

OPERATING CHARACTERISTICS FLANGED GATE, GLOBE, AND CHECKS

FLOW COEFFICIENTS

Flow coefficients are the same for both carbon steel and stainless steel bodies. Refer to main catalog for valve size offerings.

GATE VALVE Cv's

CLASS 150													
SIZE	2"	2-1/2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Cv	298	466	694	1,234	2,873	5,109	8,622	12,416	17,651	23,055	30,603	37,782	57,349
CLASS 300													
SIZE	2"	2-1/2"	3"	4"	6"	8"	10"	12"					
Cv	289	452	672	1,194	2,776	4,935	7,982	11,929					

GLOBE VALVE Cv's

CLASS 150									
SIZE	2"	2-1/2"	3"	4"	6"	8"	10"	12"	
Cv	46	72	105	166	400	810	1,310	1,900	
CLASS 300									
SIZE	2"	2-1/2"	3"	4"	6"	8"	10"		
Cv	46	84	104	165	436	692	1,120		

SWING CHECK VALVE Cv's

CLASS 150												
SIZE	2"	2-1/2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
Cv	218		499	903	2,032	3,679	5,857	8,435	11,708	15,293	19,754	24,912
CLASS 300												
SIZE	2"	2-1/2"	3"	4"	6"	8"	10"	12"				
Cv	211	330	482	858	1,963	3,549	5,546	8,128				

Cv is the volume of water in U.S. gallons per minute that passes through the valve at a pressure drop of 1 PSI at 68°F. Cv is in imperial units; in metric units, the same coefficient (often called the Flow Factor) is Kv and corresponds to the flow rate of water in cubic meters (m³) per hour at a pressure drop of 100kPa (1 bar) at 20°C.

OPERATING CHARACTERISTICS GATE, GLOBE, AND CHECK VALVES

FLOW COEFFICIENTS

The approximate corresponding formulas for flow are:

$$Q = C_v \times \sqrt{\frac{\Delta P \times 62.4}{D}}$$

Where:

- Q = Valve flow rate in gallons per minute (USGPM)
- ΔP = Pounds per square inch (PSI) pressure drop across the valve
- 62.4 = Conversion factor for fluids computed in relation to water
- D = Density of fluids in pounds per cubic foot

$$Q = K_v \times \sqrt{\frac{\Delta P \times 1000}{D}}$$

Where:

- Q = Valve flow rate in cubic meters per hour (m³/h)
- ΔP = pressure drop across the valve in Bar
- 1000 = Conversion factor for fluids computed in relation to water
- D = Density of fluids in kilograms per cubic meter (kg/m³)

The relationship between Cv and Kv, expressed in the above mentioned unit of measure, is as follows:

$$K_v = \frac{C_v}{1.16}$$

CLASS 150#

ANSI B16.5 - 1/16" Raised Face Mate with 125# Cast Iron Flanges - ANSI B16.1							
Size	Flange Diameter	Flange Thickness	Bolt Circle Diameter	Bolt Hole Diameter	Number of Bolts	Diameter of Bolts	Length of Stud Bolts
2	6	5/8	4 3/4	3/4	4	5/8	3 1/4
2 1/2	7	11/16	5 1/2	3/4	4	5/8	3 1/2
3	7 1/2	3/4	6	3/4	4	5/8	3 3/4
3 1/2	8 1/2	13/16	7	3/4	8	5/8	3 3/4
4	9	15/16	7 1/2	3/4	8	5/8	3 3/4
5	10	15/16	8 1/2	7/8	8	3/4	4
6	11	1	9 1/2	7/8	8	3/4	4
8	13 1/2	1 1/8	11 3/4	7/8	8	3/4	4 1/4
10	16	1 3/16	14 1/4	1	12	7/8	4 3/4
12	19	1 1/4	17	1	12	7/8	4 3/4
14	21	1 3/8	18 3/4	1 1/8	12	1	5 1/4
16	23 1/2	1 7/16	21 1/4	1 1/8	16	1	5 1/2
18	25	1 9/16	22 3/4	1 1/4	16	1 1/8	6
20	27 1/2	1 11/16	25	1 1/4	20	1 1/8	6 1/4
24	32	1 7/8	29 1/2	1 3/8	20	1 1/4	7

CLASS 300#

ANSI B16.5 - 1/16" Raised Face Mate with 250# Cast Iron Flanges - ANSI B16.1							
Size	Flange Diameter	Flange Thickness	Bolt Circle Diameter	Bolt Hole Diameter	Number of Bolts	Diameter of Bolts	Length of Stud Bolts
2	6 1/2	7/8	5	3/4	8	5/8	3 1/2
2 1/2	7 1/2	1	5 7/8	7/8	8	3/4	4
3	8 1/4	1 1/8	6 5/8	7/8	8	3/4	4 1/4
3 1/2	9	1 3/16	7 1/4	7/8	8	3/4	4 1/2
4	10	1 1/4	7 7/8	7/8	8	3/4	4 1/2
5	11	1 3/8	9 1/4	7/8	8	3/4	4 3/4
6	12 1/2	1 7/16	10 5/8	7/8	12	3/4	5
8	15	1 5/8	13	1	12	7/8	5 1/2
10	17 1/2	1 7/8	15 1/4	1 1/8	16	1	6 1/4
12	20 1/2	2	17 3/4	1 1/4	16	1 1/8	6 3/4
14	23	2 1/8	20 1/4	1 1/4	20	1 1/8	7
16	25 1/2	2 1/4	22 1/2	1 3/8	20	1 1/4	7 1/2
18	28	2 3/8	24 3/4	1 3/8	24	1 1/4	7 3/4
20	30 1/2	2 1/2	27	1 3/8	24	1 1/4	8 1/4
24	36	2 3/4	32	1 5/8	24	1 1/2	9 1/4

METRIC EQUIVALENTS

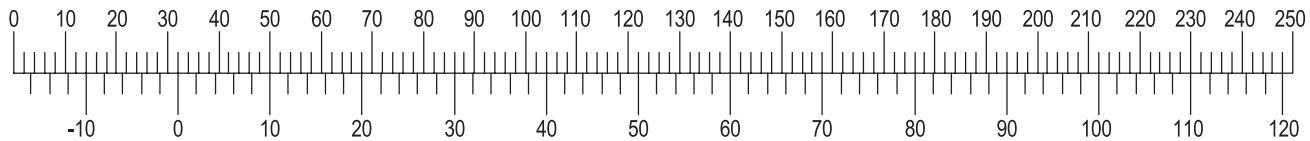
CONVERSION FROM INCHES TO MILLIMETERS					
in.	mm	in.	mm	in.	mm
1	25.4	36	914.4	71	1803.4
2	50.8	37	939.8	72	1828.8
3	76.2	38	965.2	73	1854.2
4	101.6	39	990.6	74	1879.6
5	127.0	40	1016.0	75	1905.0
6	152.4	41	1041.4	76	1930.4
7	177.8	42	1066.8	77	1955.8
8	203.2	43	1092.2	78	1981.2
9	228.6	44	1117.6	79	2006.6
10	254.0	45	1143.0	80	2032.0
11	279.4	46	1168.4	81	2057.4
12	304.8	47	1193.8	82	2082.8
13	330.2	48	1219.2	83	2108.2
14	355.6	49	1244.6	84	2133.6
15	381.0	50	1270.0	85	2159.0
16	406.4	51	1295.4	86	2184.4
17	431.8	52	1320.8	87	2209.8
18	457.2	53	1346.2	88	2235.2
19	482.6	54	1371.6	89	2260.6
20	508.0	55	1397.0	90	2286.0
21	533.4	56	1422.4	91	2311.4
22	558.8	57	1447.8	92	2336.8
23	584.2	58	1473.2	93	2362.2
24	609.6	59	1498.6	94	2387.6
25	635.0	60	1524.0	95	2413.0
26	660.4	61	1549.4	96	2438.4
27	685.8	62	1574.8	97	2463.8
28	711.2	63	1600.2	98	2489.2
29	736.6	64	1625.6	99	2514.6
30	762.0	65	1651.0	100	2540.0
31	787.4	66	1676.4		
32	812.8	67	1701.8		
33	838.2	68	1727.2		
34	863.6	69	1752.6		
35	889.0	70	1778.0		

