Duo-Pro® Engineered 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:

ASTM D4101 (PP)
ASTM D3222 (PVDF)
ASTM D3275 (ECTFE)
ASTM D3350 (PE)
ASTM D3307 (PFA)
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 is required for dissimilar material double containment systems and can also be used for similar material systems 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. System product pipe shall be capable of transporting stated media under continuous exposure for 25 years. System secondary pipe shall be capable of containing stated media, in the event of failure of primary pipe, per state or federal guidelines for a minimum of 30 days.

B. System shall provide the ability to incorporate leak detection as specified within the leak detection section. Access tees, pull ropes, and low-point instrumentation taps 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.

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

1.5 System Performance Requirements

System performance requirements shall handle the following:

	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.

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 1 year. Asahi/America is not responsible for failures due to installation error or neglect.

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

PART 2: PRODUCTS

2.1 Manufacturers

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

2.2 Materials

A. Product Pipe
ASTM D4101 Group 2, Class 1 polypropylene random copolymer (PPR) resin.
ASTM D4101 Group 1, Class 2 polypropylene homopolymer (PPH) resin.
ASTM D3222 Type II suspension grade homopolymer polyvinylidene fluoride (PVDF) resin.
ASTM D3275 Class 2 ethylene chlorotrifluoroethylene resin (ECTFE).
ASTM D3350 Cell Class PE445584C advanced polyethylene (PE) resin.
ASTM D3307 PFA extrusion, molding, machine grade compatible for IR joining

B. Containment Pipe
Same as product pipe
Alternative: ASTM D4101 Group 2, Class 1 pigmented polypropylene random copolymer (PPR) resin.
Alternative: ASTM D4101 Group 1, Class 2 pigmented polypropylene homopolymer (PPH) resin.
Alternative: ASTM D3350 cell classification 445574C polyethylene (PE) resin or better

2.3 Pressure Rated Piping

Components shall be pressure rated in accordance with ASTM D2837 and DIN9080 for hydrostatic design basis. Pressure rating is based on continuous service life of 25 years at 68° F (20° C).

A. Product Pipe
PPR SDR 11 (PRO150) and shall be pressure rated to 150psi at 68° F (20° C) for all diameter sizes ½” - 20” (20 - 500mm).
PPH SDR 33 (PRO45) and shall be pressure rated to 45psi at 68° F (20° C) for all diameters 4” - 32” (110 - 800mm).
PVDF (Super Proline®) shall be SDR 21 pressure rated to 230psi at 68° F (20° C) for all diameter sizes ½” - 2½” (20 - 75mm) and SDR33 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.

ECTFE SDR21 (Ultra Proline®) shall be pressure rated to 150psi at 68° F (20° C) for all diameter sizes ½” - 4” (20 - 110mm).
Advanced PE SDR 11 (Chem Proline®) shall be pressure rated to 150psi at 68° F (20° C) for all diameter sizes ½” - 20” (20 - 500mm).

B. Containment Pipe
PPR SDR11 (PRO150) and shall be pressure rated to 150psi at 68° F (20° C) for all diameter sizes 3” - 20” (90 - 500mm).
PPH SDR33 (PRO45) and shall be pressure rated to 45psi at 68° F (20° C) for all diameters 4” - 32” (110 - 800mm).
PVDF (Super Proline) shall be SDR 33 pressure rated to 150psi at 68° F (20° C) for all diameter sizes 3" - 12" (90 - 315mm).
SDR21 pressure rated to 230psi at 68° F (20C) is available for diameters sizes 3" - 10" (90 - 250mm) as an option.
ECTFE SDR 21 (Ultra Proline®) shall be pressure rated to 150psi at 68° F (20° C) for all diameter sizes 3" - 4” (90 - 110mm).
PE SDR 33 shall be pressure rated to 45psi at 68° F (20° C) for all diameter sizes 3" - 32" (90 - 800mm).

2.4 Pressure Rated Fittings

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

B. Containment Fittings
Shall meet requirements of section 2.3.B. No split fittings will be allowed.

2.5 Non-Pressure Rated Fittings

Laterals, sanitary tees, etc. shall be pressure rated to a minimum of 10 feet H_2O.

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

B. Containment Fittings
SDR dimensions must meet requirements of section 2.3.B.

2.6 Unlisted Components (when conforming to code requirements)

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 pressure rated to twice the maximum operating pressure (for a period of two hours minimum).

