	Size OD (mm)	68° F (20° C)	86° F (30° C)	104° F (40° C)	122° F (50° C)	140° F (60° C)
1/2	20	31	31	28	23	20
3/4	25	36	33	31	31	28
1	32	41	41	36	36	31
1-1/2	50	56	56	48	46	41
2	63	66	64	59	56	48
3	90	84	79	74	69	64
4	110	92	89	84	79	71
6	160	115	107	102	97	90
8	200	128	123	118	113	105
10	250	146	141	133	128	118
12	315	161	156	151	143	131

**Table 4 – External Support Spacing Correction Factors based on Operating Media Density for PE100-RC**

Material	SDR	Media Density [g/cm³]			
		< 0.01	1	1.25	1.5
		Factor			
PE100-RC	11	1.30	1	0.96	0.92