CONVERSION FROM FRACTIONAL INCHES TO MILLIMETERS					
in.	mm	in.	mm	in.	mm
1/64	0.016	0.397	33/64	0.516	13.097
1/32	0.031	0.794	17/32	0.531	13.494
3/64	0.047	1.191	35/64	0.547	13.891
1/16	0.063	1.588	9/16	0.563	14.288
5/64	0.078	1.984	37/64	0.578	14.684
3/32	0.094	2.381	19/32	0.594	15.081
7/64	0.109	2.778	39/64	0.609	15.478
1/8	0.125	3.175	5/8	0.625	15.875
9/64	0.141	3.572	41/64	0.641	16.272
5/32	0.156	3.969	21/32	0.656	16.669
11/64	0.172	4.366	43/64	0.672	17.066
3/16	0.188	4.763	11/16	0.688	17.463
13/64	0.203	5.159	45/64	0.703	17.859
7/32	0.219	5.556	23/32	0.719	18.256
15/64	0.234	5.953	47/64	0.734	18.653
1/4	0.250	6.350	3/4	0.750	19.050
17/64	0.266	6.747	49/64	0.766	19.447
9/32	0.281	7.144	25/32	0.781	19.844
19/64	0.297	7.541	51/64	0.797	20.241
5/16	0.313	7.938	13/16	0.813	20.638
21/64	0.328	8.334	53/64	0.828	21.034
11/32	0.344	8.731	27/32	0.844	21.431
23/64	0.359	9.128	55/64	0.859	21.828
3/8	0.375	9.525	7/8	0.875	22.225
25/64	0.391	9.922	57/64	0.891	22.622
13/32	0.406	10.319	29/32	0.906	23.019
27/64	0.422	10.716	59/64	0.922	23.416
7/16	0.438	11.113	15/16	0.938	23.813
29/64	0.453	11.509	61/64	0.953	24.209
15/32	0.469	11.906	31/32	0.969	24.606
31/64	0.484	12.303	63/64	0.984	25.003
1/2	0.500	12.700	1	1.000	25.400

Temperature Conversions

$$F^{\circ} = C^{\circ} \times 1.8 + 32$$

$$C^{\circ} = (F - 32) / 1.8$$



	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Arsenic Acid	D	D	D	D	B		B	D	B	A	D	B	A	B	A		A	A
Asphalt Emulsion	C	A	B	B	A		A	A	A	D	A	D	A	D	C	A		A
Asphalt Liquid	C	A	B	B	A		A	A	A	C	A	D	A	D	C			A
Barium Carbonate	C	B	B	B	B		B	B	A	B	A	A	A	A	A			A
Barium Chloride	D	B	C	C	B	B	C	B		A	A	A	A	B	A			A
Barium Cyanide	D	C		C	B		B	D		B	A	B	B	B	B			A
Barium Hydrate	D	D			A		A	B		A	A							A
Barium Hydroxide	D	C	C	B	B	A	A	B		A	A	B	A	B	A	A		A
Barium Nitrate	B				A		A			A	A				B			A
Barium Sulfate	D	C	C	C	A		A	B		A	A	B	A	B	A			A
Barium Sulfide	D	D	C	D	B		B	C		A	A	A	A	B	B	B		A
Beer	A	B	D	D	A	A	A	A		B	A	B	A	C	B	A		A
Beet Sugar Liquors	A	A	B	B	A		A	A		A	A	B	A	C	A	A		A
Benzaldehyde	A	A	A	C	A		A	B	B	D	A	A	D	D	D	A		A
Benzene (Benzol)	B	B	B	B	B	B	A	A	B	D	C	D	B	D	D	A	A	A
Benzoic Acid	B	B	D	D	B	A	B	B	A	C	A	D	B	D	C	D		A
Beryllium Sulfate	B	B		B	B		A	B		B	A	B	B	B	B			A
Bleaching Powder wet		B			C		B	D	A	D	D	B	B	B	A	D		A
Blood (Meat Juices)	B	B		D	A	A	A	B		B	A	A	B	B	B			A
Borax (Sodium Borate)	C	D	C	C	A		A	A		B	A	A	A	B	D			A
Bordeaux Mixture					A		A			A								A
Borax Liquors	C	A	C	C	B		A	A	B		A	A	A	D	C			A
Boric Acid	B	C	D	D	B		B	B	A	B	A	B	A	B	B	D	A	A
Brake Fluid	B	B		B	B	A		B		D	B	B	D	B	C			A
Brines, saturated	C	B	D	C	B		B	B	A	A	A	A	A	B	B	C		A
Bromine, dry	C	B	D	D	D		B	A	A	D	D	D	B	D	D	D	B	A
Bunker Oils (Fuel)	A	B	B	B	A		A	A		B	A		A		B			A
Butadiene	B	C	B	B	A		A	C	B	C	A	C	B	D	C			D
Butane	A	A	B	B	A		A	B	A	B	A	D	A	A	B	A		A
Butter					A		A			B	A			D	B			A
Buttermilk	A	D	D	D	A		A	D		A	A	B	A	D	A			A
Butyl Acetate	B	B		B	B		A	B	B	D	B	D	D	D	D			A
Butylene	A	A	A	A	A		A	A		D	A	D	D	D	D	A		A
Butyric Acid	B	C	D	D	B		B	B	A	C	A	C	C	C	C	D		A
Calcium Bisulfite	C	C	D	D	B		B	D	B	A	D	D	A	B	A			A
Calcium Carbonate	C	C	D	D	B		B	B	B	A	A	B	A	B	A	A		A
Calcium Chlorate	B	D	C	C	B		B	B	B	B	D	B	B	B	B		B	A
Calcium Chloride	C	B	C	C	B	B	B	B	A	A	A	B	A	B	A	D		A
Calcium Hydroxide	D	C	C	C	B		B	A	A	A	A	A	A	B	B	A		A
Calcium Nitrate	B				B		B			B	C	B	A	B	B			A
Calcium Phosphate	D	C		C	B		B			B	B	B	B	B	B			A
Calcium Silicate	D	C		C	B		B			B	A	B	B	B	B			A
Calcium Sulfate	B	C	C	C	B	B	B	B	B	A	A	B	A	B	A			A
Caliche Liquor			B		A		A			B	A			B	B			A
Camphor	C	C		C	B		C	C		B	A	B	B	B	B			A
Cane Sugar Liquors	A	B		B	A		A	C		B	A	B	B	C	B			A
Carbonated Beverages	B	B	D	B	B	B	B	C		B	A	B	B	D	B		A	A
Carbonated Water	A	B	B	A	A	B	A	B		A	A	A	A	D	A		A	A
Carbon Bisulfide	A	C	B	B	B		B	B		D	A	D	A	D	D			A
Carbon Dioxide, Dry	A	A	A	B	A	A	A	A		C	A	B	B	B	B		A	A
Carbonic Acid	A	D	D	D	B	B	A	B		B	A	B	A	B	B		A	A
Carbon Monoxide	A	A		B	A	A	A	A	A	B	A	B	B	C	D	A		A
Carbon Tetrachloride, dry	B	C	B	C	A	A	A	A	A	D	A	D	B	D	D	A	A	A
Carbon Tetrachloride, wet			D	D	D	B	B	B	B	D	B	D	B	D	D	A	A	A
Casein	C	C		C	B		B	C		B	A	B	B	B	B			A
Caster Oil	A	A	B	B	A		A	A	A	A	A	B	A	B	B	A		A
Caustic Potash					A		A	B		B	D			B	B			A
Caustic Soda	D		B	B	A		A	A		C	D	B	B	B				A
Cellulose Acetate	B	B		B	B		B	B	B	D	C	B	D	D	D			A
China Wood Oil (Tung)	A	C	C	C	A		A	A	A	A	A	D	A	B	B	A		A
Chlorinated Solvents	D	C	C	C	A		A	B		D	A	D	C	D	D			A
Chlorinated Water	C				C	D	A	D	D	B	D		A	B	A	D	B	A
Chlorine Gas, dry	B	C	B	B	B	C	A	A	A	C	D	D	B	C	D	D	A	A
Chlorobenzene, dry	B	B	B	B	A		A	B	B	D	B	D	A	D	D	A		A
Chloroform, dry	D	B	B	C	A	B	A	A	B	D	A	D	B	D	D	B		A
Chlorophyll, dry	B	B		B	B		A	B		B		B	B	B	B			A
Chlorosulfonic Acid, dry	B	C	B	B	B		B	B	A	D	D	D	D	D	D	D		A
Chrome Alum	C	C	B	C	A		A	B		B	B	B	B	B	B	D		A
Chromic Acid < 50%	C	D	D	D	C	C	B	C	B	D	D	C	C	B	D	D		A
Chromic Acid > 50%	D	D	D	C	C	D	B	D	B	D	D	C	C	B	D	D		A
Chromium Sulfate	B	C		D	B		C	B		B	C	B	B	B	B			A
Cider	B				A		B	A		A				D				A
Citric Acid	B	C	D	D	B	C	A	B	A	B	A	B	A	A	A	B	A	A
Citrus Juices	C	B	D	D	B		A	A		A	A		A	D	A			A
Coca-Cola Syrup					A		A			B	A		B	D	B			A
Coconut Oil	B	B	C	C	B		A	B		A	A				C			A