2.7 Valves

Pressure Rated
Valving arrangements that are to be double contained in molded tee's shall be supplied pressure rated 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 pressure rated to 10 feet H_2O, conforming with Section 2.5 above.

2.8 Pipe Support Clips ("Spider Clips")

Product pipe support clips shall be secured to the product pipe in a manner that a maximum of 0.1" deflection is allowed between centralizers. Support clips shall allow axial movement of product pipe within containment pipe and maintain a concentric relationship between product pipe and containment pipe. Support clips shall supply a minimum of 1.5" wide surface area to prevent point loading of product pipe. Centralizers are welded near the ends of the primary and secondary pipe and fittings with enough strength to allow simultaneous fusion.

2.9 Simultaneous Weld Centralizers

A. Simultaneous weld centralizers shall be provided of the same resin as product pipe and containment pipe 2.2. All centralizers shall be sized to maintain alignment of product pipe within +/- 10% of wall thickness. Centralizers shall be hot gas welded to the primary and secondary pipe with enough strength to allow simultaneous fusion.

B. Molded centralizers shall supply four openings on 90° spacing to allow for drainage and venting of the annular space.

C. Fabricated centralizers shall be designed with vent and drain openings.

2.10 Anchors

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

B. Dissimilar primary/secondary anchors shall be manufactured with the same material and pressure rating as the containment pipe 2.3.b and securely restrain the product pipe within. Dissimilar anchors shall be supplied by the piping manufacturer.
h 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.

2.11 Vents and Tees

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.

2.12 Access Tees

Shall be provided per contract drawings and per leak detection manufacturer's requirements. Access tees shall be of same resin as containment pipe 2.3.B.ll 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.

2.13 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 25psi pressure rating at 68° F (20° C).

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

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.

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.

E. Install continuous running pull rope for installation of leak detection cable if required. Manufacturer shall supply pipe spools with pull rope in place.

F. Support discs and welding rod are required for field cut pipe lengths, support disc quantity can be approximated as follows 2/3 x (#cuts + #fitting).

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. Product 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 the pressure testing.

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 H_2O 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 H_2O 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 1 - Material Properties

				PVDF	ECTFE	PP-R	PP-H	Advanced PE
	Specific density at 23°C	ISO 1183	g/cm^3	1.78	1.68	0.91		0.96
	MFR 190/5	ISO 1133	g/10min			0.5	0.5	0.25
	MFR 190/2.16							
	MFR 230/5			6		1.25	1.25	
	MFR 275/2.16				1			
	MFI range	ISO1872/1873	--				M003	T003
Mechanical Properties	Tensile stress at yield	ISO 527	MPa	50	30	25	30	25
	Elongation at yield	ISO 527	%	9	5	12	10	9
	Elongation at break	ISO 527	%	80	250	>300	>300	>600
	Impact strength unnotched at +23°C	ISO 179	kJ/m^2	124	no break	no break	no break	no break
	Impact strength unnotched at -30°C					no break	no break	no break
	Impact strength notched at +23°C	ISO 179	kJ/m^2	11	no break	22	8	16
	Impact strength notched at 0°C					4	2.8	n/a
	Impact strength notched at -30°C					2.5	2.2	6
	Ball indentation hardness acc. Rockwell	ISO 2039-1	MPa	80	90	45	60	46
	Flexural strength (3.5% flexural stress)	ISO 178	MPa	80	47	20	28	24
	Modulus of elasticity	ISO 527	MPa	2000	1690	900	1300	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	140		65	91	77
	Heat deflection temperature HDT/B	ISO 75	°C	145	90	70	96	75
	Linear coefficient of thermal expansion	DIN 53752	K^{-1} x 10^{-4}	0.2	0.8	1.6	1.6	1.8
	Thermal conductivity at 20 °C	DIN 52612	W/(m x K)	0.2	0.15	0.24	0.22	0.4
	Flammability	UL94	--	V-0	V-0	94-HB	94-HB	94-HB
		DIN 4102	--			B2	B2	B2
		FM 4910	--	yes				
Electrical Properties	Specific volume resistance	VDE 0303	OHM cm	>10^{13}	>10^{16}	>10^{16}	>10^{16}	>10^{16}
	Specific surface resistance	VDE 0303	OHM	>10^{12}	>10^{14}	>10^{13}	>10^{13}	>10^{13}
	Relative dielectric constant at 1 MHz	DIN 53483	--	7.25	2.6	2.3	2.3	2.3
	Dielectric strength	VDE 0303	kV/mm	22	30-35	70	75	70
	Physiologically non-toxic	EEC 90/128	--	Yes	Yes	Yes	Yes	Yes
	FDA	--	--	Yes	Yes	Yes	Yes	Yes
	UV stabilized	--	--	Yes	Yes	No	No	Yes
	NSF 61	--	--		Yes[1]	Yes	Yes	Yes
	Color	--	--	Natural	Natural	Grey	Grey	Black