CHEMICAL COMPATIBILITY

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Acetaldehyde	B	C	C	C	A		A	A	A	D	A	B	C	D	D	B		A
Acetamine	B	B	B	B	B				A	A				D	B	B		A
Acetate Solvents	A	B	A	B	A			A	A	D	D	D	D	D	D			A
Acetic Acid, aerated	B	D	D	D	A			A	A	C	D	C			C	B	A	A
Acetic Acid, Air Free	B	B	D	D	A	A	A	A	A	C	D	D	D		C	B	A	A
Acetic Acid, crude	C	C	C	C	A	A	A	B	A	D	D	D	D		D	B	A	A
Acetic Acid, glacial						A			A	D	D	B	C	C	C	B	A	A
Acetic Acid, pure	C	C	D	D	A	A	A	D	A	D	D	D	D	A	D	B	A	A
Acetic Acid, 10%	C	C	C	C	A	A	A	B	A	D	B	B	D	C	C	B	A	A
Acetic Acid, 80%	C	C	C	C	A	A	A	B	A	D	D	C	D	D	D	B	A	A
Acetic Acid Vapors	B	D			D	D	B	C	A	D						B	A	A
Acetic Anhydride	B	D	D	D	B	B	B	B	A	D	C	C	D	B	C		A	A
Acetone	A	A	A	A	A	A	A	A	A	D	A	A	D	D	D		A	A
Other Ketones	A	A	A	A	A	A	A	A	A	D	A	D	D	D	D			A
Acetyl Chloride	D	A		D	C			B	A	D	D	D	D	D	D			A
Acetylene	A	B	A	A	A	A	A	A	A	B	A	A	A	C	C	A		A
Acid Fumes	B	D	D	D	B		B			C	D			C	B			A
Acrylonitrile	B	A	A	C	A		B	A	A	D	D	D	C	D	D	A		A
Air	A	A	A	A	A		A	A	A	A	A	A	A	A	A	A		A
Alcohol, Amyl	B	B	B	C	A		B	B	B	C	A	A	B	B	C	A	A	A
Alcohol, Butyl	B	B	B	C	A		A	A	A	B	A	C	A	B	B	A	A	A
Alcohol, Diacetone	A	A	A	A	A		A	B	A	D	A	B	D	C	C	A	A	A
Alcohol, Ethyl	B	B	B	B	B		A	B	A	A	A	A	A	B	B	A	A	A
Alcohols, Fatty	B	B	B	B	A		A		A	B	A			B	B	A	A	A
Alcohol, Isopropyl	B	B	B	B	B		A	B	B	C	A	A	A	B	B	A	A	A
Alcohol, Methyl	B	B	B	B	A		A	A	A	B	A	A	C	A	A	A	A	A
Alcohol, Propyl	A	A	B	B	A		A	A	A	B	A	A	A	B	B	A	A	A
Alumina	A	A							A	A	A	A				A		A
Aluminum Acetate	C	D		D	A	B	B	C	B	D	A	A	D	D	D			A
Aluminum Chloride dry	B	B	C	D	C		D	B	B	B	A	A	A	B	B	A	A	A
Aluminum Chloride solution	C			D	C	C	B	B	A	B	D	A	A	B	B	A	A	A
Aluminum Fluoride	C		D	D	C		C	B	A	A	C	A	A	B	A			A
Aluminum Hydroxide	A	A	D	D	A	B	B	B	B	A	C	A	A		A			A
Aluminum Nitrate	D	D		D	C		B	C	B	B	D	B	D	B	B			A
Aluminum Oxalate	B						A	B	A									A
Alum (Aluminum Potassium Sulfate)	D	D		D	B	C	B	C	A	B	D		B	B	B		A	A
Alum (Aluminum Sulfate)	C	C	D	D	B	A	B	C	A	A	D	A	A	B	A	A	A	A
Amines	B	B	B	C	A	A	A	B	B	D	C	C	D	D	D	B		A
Ammonia, Alum	C				A		A		A	B	C				B	D	A	A
Ammonia, Anhydrous Liquid	A	D	A	B	A	A	A	B	A	B	D	B	D	B	C	A	A	A
Ammonia, Aqueous	B	D	A	A	A		A	B	B	B	D		A	B	B	B	A	A
Ammonia, Gas, hot	A	D		B	A		A	B	B	C	D	A	D	C	A		A	A
Ammonia Liquor					A		A		B							B	A	A
Ammonia Solutions	C	D	B	B	A		A	B	B	B	D	B	D	D	B	B	A	A
Ammonium Acetate	B	D		B	B		A	B	B	B	D	A	D	D	B			A
Ammonium Bicarbonate	B	B	C	B	B		B	B	B		B	A	A	B	A	B		A
Ammonium Bromide 5%	D				B		B	B			A							A
Ammonium Carbonate	B	B	B	B	B		B	B		C	D	A	B	B	A			A
Ammonium Chloride	D	D	D	D	C		C	B	B	B	B	C	A	A	A	D		A
Ammonium Hydroxide 28%	C	D	C	C	B	A	A	D	B	B	D	B	A		A	B	A	A
Ammonium Hydroxide Concentrated	C	D	C	C	B	A	A	C	B	C	D	A	A	A	A		A	A
Ammonium Monosulfate	D					A		B	B	B		D						A
Ammonium Nitrate	B	D	D	D	A	A	B	D	B	A	D	A	A	A	A	C		A
Ammonium Oxiate 5%	A				A		A	B			A							A
Ammonium Persulfate	C	C			A		A	D		D	D	B	B	B	C			A
Ammonium Phosphate	C	D	D	D	B		B	C		A	C	A	A	A	A	A		A
Ammonium Phosphate Di-basic	B	C	D	D	B		B	C	B	A	A		A		A	A		A
Ammonium Phosphate Tri-basic	C	C	D	D	B		B	C	B	A	A		A		A	A		A
Ammonium Sulfate	C	C	C	D	B	B	B	B	B	A	B	A	B	B	A	A	A	A
Ammonium Sulfide	C	D	D	D	B		B	B		A	A	A	D	B	B			A
Ammonium Sulfite	C	C	C	C	A		B	D		B	A	B	A		A			A
Amyl Acetate	B	B	C	C	B	A	A	B	A	D	A	B	D	D	D	D		A
Amyl Chloride	D	B		B	A		A	B	B	D	A	D	D	D	C	B		A
Aniline	C	D	C	C	B		A	B	B	D	D	C	C	D	D	B	A	A
Aniline Dyes	C	C	C	C	A		A	A		C	A	C	B	C	C			A
Apple Juice	B	C	D	D	B		A	A		A	A	B	A	B	A			A
Aqua Regia (Strong Acid)	D	D	D	D	B		B			D	D	D	D	D	D		D	A
Aromatic Solvents	A	A	C	B	A		A	B		D	A	D		A	D			A

CHEMICAL COMPATIBILITY

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Coffee	A	A		D	A		A	B		A	A				A			B
Coffee Extracts, hot	A	B	C	C	A		A	A		A	A					D		A
Coke Oven Gas	A	C	B	B	A		A	B		C	D	D	B	C	D	C		A
Cooking Oil	B	B	B	B	A		A	A		A	A	D	A	C	B			A
Copper Acetate	D	D	D	D	A		A	C	B	C	D	B	D	D	C			A
Copper Carbonate	D				A		A				A							A
Copper Cyanide	D	D		D	A		A	C		A	A	B	B	B	A			A
Copper Nitrate	D	D	D	D	B		B	D		A	A	B	A	A	A			A
Copper Sulfate	D	D	D	D	B	B	B	C	A	A	A	A	A	A	A	A	A	A
Corn Oil	B	B	C	C	B		B	B		A	A	C	A	C	C			A
Cottonseed Oil	B	B	C	C	B		B	B		A	A	C	B	C	B			A
Cresol					B		B			D	D	D	D	D	D			A
Cresote Oil	B	B	B	B	B	B	A	B	B	C	D	D	A	D	D			A
Cresylic Acid	C	C	C	D	B		B	B		D	D	D	B	D	D			A
Crude Oil, sour	B	C	B	C	A		A	B		A	A	D	A	C	B			A
Crude Oil, sweet	A	B	B	B	A		A	A		A	A		A		B			A
Cupric Nitrate	D				A		A	D			D							A
Cutting Oils, Water/Emulsions	A	A	B	B	A		A			A	A		A		B			A
Cyanide Plating Solution	D	D		D	B		B	D		B	D	B	B	B	B			A
Cyclohexane	A	A	A	A	A		A	B	B	C	A	D	A	D	D	A		A
Cyclohexanone	B	B			A		A	B	B	D	A				D	A		A
Detergents, synthetic	B	B		B	B		A	B		B	A	B	A	B	B			A
Dextrin	B	B		B	B		B	B		B	A	B	B	B	B			A
Dichloroethane				C	C		B	B		D	D	D			D			A
Dichloroethyl Ether	B	B		B	B		B			D	D	D	D	D	D			A
Diesel Oil Fuels	A	A	A	A	A		A	A		A	A	D	A	D	C			A
Diethylamine	B	B	A	B	A		A	B		B	A	C	D	C	C	B		A
Diethyl Benzene					B		B			D	C	D			D			A
Diethylene Glycol	B	B		A	A		A	B		A	A	A	B	B	A			A
Diethyl Sulfate	B	B		B	B		B	B		C	A	C	B	D	C			A
Dimethyl Formamide	B	B		B	A		A	B		B	A	D	D	D	D			A
Dimethyl Phthalate										B	C		D	B	B			A
Dioxane	B	B		B	B		B	B		D	C	C	D	D	D		A	A
Dipentane (Pinene)	A	A		A	A		A	A		B	A	D	B	D	D			A
Disodium Phosphate	B				B		B	C		B	A		B	B	B			A
Dowtherm	A	A	B	B	A		A	A		D	A	D	A	D	D	C	A	A
Drilling Mud	B	B	B	B	A		A	B		A	A	A	A	B	C			A
Dry Cleaning Fluids	A	C	B	B	A		A	B		D	A		B		D			A
Drying Oil	C	C	C	B	B		B	B		A	A				B			A
Enamel	A									B	A	D			B			A
Epsom Salts (MgSo4)	A	B	C	C	B		B	B		A	A		A	D	A	B		A
Ethane	A	B	C	C	B		B	B		A	A	D	A		B			A
Ethers	A	B	A	B	A	B	A	B		D	C	C	C	D	D			A
Ethyl Acetate	A	C	B	C	B	A	B	B	B	D	C	C	D	D	D	A		A
Ethyl Acrylate	C	B	C	C	A		A	B	A	D	B	C	D	D	D	A		A
Ethyl Benzene							A			A	C	A	D	D	D	B		A
Ethyl Bromide	B	A		B	B		C	B		B	A	B	B	D	B			A
Ethyl Chloride, dry	B	B	B	B	A	A	A	B	B	C	A	C	B	D	C	A		B
Ethyl Chloride, wet	D	C	D	D	B		B	B	B	C	A	B	B	D	C	A		A
Ethylene Chloride	C				A		A	B	B	D	A		D		A			A
Ethylene Dichloride					B		A	B		D	C	D	D	D	D	A	A	A
Ethylene Glycol	A	B	B	B	B	A	A	B	A	A	A	A	A	B	B	A		A
Ethylene Oxide	C	C	B	B	B		B	B	A	D	A	D	D	D	D	D		A
Ethyl Ether	B	B		C	A		A	A	B	D	A	D	D	D	D			A
Ethyl Silicate	A	B		B	B		B	B		B	A	B	B	B	C			A
Ethyl Sulfate					B		B			B	A	C	A		B			A
Fatty Acids	B	C	D	D	A		A	B	A	B	A	D	A	D	B	A	A	A
Ferric Hydroxide					A		A	A		B	A							A
Ferric Nitrate	D	D	D	D	C	B	A	D	B	A	A	A	A	B	A			A
Ferric Sulfate	D	D	D	D	B	B	A	D		A	A	A	A	A	A	C		A
Ferrous Ammonium Citrate	B				B		B				A							A
Ferrous Chloride	D	B	D	D	D		D	D	D	A	A	A	A	B	A	C	A	A
Ferrous Sulfate	C	B	D	D	B		B	B	B	A	A	A	A	B	A		A	A
Ferrous Sulfate, Saturated	C	C	C	C	A		A	B	B	C	A	B	B	B	C			A
Fertilizer Solutions	B	C	B	B	B		B	B		B					B			A
Fish Oils	C	B	B	B	A		A	A		A	A	D	A	D	B			A
Flue Gases	C	B		B	A		A	B		C	C	D	C	B	C			A
Fluoboric Acid	B				B		A			A	D			B	B			A
Fluorosilicic Acid	D	B	D	D	B		B	A	B	C	C	C	C	C	C			A
Formaldehyde, cold	A	A	A	B	A	A	A	A	B	B	A	B	D	C	C	A		A
Formaldehyde, hot	B	B	D	D	C		B	B	B	B	A			B	B			A
Formic Acid, cold	D	B	D	D	B	B	A	B	A	D	D		B	C	B	A	A	A
Formic Acid, hot	D	B	D	D	B	D	B	B	B	D	D		A		A	D	A	A
Freon Gas, dry	B	B	B	B	A	A	A	A	B	C	A	C	C	B	C	A	A	A
Freon 11, MF, 112, BF	B	B		C	A		A	B	B	C	A	C	D	B	C	A	A	A
Freon 12, 13, 32, 114, 115	A	A		B	A		A	B	B	B	A	A	D	B	A	A	A	A

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Freon 21, 31	B	B		C	A		A	B	B	D	A	D	D		D	A	A	
Freon 22	A	A		B			A	B	B	D	A	D	D		B	A	A	
Freon 113, TF	B	B		C	A		A	B	B	B	A	C	C		C	A	A	
Freon, wet	D	D		D	C	B	B	B	B	B	A	B	D	B	B	D	A	A
Fruit Juices	B	B	D	D	A		A	B		A	A	A	A	C	A			A
Fuel Oil	A	B	B	B	A		A	B		A	A	D	A	C	C			A
Fumaric Acid							A			B	A				B			A
Furfural	A	A	A	B	A	B	A	B	B	D	A	C	D	D	C			A
Gallic Acid 5%	A	C	D	D	B		B	B	B	B	A	C	A	C	B	A		A
Gas, Manufactured	B	B	B	B	B		B	A		A	A		A		A	A		A
Gas, Natural	B	B	B	B	A		B	A		A	A	D	A	B	A	A		A
Gas, Odorizers	A	A	B	B	B		A	B		B	A		A		B	A		A
Gasoline, Aviation	A	A	A	B	A		A	A	A	C	A		A		D	A	A	A
Gasoline, Leaded	A	A	A	A	A		A	B	A	C	A		A	B	D	A	A	A
Gasoline, Motor	A	A	A	B		A	A	A	C	A	D		A	D	D	A	A	A
Gasoline, Refined	A	B	B	B	A		A	B	A	C	A	D	A	D	C	A	A	A
Gasoline, Sour	A	B	B	B	A		A	C	A	C	A	D	A	C	D	B	A	A
Gasoline, Unleaded	A	A	A	B	A		A	A	A	C	A		A	B	D	A	A	A
Gelatin	A	A	D	D	A		A	B		A	A	A	A	B	A	A		A
Glucose	A	A	B	B	A		A	A	A	A	A	A	A	B	A	A		A
Glue	A	B	A	B	B		A	B	A	A	A	B	A	B	A	A		A
Glycerine (Glycerol)	A	B	C	B	A	A	A	A	C	A	A	B	A	D	A		A	
Glycol Amine	C	D		B	B	A			D	A	C	D	D	C			A	
Glycol	A	B	C	B	B		A	B		B	C	A	A	B	A			A
Graphite	B	B		C	B		A	B		B	A	B	B	B	B			A
Grease	B	C	A	A	A		A	B		A	A	D	A	D	B			A
Helium Gas	B	B		B	A		A	B	A	B	A	B	B	B	B			A
Heptane	A	A	B	B	A		A	B	A	A	A	D	A	B	B			A
Hexane	A	B	B	B	A		A	B	A	A	A	D	A	B	C	A		A
Hexanol, Tertiary	A	A	A	A	A		A	A	A	A	A	D	B	C	C	A		A
Hydraulic Oil, Petroleum Base	A	B	A	B	A		A	A		A	A	D	A	B	B			A
Hydrazine	C	D		D	B		B	D		C	D	B	D	C	C			A
Hydrocyanic Acid	A	D	D	C	A		A	C	B	B	D	B	A	B	B			A
Hydrofluosilicic Acid	D	A	D	D	C		B	B		B	A	B	A	B	B		A	
Hydrogen Gas, cold	A	B	B	B	A		A	A		B	A	B	A	B	B	A		A
Hydrogen Gas, hot	C		B		B				A	B	A	B			B			A
Hydrogen Peroxide, Concentrated	A	D	D	D	B		B	D	D	D	D	B	B	B	D	D		A
Hydrogen Peroxide, Dilute	A	C	D	D	B		B	D	D	A	D	B	A		B	D		A
Hydrogen Sulfide, Dry	A	C	B	B	A	B	B	B	B	C	C	A	A	B	A	D	A	A
Hydrogen Sulfide, Wet	B	D	C	D	B		B	C	D	C	C	B	A	B	B	D	A	A
Hypo (Sodium Thiosulfate)	B	C	D	C	B		B	B		A	A	A	A		A			A
Illuminating Gas	A	A	A	A	A		A	A		C	A	D	A	D	C			A
Ink-Newsprint	C	C	D	D	A		A	B		A	A	B	A	B	B	A		A
Iodoform	C	C	B	C	A		A	C		A	A		A		A			A
Iso-Butane					B		B			B	A	D			D			A
Iso-Octane	A	A	A	B	A		A	A		A	A	D	A	B	C			A
Isopropyl Acetate					B		A			D	A	D			D		A	A
Isopropyl Ether	B	A	A	B	A		A	B	A	C	A	D	D	D	C	A	A	A
J P-4 Fuel	A	A	A	B	A		A	A	A	A	A		A		C	A		A
J P-5 Fuel	A	A	A	A	A		A	A	A	B	A		A		C	A		A
J P-6 Fuel	A	A	A	A	A		A	A	A	A	A		A		C	A		A
Kerosene	A	A	B	B	A		A	A	A	A	A	D	A	D	C	A	A	A
Ketchup	D	D	D	D	A		A	B		A	A		A	B	A			A
Ketones	A	A	A	A	A		A	A		D	A	D	D	D	D			A
Laquer (and Solvent)	A	A	C	C	A		A	A		D	A	D	D	D	D			A
Lactic Acid Concentrated cold	C	D	D	D	A	D	A	D	A	B	D	B	A	B	A	A		A
Lactic Acid Concentrated hot	C	D	D	D	B	D	A	D	B	C	D	B	B	B	C		A	A
Lactic Acid Dilute cold	A	D	D	D	A	B	A	C	A	B	D	B	A	B	A		A	
Lactic Acid Dilute hot	B	D	D	D	A	D	A	D	B	C	D		D		D		A	A
Lactose	B	B		C	B		B	B		B	A	B	B	B	C			A
Lard	A	B		A	A		A			B	A	C			C			A
Lard Oil	B	B	C	C	B		A	B		A	A	B	A	D	B			A
Lead Acetate	D	C	D	D	B		B	B		A	A	B	B	B	B			A
Lead Sulfate	D	C		D	B		B	B		B	A	B	B	B	B			A
Lecithin	D	C		C	B		B	B		D	A	D	B	D	D			A
Linoleic Acid	A	B	B	B	A		A	B		B	A	D	B	D	B			A
Linseed Oil	A	B	A	A	A		A	B		A	A	D	A	B	C			A
Lithium Chloride	D	B		B	B		A	B		B	A	B	A	B	B			A
LPG	A	A	B	B	B		B	B		A	A	D	A	D	B			A
Lubricating Oil Petroleum Base	A	B	A	A	A		A	B		A	A	D	A	C	B			A
Ludox	D	D		B	B		B	B		B	B	B	B	B	B			A
Magnesium Bisulfate	B	B	B	B	A		A	B		B	A	B	B	B	B			A
Magnesium Bisulfide	C	D		D	B		B	B		B	A	B	B	B	B			A
Magnesium Carbonate	B	B		B	A		A	B		B	A	B	B	B	B			A
Magnesium Chloride	D	B	C	D	B	C	B	B	A	A	A	A	A	A	A	C		A
Magnesium Hydroxide	D	B	B	B	A	A	A	B	B	A	A	A	A	A	A	D		A