1) Resin is listed

.

4.2 Pressure Rating

Permissible operating pressure for various materials used in Dou-Pro double contained 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 Engineering staff for chemical recommendations.

Table 2 - Permissible Operating Pressures for PVDF Pipe and Fittings (psi)

Temperature		1 Year		5 Year		10 Year		25 Year		50 Year	
		PVDF		PVDF		PVDF		PVDF		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 3 - Permissible Operating Pressures for PP Pipe and Fittings (psi)

Temperature		1 Year		5 Year		10 Year		25 Year		50 Year	
		PP-H	PP-R	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R
° C	° F	Pro45 SDR 33	Pro150 SDR 11	Pro45 SDR 33	Pro150 SDR 11	Pro45 SDR 33	Pro150 SDR 11	Pro45 SDR 33	Pro150 SDR 11	Pro45 SDR 33	Pro150 SDR 11
10	50	82.1	307.0	75.3	289.3	72.6	282.0	69.1	272.6	66.6	265.7
20	68	70.9	261.9	64.7	246.2	62.2	239.7	59.0	231.4	56.7	225.3
30	86	60.7	222.8	55.1	208.9	52.8	203.2	49.9	195.8	47.9	190.4
40	104	51.5	189.1	46.4	176.8	44.3	171.7	41.8	165.3	39.9	160.5
50	122	49.4	160.0	44.2	149.1	42.1	144.7	39.5	139.1	37.7	134.9
60	140	40.9	135.0	36.3	125.5	34.5	121.6	32.3	116.7	30.7	113.1
70	158	37.5	113.5	33.0	105.2	31.3	101.9	25.8	88.3	21.8	74.0
80	176	30.2	95.2	25.3	84.1	21.4	71.1	17.1	56.9		
90	194	24.0	79.6	17.1	55.5	14.5	46.9				
95	203	21.2	67.3	14.2	45.5	12.0	38.4				
100	212	CF	55.5	CF	37.5	CF	31.7				
110	230	12.3	38.2								
120	248	8.9									

CF: Consult Factory

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

Table 4 - Permissible Operating Pressures for Advanced PE Pipe and Fittings (psi)

Temperature		1 Year		5 Year		10 Year		25 Year		50 Year	
		Advanced PE		Advanced PE		Advanced PE		Advanced PE		Advanced PE	
° C	° F	45	150	45	150	45	150	45	150	45	150
		SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11
10	50	59.5	190.4	57.1	182.7	56.1	179.5	54.8	175.3	53.8	172.2
20	68	50.0	159.9	48.0	153.5	47.1	150.8	46.0	147.3	45.2	144.7
30	86	42.5	135.9	40.8	130.4	40.0	128.1	39.1	125.2	38.4	122.9
40	104	36.5	116.7	35.0	112.0	34.4	110.0	33.6	107.5	33.0	105.6
50	122	31.6	101.2	30.3	97.1	29.8	95.4				
60	140	27.6	88.5	21.9	70.2						
70	158	20.6	66.1								
80	176	13.9	44.6								

Table 5 - Permissible Operating Pressures for ECTFE Pipe and Fittings (psi)

Temperature		1 Year	5 Year	10 Year	25 Year	50 Year
° C	° F	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE
		SDR 21	SDR 21	SDR 21	SDR 21	SDR 21
10	50	207.8	201.3	198.5	195.0	192.3
20	68	182.8	176.7	174.1	170.7	168.2
30	86	159.1	153.3	150.9	147.7	145.4
40	104	136.7	131.4	129.1	126.2	124.1
50	122	115.8	110.9	108.9	106.2	104.3
60	140	96.5	92.1	90.3	87.9	CF
70	158	78.9	75.0	73.4	71.3	CF
80	176	63.1	59.7	58.3	56.5	CF
90	194	49.1	46.3	45.1	CF	CF
95	203	42.9	40.3	39.2	CF	CF

CF: Consult Factory

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

4.3 Support Spacing

Support spacing is based on media with specific gravity of 1.0 at 68° F (20° C). Correction factors must be used for denser media and elevated temperatures. See Table A-10 and Table A-11 for correction factors.