CHEMICAL COMPATIBILITY

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Magnesium Hydroxide Hot	D	D	B	B	A	A	A	A	B	B	A		A	B	B	D		A
Magnesium Nitrate	B				A		A	B		B	A		B	B	A			A
Magnesium Sulfate	B	B	B	B	A	A	A	B	A	A	A	A	A	A	A	A		A
Maleic Acid	B	B	B	C	B		B	B	A	B	A	D	A	D	B			A
Maleic Anhydride	B	B		B	B		B	B	B	D	C	D	B	D	D			A
Malic Acid	B	B	D	D	B		B	B		A	A		A		A			A
Malt Beverage					A		B	A		A	A	B	A		A			A
Manganese Carbonate	B				B		A			B	A							A
Manganese Sulfate	B	B		D	A		A	B		B	A	B	B	B	B		A	A
Mayonnaise	D	D	D	D	A		A	B		A	A		A		A			A
Meat Juices	B	D			A		A			B	A			B	B			A
Melamine Resins				D	C		C			B	A			D	B			A
Methanol	B	B		B	A		A	B		B	C	D	B	D	B			A
Mercuric Chloride	D	D	D	D	B		B	D	B	A	A	A	A	B	B	C		A
Mercuric Cyanide	D	D	D	D	A		A	C	B	A	A	A	A	B	B			A
Mercurous Nitrate	D	D			A		A	D		A	A		B	B				A
Mercury	D	D	A	A	A		A	B	B	A	A	A	A	B	A			A
Methane	A	A	B	B	A		A	B	A	A	A		A		B			A
Methyl Acetate	A	A	B	B	A		A	B	A	D	B	B	D	D	D	A		A
Methyl Acetone	A	A	A	A	A		A	A		D	B	A	D	D	D	A		A
Methylamine	A	D	B	B	A		A	C	B	D	A	B	D	D	D	A		A
Methyl Bromide 100%	C	C		D	B		A	B		B	A	D	B	D	D			A
Methyl Cellosolve	A	A	B	B	A		A	B	B	C	A	B	D	D	D	B		A
Methyl Cellulose					A		A		B	D	A				D			A
Methyl Chloride	D	B	B	B	A		A	B		D	A	D	B	D	D	A		A
Methyl Ethyl Ketone	A	A	A	A	A		A	A	B	D	A	B	D	D	D	A	A	A
Methylene Chloride	C	A	B	B	A		A	B	B	D	A	D	C	D	D	A		A
Methyl Formate	C	A	C	C	B		A	B	B	D	A	B	D	B	B			A
Methyl Isobutyle Ketone					A		A			D	A				D	A		A
Milk & Milk Products	A	B	D	D	A		A	B		A	A	A	A	B	A	A		A
Mineral Oils	A	B	B	B	A		A	A		A	A	D	A	C	B			A
Mineral Spirits	A	B	B	B	B		B	B		A	A		A		C			A
Mixed Acids (cold)	D	D	C	C	B		B	C		D	D	D	B	D	D	C		A
Molasses, crude	B	A	A	A	A		A	A		A	A		A	B	A	A		A
Molasses, Edible	A	A	C	C	A		A	A		A	A		A		A	A		A
Molybdic Acid					A		A				A							A
Monochloro Benzene Dry					B		B	B		D	C				D		A	A
Morpholine	B	B		B	A		A	B		D	A	B	D	D	D			A
Mustard	B	A	B	B	A		A	A		A	A		A		A			A
Napha	A	B	B	B	B		B	B	A	B	A	D	A	C	C	A		A
Naphthalene	B	B	B	B	B		B	B	B	D	A	D	A	D	D	A		A
Natural Gas, Sour	B	B	B	B	A		A	D	A	A	A	D	A	D	A	A		A
Nickel Ammonium Sulfate	D	D	D	D	A		A	C		A	C	B	D	B	B	A		A
Nickel Chloride	D	D	D	D	B		A	B	A	A	D	B	A	B	A	C	A	A
Nickel Nitrate	C	D	D	D	B		A	B		A	C	A	A	B	A			A
Nickel Sulfate	D	D	D	D	B		A	B	B	A	C	B	A	B	A	A	A	A
Nicotinic Acid	A	A	B	C	A		A	A		D	C	D	B	D	D			A
Nitric Acid 10%	D	D	D	D	A	A	A	D		C	D		A		B	D	A	A
Nitric Acid 30%	D	D	D	D	A	D	A	D		C	D	B	A	D	C	D	B	A
Nitric Acid 80%	B	D	D	D	C	D	B	D		D	D	B	B	D	D	D	B	A
Nitric Acid 100%	B	D	D	D	A	D	A	D		D	D	D	B	C	D	D	B	A
Nitric Acid Anhydrous	B	D	D	C	A	D	A	D		D	D	D	A	D	D	D	B	A
Nitrobenzene	C	D	B	B	A		A	B	B	D	B	C	C	D	D	A		A
Nitrogen	A	A	A	A	A		A	A		A	A	B	A	B	A			A
Nitrous Acid 10%	D	D	D	D	B		B	D		C	B		A		A			A
Nitrous Gases	B	D	B	C	A		A	D			B							A
Nitrous Oxide	C	B	B	C	B		B	D	B	B	A		A		B	A		A
Oils & Fats	B				A		A			B	A	D				A		A
Oils, Animal	A	A	A	A	A		A	B	A	A	A	B	B	C	B	A		A
Oils, Petroleum Refined	A	B	A	A	A		A	A	A	A	A	D	A	B	B	A		A
Oils, Petroleum Sour	A	C	B	C	A		A	A	A	B	A	D	A	B	B	A		A
Oils, Water Mixture	A	A	B	B	A		A		A	A	A		A		B	A		A
Olaic Acid	B				B		B	A		D	C		C		D	A		A
Oleic Acid	B	B	C	C	B		A	B	B	B	C	D	A	D	C	A		A
Oleum	B	C	B	D	B		B	C	B	D	D	D	C	B	D	D		A
Oleum Spirits	D	D		D	D		B	D		C	D	D	A	D	D	D		A
Olive Oil	B	C	B	B	A		A	A		A	A	B	A	B	B	A		A
Oxalic Acid	C	B	D	D	B	D	B	B		C	A	B	A	B	B	D	A	A
Oxygen	A	A	B	B	A	A	A	A	A	B	D	A	A	A	B	D		A
Ozone, Dry	B	B	C	C	A		A	A	A	D	C	B	B	B	D	D		A
Ozone, Wet	B	B	C	C	A		A	A	A	D	C	B	B	B	D	D		A
Paints & Solvents	A	A	A	A	A		A	A		D	A	D	B	D	D			A
Palmitic Acid	B	B	C	C	B		B	B		B	A	B	A	D	B	D		A
Palm Oil	A	B	C	C	B		A	A		B	A	D	A	D	B	A		A
Paper Pulp	D	B		B	A		A	B		B	A	B	B	B	B	A		A
Paraffin	A	A	B	B	A		A	A	A	A	A	D	A	B	C	A		A

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Paraformaldehyde	B	B	B	B	B		B	B		B	A	D			B			A
Paraldehyde					B		B			B	A	D			B		A	A
Pentane	A	A	B	B	A		A	B		A	A	D	A		B			A
Perchloroethylene, dry	B	C	B	B	A		A	B	B	D	B	D	A	D	D	A		A
Petrolatum (Vaseline Petroleum Jelly)	B	B	C	C			A	A		A	A		A		B			A
Phenol	A	B	D	D	A	B	A	A	A	D	C	D	B	D	D	D		A
Phosphate Ester 10%	D	D	A	A	A		A	A		D	A	A			A			A
Phosphoric Acid 10%	D	D	D	D	D	B	B	D		B	D	B	A	B	A	D	A	A
Phosphoric Acid 50% Cold	D	D	D	D	B	B	B	C		B	D	B	A	B	B	D	A	A
Phosphoric Acid 50% Hot	D	D	D	D	D	D	B	C		B	D	B	A	B	B	D	A	A
Phosphoric Acid 85% Cold	D	D	B	B	A	C	B	A		C	D		B	B	C	D	A	A
Phosphoric Acid 85% Hot	D	D	C	C	B	D	B			C	D		B	C	D	D	A	A
Phosphoric Anhydride	A				A		A			D	B		B		D	D	A	A
Phosphorous Trichloride	D		B	C	A		A			D	D	B	B		D	D	A	A
Phthalic Acid	B	B	C	C	B		A	A	B	C	B		A		C	A		A
Phthalic Anhydride	B	B	C	C	B		B	A	A	C	A		A		C	A		A
Picric Acid	C	C	D	D	B	C	B	D	B	C	D	B	B	B	A	B		A
Pineapple Juice	A	C	C	C	A		A	A		A	A		A	D	A			A
Pine Oil	B	B	B	B	A		A	B		A	A	D	A	D	D			A
Pitch (Bitumen)					A		A			C	A	D			C			A
Polysulfide Liquor	D	D		B	B		A	B		B	D	B	B	B	B			A
Polyvinyl Acetate	B	B		B	B		B	B		B	A	B	B	B	C			A
Polyvinyl Chloride	B	B		B	B		B	B			A	B		B	C			A
Potassium Bicarbonate	A				A		A	B		B	A							A
Potassium Bichromate	A				A		A	A		B	B		B		B			A
Potassium Bisulfate	B				A		A	B		B	A		A	C	B			A
Potassium Bisulfite	C	C	D	D	B		B	D		A	A	B	A	C	A			A
Potassium Bromide	C	C	D	D	A	C	B	B		A	A	B	A	B	A			A
Potassium Carbonate	D	B	B	B	B	A	B	B		A	A	B	A	B	A			A
Potassium Chlorate	C	B	B	B	B	B	B	C		A	A	B	A	A	A			A
Potassium Chloride	D	C	C	B	B	B	A	B	B	A	A	A	A	B	A	A		A
Potassium Chromate	B	B		B	B		B	B		B	A	B	B	B	A			A
Potassium Cyanide	D	D	B	B	B		B	B	B	A	A	A	A	B	A			A
Potassium Dichromate	A	D	C	C	B		A	B		A	A	B	A	B	A			A
Potassium Ferricyanide	B	D	C	C	A	B	B	B		A	A	B	A		A			A
Potassium Ferrocyanide	B	B	C	C	B		B	A		A	A		A		A			A
Potassium Hydroxide Dilute Cold	D	D	A	A	B	B	B	A		A	D		D	B	B	B	A ⁺	A ⁺
Potassium Hydroxide to 70%, Cold	D	D	B	B	B	C	B	A		B	D	B	D	B	B	B	A ⁺	A ⁺
Potassium Hydroxide Dilute Hot	D	D	B	B	B	C	B	A		B	D			B				A ⁺
Potassium Hydroxide to 70%, Hot	D	D	A	B	B	D	B	A		C	D	A		A	B			A ⁺
Potassium Iodide	D	D	C	C	B	B	B	C		A	A	B	A		A			A
Potassium Nitrate	A	B	B	B	B	B	B	B	B	A	A	B	A	B	A			A
Potassium Oxalate	C				A		A			A								A
Potassium Permanganate	B	B	B	B	B	B	B	B	B	A	A	B	A	B	A			A
Potassium Phosphate	D	C		C	B		B	B	B	A	A	A	A	B	A	A		A
Potassium Phosphate Di-basic	B	B	A	A	A		A	B	B	A	A	B	A		A	A		A
Potassium Tri-basic	D		A	A	B		A	B		B		B			B	A		A
Potassium Sulfate	A	B	B	C	A	A	A	B		A	A	A	A	B	A	A		A
Potassium Sulfide	B	B	B	B	A		A	C	A	A	A	B	B	B	B	A		A
Potassium Sulfite	B	B	B	B	A		A	C	B	B	A	A	B	B	B	A		A
Producer Gas	B	B	B	B	B	A	B	A		A	A	D	A		B			A
Propane Gas	A	A	B	B	B	A	A	B	A	A	A	D	A	B	B	A		A
Propyl Bromide	B	B		B	B		A	B		B	A	B	B	D	B			A
Propylene Glycol	A	B	B	B	B		B	B		A	C	B	A	B	A			A
Pyridine	B			B	B		A			D	D		D		D			A
Pyrogallic Acid	B	B	B	B	B	B	A	B		A	A		A		A			A
Quench Oil	A	B	B	B	A		A			A	A		A	B	B			A
Quinine, Sulfate, dry					A	B	A	B		A								A
Resins & Rosins	A	A	C	C	A	B	A	A		C	A		A		C	A		A
Resorcinol						B		B										A
Road Tar	A	A	A	A	A		A	A		B	A	D	A	D	C			A
Roof Pitch	A	A	A	A	A		A	A		B	A		A		C			A
Rosin Emulsion	A	B	C	C	A		A	A		D	A		B		C			A
R P-1 Fuel	A	A	A	A	A		A	A		B	A		A		C			A
Rubber Latex Emulsions	A	A	B	B	A		A			A			A					A
Rubber Solvents	A	A	A	A	A		A	A		D	C		D		C			A
Salad Oil	B	B	C	C	B		A	B		A	A	B	A	B	A			A
Salicylic Acid	C	C	D	D	A		B	B		A	A	B	A	B	A			A
Salt (NaCl)	B	B	C	C	B		A	A		A	A		A		A			A
Salt Brine	B	B		D	B		B	B		A	A	B	B	D	D	C		A
Sauerkraut Brine					B		B				C							A
Sea Water	C	C	D	D	B		B	A		A	A	A	A	C	A	C		A
Sewage	C	C	C	D	B	A	B	B		A	B	B	B	B	C			A
Shellac	A	A	A	B	A		A	A		A	A				A			A
Silicone Fluids	B	B		B	B		B			B	A		B	B	B			A
Silver Bromide	D				A	C	A	B			D							A