Table 6 - External Support Spacing for Duo-Pro with PP Containment (feet)

OD		20° C / 68° F		30° C / 86° F		40° C / 104° F		50° C / 122° F		60° C / 140° F		70° C / 158° F		80° C / 176° F	
mm	inch	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R	PP-H	PP-R
		Pro45	Pro150	Pro45	Pro150	Pro45	Pro150	Pro45	Pro150	Pro45	Pro150	Pro45	Pro150	Pro45	Pro150
		SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11	SDR 33	SDR 11
90	3"	4.25	5.50	4.00	5.25	3.75	5.00	3.75	5.00	3.50	4.75	3.50	4.50	3.50	4.50
110	4"	4.50	6.00	4.50	6.00	4.25	5.75	4.25	5.50	4.00	5.25	3.75	5.00	3.50	4.50
160	6"	5.75	7.50	5.50	7.25	5.25	7.00	5.00	6.50	4.75	6.25	4.50	6.00	4.25	5.50
200	8"	6.25	8.25	5.75	7.75	5.75	7.50	5.50	7.25	5.25	7.00	5.00	6.50	4.75	6.25
250	10"	7.00	9.25	6.50	8.75	6.50	8.50	6.25	8.25	5.75	7.75	5.75	7.50	5.25	7.00
315	12"	7.75	10.25	7.50	10.00	7.25	9.75	7.00	9.25	6.50	8.75	6.50	8.50	6.00	8.00
355	14"	8.25	11.00	8.00	10.75	7.75	10.25	7.25	9.75	7.00	9.25	6.75	9.00	6.50	8.50
400	16"	8.75	11.75	8.50	11.25	8.25	11.00	8.00	10.50	7.50	10.00	7.25	9.50	6.75	9.00
450	18"	9.50	12.50	9.25	12.25	8.75	11.75	8.50	11.25	8.00	10.75	7.75	10.25	7.25	9.75
500	20"	10.25	13.50	9.75	13.00	9.50	12.75	9.25	12.25	8.75	11.50	8.25	11.00	7.75	10.25
560	22"	11.00	14.50	10.50	14.00	10.25	13.50	9.75	13.00	9.50	12.50	8.75	11.75	8.50	11.25
630	24"	11.75	15.75	11.50	15.25	11.00	14.75	10.50	14.00	10.25	13.50	9.50	12.75	9.25	12.25

Table 7 - Support Spacing Correction Factors based on Operating Media Density for PP-R SDR 11 and PPH SDR 33 Piping

Material	SDR	Operating Media Density [g/cm^3]			
		<0.01 (gases)	1	1.25	1.5
PP-R	SDR11	1.3	1	0.96	0.92
PP-H	SDR33	1.65	1	0.96	0.92

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

Table 8 – Support Spacing for PVDF Containment Piping in Feet

OD			20° C / 68° F	30° C / 86° F	40° C / 104° F	50° C / 122° F	60° C / 140° F	70° C / 158° F	80° C / 176° F	100° C / 212° F	120° C / 248° F
mm	inch	SDR									
90	3"	21	5.75	5.50	5.25	5.25	5	4.75	4.50	4.00	3.25
110	4"	33	6.00	5.75	5.50	5.50	5.00	5.00	4.75	4.00	3.50
160	6"	33	7.00	7.00	6.75	6.50	6.00	6.00	5.50	5.00	4.50
200	8"	33	7.75	7.75	7.50	7.00	7.00	6.50	6.25	5.50	5.00
250	10"	33	8.75	8.50	8.25	7.75	7.50	7.25	7.00	6.25	5.50
315	12"	33	9.75	9.75	9.25	9.00	8.50	8.25	7.75	7.00	6.25

Table 9 – Support Spacing Correction Factors based on Operating Media Density for PVDF Containment Piping