CHEMICAL COMPATIBILITY

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Silver Cyanide	D	D		D	A			A	B		B	D		B	B	B		A
Silver Nitrate	D	D	D	D	A		A	D		C	A	A	A	B	C			A
Silver Plating Sol.	B				A		A			D					B			A
Soap Solutions (Stearates)	C	A	A	B	A		A	A		A	A	A	A	B	B			A
Sodium Acetate	B	B	C	C	B		B	B	B	B	A	B	A	D	B	A		A
Sodium Aluminate	D	B	C	C	A		B	B	B	A	A	B	A	B	A	A		A
Sodium Benzoate	B				B		B	B			B							A
Sodium Bicarbonate	B	B	C	C	B		A	B		A	B	A	A	B	A			A
Sodium Bichromate	A				B		B			D	A			B				A
Sodium Bisulfate 10%	D	B	D	D	A		A	B		A	D	B	A	B	A	A		A
Sodium Bisulfite 10%	D	B	D	D	A		B	B	B	A	D	B	A	B	A	A		A
Sodium Borate	B	B	C	C	B		B	B		A	A	B	A	B	A			A
Sodium Bromide 10%	B	B	C	D	B		B	B		A	A	B	A	B	A			A
Sodium Carbonate (Soda Ash)	D	B	B	B	A		A	B	B	A	A	B	A	B	A	A		A
Sodium Chlorate	C	B	C	C	B		B	C	B	A	A	B	A	B	A		B	A
Sodium Chloride	B	B	C	C	B		A	A	B	A	A	B	A	B	A	A	A	A
Sodium Chromate	D	C	B	B	A		B	B		A	A	B	A		A			A
Sodium Citrate	D				B		B				A							A
Sodium Cyanide	D	D	B	B	A	B	A	B		A	A	B	A	B	A			A
Sodium Ferricyanide	A				A		A	B			A							A
Sodium Fluoride	C	C	D	D	B	B	A	B		A	A	B	A	B	A	C		A
Sodium Hydroxide 20% Cold	D	A	A	A	A	A	B	A		A	D	B	B	B	A	C	A	A*
Sodium Hydroxide 20% Hot	D	A	B	B	A	C	A	A		B	D	B	C	B	B	C	A	A*
Sodium Hydroxide 50% Cold	D	A	A	B	A	B	A	A		A	D	B	C	B	A	C	A	A*
Sodium Hydroxide 50% Hot	D	A	B	B	A	C	A	B		B	D	B	C	B	B	C	A	A*
Sodium Hydroxide 70% Cold	D	A	A	A	A	B	B	A		B	D	B	C	B	C	C	A	A*
Sodium Hydroxide 70% Hot	D	B	B	B	A	C	B	B		D	D	B	C	B	D	C	A	A*
Sodium Hypochlorite (Bleach)	D	D	D	D	D	D	C	D	A		D		A			B		A
Sodium Hyposulfite	B				B		B	B			A							A
Sodium Lactate	D				A		A	B			A							A
Sodium Metaphosphate	A	C	B	C	B	B	B		A	A	B	B		B	A		A	A
Sodium Metasilicate Cold	B	B	C	C	A		A	A		B	A		B	B	A	A		A
Sodium Metasilicate Hot	B	B	D	D	A		A	A	A		A							A
Sodium Nitrate	A	B	B	B	A	B	A	B	C	A	B	A	A	B	B	A		A
Sodium Nitrite	A				B		B	C	B	C	B	A	B		D	A		A
Sodium Perborate	B	B	B	B	B	B	B	B	B	C	A	A	A	C	B			A
Sodium Peroxide	C	D	C	C	B	B	B	B	B	C	A	A	A	B	B			A
Sodium Phosphate	D	C	C	C	B	B	B	B	B	B	B	A	A	B	C	A		A
Sodium Phosphate Di-basic	D	C	C	C	B		B	B	B	A	A	A	A		A	A		A
Sodium Phosphate Tri-basic	D	C	C	C	B		B	B	B	A	A	A	A		B	A		A
Sodium Polyphosphate					B		B	B	B	B		A			B			A
Sodium Salicylate					A		A				A							A
Sodium Silicate	B	B	B	B	B		B	B		A	A	B	A	B	A	D		A
Sodium Silicate, hot	C	C	C	C	B		B	B		A	B					D		A
Sodium Sulfate	B	B	B	B	A	B	A	A		A	A	A	A	A	A			A
Sodium Sulfide	C	D	B	B	B	A	B	B		A	A	B	A	B	A	A		A
Sodium Sulfite	B	C		A	A	A	A	B	B	A	A	B	B	B	A	D		A
Sodium Tetraborate				A	A		A			A	A	B			A			A
Sodium Thiosulfate	B	C	B	C	B	A	B	B		A	A	A	A	B	A	A		A
Soybean Oil	B	B	C	C	A		A	A		A	B	B	A	D	B			A
Starch	B	B	C	C	B		A	A		A	A	C	A	B	A			A
Steam (212°F)	A	A	A	A	A	A	A	B		D	D	B	C	B	D		A	A
Stearic Acid	A	C	C	C	B		B	B	A	A	A	B	A	B	C	A	A	A
Styrene	A	A	A	B	A		A	B	A	D	A	D	B	D	D	A		A
Sugar Liquids	A	A	B	B	A		A	A		A	A	B	A	D	A			A
Sugar, Syrup & Jam	B	B		C		A	A				A			D	B			A
Sulfate, Black Liquor	C	C	C	C	B	A	B	B		C	C	B	C	D	B			A
Sulfate, Green Liquor	B	C	C	C	B	A	B	B		C	A		C	D	B			A
Sulfate, White Liquor	B	C	C	C	B	B	D	C		C	D		C	D	B			A
Sulfur	A	D	C	C	B		A	B		D	A	B	B	B	C	C		A
Sulfur Chlorides	D	B	D	D	D		A	B		D	A	C	A	B	D		A	A
Sulfur Dioxide, dry	A	B	B	B	A	A	B	B	A	D	A	A	A	D	D	A	A	A
Sulfur Dioxide, wet	C	D			A	C	B	A	B	D	D	B		B	D		A	A
Sulfur Hexafluoride	A	B			A		A								B			A
Sulfur, Molten	A	D	C	B	B		A	D	B	D	D	B	B	B	C			A
Sulfur Trioxide		B	B	B	B	B	B	B	B	D	D		B	D	D		D	A
Sulfur Trioxide, dry	A	B	B	B	B	B	B	B	B	D	A	B	A	D	D	A	D	A
Sulfuric Acid 0 to 77%	C	C	D	D	C		B	B		B	D		A	B	B	D	A	A
Sulfuric Acid 100%	D	C	C	B	A	B	A	D		D	D	C	B	B	D	D	D	A
Sulfurous Acid	C	D	D	D	B		B	D	B	C	C	C	A	B	C	D	A	A
Tall Oil	C	B	B	B	B		B	B	A	B	A	D	A	D	B	D		A
Tannic Acid (Tannin)	C	B	C	C	B	B	B	B	B	B	A	B	A	B	B	A		A
Tanning Liquors	A				B		B			B	D				D			A
Tar & Tar Oils	A	A	A	A	A	A	A	A		C	A	D	A	D	D			A
Tartaric Acid	B	B	D	D	A	A	A	B	B	C	A	B	A	B	B			A
Tetraethyl Lead	B	B	C	C	B		B	A			A							A

CHEMICAL COMPATIBILITY

	Aluminum	Brass	Carbon Steel	Ductile Iron/Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Hypalon	Neoprene	Nylon	Grafoil	Teflon
Toluol (Toluene)	A	A	A	A	A		A	A	A	D	C	D	B	D	D	A		A
Tomato Juice	A	C	C	C	A		A	B		A	A		A	D	A			A
Transformer Oil	A	B	A	B	A		A	A		A	A		A	D	B			A
Tributyl Phosphate	A	A	A	A	A		A	A		D	A	B	D	D	D	A		A
Trichlorethylene	A	B	B	C	B	A	B	B	A	D	A	D	B	D	D	A	A	A
Trichloroacetic Acid	D	B		D	D		B	B	A	C	D		D		D			A
Triethanolamine	B				B		B	B	A	C	A	B		B	B			A
Triethylamine		B			B		B	B	A	B	C				B			A
Trisodium Phosphate	D				B		B		A	A	A	B	B	B	A			A
Tung Oil	B	B	B	B	A		A	C	A	A	A	D	A	D	B			A
Turpentine	B	B	B	B	B	A	B	B	A	B	A	D	A	C	D	A		A
Urea	B	B	C	C	B		B	B	A	C	A	B	D	D	B			A
Uric Acid	D				A		A		A		B							A
Varnish	A	A	C	C	A		A	A	A	C	A	D	B	D	B			A
Vegetable Oils	A	B	B	B	A		A	B	A	A	A	D	A	B	B			A
Vinegar	C	B	D	D	A		A	B	A	D	B	A	D	C	D			A
Vinyl Acetate	B	B		B	B		B	B	A		D	A		B	B	A	A	A
Water, Distilled	A	A	D	D	A	A	A	A	A	C	A	B	A	B	B			A
Water, Fresh	A	A	C	C	A	A	A	A	A	C	A	B	A	A	B	C		A
Water, Acid Mine	D	D	D	D	B	B		D	C	B	A	A	D	C	A		A	
Waxes	A	A	A	A	A		A	A	A	A	A	C	A	B	B			A
Whiskey & Wines	D	B	D	D	A		A	A	A	B	A	A	A	C	B	A		A
Xylene (Xylol), Dry	A	A	B	B	A		A	A	A	D	A	D	B	D	D	A	A	A
Zinc Bromide	D	B		D	B		B	B	A	B	A	B	B	B	B			A
Zinc Hydrosulfite	D	C	A	B	A		A	B	A	A	A	A	A	A	A			A
Zinc Sulfate	D	B	D	D	B		A	B	A	A	A	A	A	B	A		A	A