Material	SDR	Operating Media Density [g/cm^3]			
		<0.01 (gases)	1	1.25	1.5
PVDF	21	1.48	1	0.96	0.92
PVDF	33	1.36	1	0.96	0.92

Asahi/America, Inc.
655 Andover Street, Lawrence, MA 01843
800-343-3618

Table 10 – Support Spacing for Advanced PE Containment Piping in Feet

OD		20° C / 68° F	30° C / 86° F	40° C / 104° F	50° C / 122° F	60° C / 140° F
mm	inch	Advanced PE SDR 11	Advanced PE SDR 11	Advanced PE SDR 11	Advanced PE SDR 11	Advanced PE SDR 11
90	3"	5.5	5.25	4.75	4.5	4.25
110	4"	6	5.75	5.5	5.25	4.75
125	4-1/2"	6.25	6.25	5.75	5.5	5
140	5"	6.75	6.75	6.25	6	5.5
160	6"	7.5	7	6.75	6.25	5.75
180	7"	7.75	7.5	7	6.75	6.25
200	8"	8.25	8	7.5	7.25	6.75
225	9"	8.75	8.5	8	7.75	7.5
250	10"	9.5	9	8.75	8.25	7.5
280	11"	10	9.5	9.25	8.75	8
315	12"	10.5	10	9.75	9.25	8.5
355	14"	11.25	10.75	10.5	10	9.25
400	16"	12	11.25	11	10.5	9.75
450	18"	12.25	11.75	8	10.75	10
500	20"	13	12.5	12	11.5	10.75
560	22"	10.5	13.25	12.75	12.25	11.5
630	24"	14.75	14.25	13.75	13	12.25

Table 11 – Support Spacing Correction Factors based on Operating Media Density for Advanced PE Containment Piping

Material	SDR	Operating Media Density [g/cm^3]			
		<0.01 (gases)	1	1.25	1.5
Advanced PE	SDR11	1.47	1	0.96	0.92

Table 12 – Support Spacing for ECTFE Containment Piping in Feet

OD		20° C / 68° F	30° C / 86° F	40° C / 104° F	50° C / 122° F	60° C / 140° F	70°C / 157°F	80°C / 176°F	90°C / 194°F	100°C / 212°F	120°C / 248°F
mm	in	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE	ECTFE
		SDR21	SDR21	SDR21	SDR21	SDR21	SDR21	SDR21	SDR21	SDR21	SDR21
90	3"	4.5	4.5	4.25	4	3.75	3.75	3.5	3.5	3.25	3
110	4"	5.25	5	5	4.75	4.5	4.25	4	4	3.75	3.5

Table 13 – Support Spacing Correction Factors based on Operating Media Density for ECTFE Containment Piping

Material	SDR	Operating Media Density [g/cm^3]			
		<0.01 (gases)	1	1.25	1.5
ECTFE	21	1.26	1	0.93	0.82

4.4 Leak Detection

All Duo-Pro® piping systems can be supplied with low point leak detection or with continuous cable leak detection. To supply with continuous leak detection cable Duo-Pro® piping systems must have an annular space greater than 1 inch.

Table 14 - Annular Space

Carrier		Containment		Containment Size					
				SDR 11		SDR 21		SDR 33	
mm	inch	mm	inch	Annular Space	Cable LD	Annular Space	Cable LD	Annular Space	Cable LD
32	1	90	3	0.82	N	0.97	N	1.03	Y
32	1	110	4	1.14	Y	1.33	Y	1.40	Y
50	1-1/2	110	4	0.79	N	0.97	N	1.05	Y
63	2	110	4	-	N*	0.72	N	0.79	N
63	2	160	6	1.34	Y	1.61	Y	1.72	Y
90	3	160	6	-	N*	1.08	Y	1.19	Y
110	4	200	8	1.06	Y	1.40	Y	1.53	Y
160	6	250	10	0.88	N	1.30	Y	1.47	Y
200	8	315	12	1.14	Y	1.67	Y	1.89	Y
250	10	355	14	-	N*	1.40	Y	1.64	Y
315	12	400	16	-	N*	0.92	N	1.20	Y
355	14	450	18	-	N*	1.03	Y	1.33	Y
400	16	500	20	-	N*	1.03	Y	1.37	Y

*Consult factory