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CHROME-MOLY ALLOYS

Pipe	Valves	Flanges	Weld Fittings	Screwed and Socket Fittings
A-335 P-1	A-217 WC-6	A-182 F-1	A-234 WP-1	A-182 F-1
A-335 P-12	A-217 WC-6	A-182 F-12	A-234 WP-12	A-182 F-12
A-335 P-11	A-182 F11/A-217 WC-6	A-182 F-11	A-234 WP-11	A-182 F-11
A-335 P-22	A-182 F-22/A-217 WC-9	A-182 F-22	A-234 WP-22	A-182 F-22
A-335 P-5	A-182 F-5/A-217 WC-5	A-182 F-5	A-234 WP-5	A-182 F-5
A-335 P-7	A-182 F-7/A-217 WC-12	A-182 F-7	A-234 WP-7	A-182 F-7
A-335 P-9	A-182 F-9/A-217 WC-12	A-182 F-9	A-234 WP-9	A-182 F-9
A-268 T-410	A-182 F-6/A-351 CA-15	A-182 F-6	A-234 WP-410	A-182 F-6

CARBON STEELS

Pipe	Valves	Flanges	Weld Fittings	Screwed and Socket Fittings
A-53	A-105 A-216 WCB	A-105, A-181 Grade 2	A-234 WPB	A-105, A-181 Grade 2
A-106B	A-105 A-216 WCB	A-105 A-181 Grade 2	A-234 WPB	A-105 Grade 2 A-181 Grade 2

LOW-TEMPERATURE STEELS

Pipe	Valves	Flanges	Weld Fittings	Screwed and Socket Fittings
A-333 Grade 6	A-350 LF-2/A-352 LCB	A-350 LF-2	A-420 WPL-6	A-350 LF-2
A-333 Grade 3	A-350 LF-3/A-352 LCS	A-350 LF-3	A-420 WPL-3	A-350 LF-3

STAINLESS STEELS

Pipe	Valves	Flanges	Weld Fittings	Screwed and Socket Fittings
A-312 T304	A-182 F-304/A-351 CF8	A-182 F-304	A-403 WP-304	A-182 F-304
A-312 304L	A-182 F-304L/A-296 CF3	A-182 F-304L	A-403 WP-304L	A-182 F-304L
A-312 T316	A-182 F-316/A-351 CF8M	A-182 F-316	A-403 WP-316	A-182 F-316
A-312 316L	A-182 F-316L/A-296 CF3M	A-182 F-316L	A-403 WP-316L	A-182 F-316L
A-312 321	A-182 F-321/A-351 CF8C	A-182 F-321	A-403 WP-321	A-182 F-321
A-312 347	A-182 F/347/A-351 CF8CMO	A-182 F-347	A-403 WP-347	A-182 F-347

MATERIAL MARKINGS

304SS	347SS	HASTELLOY A	3% NICKEL CAST IRON
304	347		
CF8	CF8C	HAST A	3NI
188S	CF82B	HA	CIA
L22	188SCB	HAA	NCI*
D2	188CB	A	
33 (JB)	D2CB		
8 ♦ (LAD)	410SS	HASTELLOY B	NI RESIST CAST IRON
S (ALOYCO)	CR13		
D (CONTRO)	11 13	HAST B	NR
F8	F6	HB	NR2
KA2S	EXELLOY (CRANE)	HAB	CAUSUL*
304LSS	CA 15	N7M	
CF3	FERRALIUM	N12M	SPECIAL
188S ELC	CD4M	N2	
D2L	CD4MCU	DC2	A-254-SMO
DF8L	DURCOMET 100	B ♦ (LADISH)	
188 ELC	38 (JB)	NiMO	LOW TEMP STEELS
316SS	ALUMINUM	CW12M	
316	AL		LCB (CAST CARBON)
CF8M	44 (JB)	HASTELLOY C	LC1 (CAST 1/2 % MOLY)
188SMO	ALUM		LC2 (CAST 2 1/2 % NICKEL)
188M	MONEL 400	HAST C	LC3 (CAST 3 1/2 % NICKEL)
188MO	M35	HC	LF1 (FORGED CARBON)
L22XM	M35W	HAC	LF2 (FORGED CARBON)
D4	DM	CW7M	LF3 (FORGED 3 1/2 NICKEL)
CF7M	M	CW12M	
8M ♦ (LAD)	MNL	N3	CARBON STEEL
36 (JB)	MONL	DC3	
6 (HMC)	MLCB	C ♦ (LAD)	WCB (CAST)
O (ALOYCO)	MON	73 (JB)	A 105 (FORGED)
C (CONTRO)	ML	NIMOCR	22 (JB)
KA2SMO	EM		DS
317SS	NICU	HASTELLOY D	CS
CG8M	QQN-177 (LAD)		
316LSS	COMPE (LAD)	HAST D	1 1/4% CR 1/2% MOLY
316L	K (TRIM)	HD	
CF3M	71 (JB)	HAD	WC6 (CAST)
188SMO ELC	Mo (HMC)		F11 (FORGED)
D4L	NICKEL 200	TITANIUM	
6L (HMC)	NI		2 1/4% CR 1/2% MOLY
L22XMELC	DNI	TI	
ALLOY 20	CZ100	T ♦ (LAD)	WC9 (CAST)
A20 J20	78 (JB)	TI ♦ (LAD)	F22 (FORGED)
CN7M FA20	CZ100S		
C20 L34	LNI	DUCTILE IRON	5% CR 1/2% MOLY
D20			
DURIMET 20	INCONEL 600	DI	C5 (CAST)
CN7MTB	INC	DCI	F5 (FORGED)
35 (JB)	CY40	21 (JB)	F5A (FORGED)
A2 (HMC)	DIN		
20 ♦ (LAD)		MALLEABLE IRON	9% CR 1% MOLY
STAINLESS 20			
F (ALOYCO)	ZIRCONIUM	MI	C12 (CAST)
DURIMET	ZR	MALL	F9 (FORGED)
CAR-20			

*The information contained herein is general in nature. Reference should be made to the manufacturing catalog for individual manufacturer markings.

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RESILIENT SEAT MATERIALS

VITON® (Fluorocarbon, FKM, or FPM)

Fluorocarbon elastomers are inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility which spans considerable concentration and temperature ranges, fluorocarbon elastomers have gained wide acceptance as a material of construction for knife gate valve seats. Fluorocarbon can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons and petroleum oils. It is particularly good in hydrocarbon service. Temperature rating is from -20°F to +300°F. Color is gray (black) or red and may be used on bleached paper lines. Fluorocarbon (VITON) is not suitable for steam or hot water service.

BUNA-N (HYCAR or Nitrile)

Buna-N is a general purpose polymer which has good resistance to oil, water, solvents and hydraulic fluids. It also displays good compression, abrasion resistance, and tensile strength. This material performs extremely well in process areas where paraffin base materials, fatty acids, oils, alcohols or glycerins are present, since it is totally unaffected. It should not be used around high polar solvents (acetones, ketones) chlorinated hydrocarbons, ozone, or nitro hydrocarbons. Temperature range is +225°F maximum. Hycar is black in color and should not be used where discoloration cannot be tolerated. It is regarded as a comparable replacement to neoprene. Major differences are: Buna-N has a higher temperature limit; neoprene is more resistant to oils.

HYPALON®

Hypalon has very good resistance to oxidation, ozone and good flame resistance. It is similar to neoprene except with improved acid resistance where it will resist such oxidizing acids as nitric, hydrofluoric and sulfuric acid. Abrasion resistance of Hypalon is excellent, about the equivalent of the nitriles. Oil and solvent resistance is somewhat between that of neoprene and nitriles. Salts have little if any effect on Hypalon. Hypalon is not recommended for exposure to concentrated oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons. Not to be used in steam service. Temperature rating is from 0°F to +220°F. Seats are white food grade and may be used on food service as well as bleached paper lines.

NEOPRENE

Neoprene was one of the first synthetic rubbers developed. It is an all purpose polymer with many desirable characteristics. Neoprene features high resiliency with low compression set flame resistance and animal and vegetable oil resistance. It is principally recommended for use in pulp and paper applications. Generally, neoprene is not recommended and is attacked by strong oxidizing acids, most chlorinated solvents, esters, ketones, aromatic hydrocarbons and hydraulic fluids. Neoprene is not generally affected by moderate chemicals, fat, greases and many oils and solvents. Temperature rating is from -20°F to +180°F. Seats are black in color and should not be used on bleached paper lines.

EPDM

EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalines. It is susceptible to attacks by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalines. EPDM should not be used on compressed air lines. It has exceptionally good weather aging and ozone resistance. Temperature rating is from -20°F to +225°F (250°F intermittent service). It is fairly good in ketones and alcohols.

PTFE (TFE or Teflon®)

PTFE is the most chemically resistant of all plastics. It also has excellent thermal and electrical insulation properties. PTFE's mechanical properties are low compared to other engineering plastics, but its properties remain at useful levels over a great temperature range (-40 to 400 °F, depending on application).

RESILIENT SEAT MATERIALS

(continued)

RTFE (Reinforced TFE)

RTFE is compounded with a selected percentage of fiber glass filler to improve strength and resistance to abrasive wear, cold flow, and permeation in molded seats. Reinforcement permits application at higher pressure and temperature than unfilled TFE. Typical temperature range is -40°F to 450°F. RTFE should not be used in applications that attack glass, such as hydrofluoric acid and hot strong caustics.

Carbon Filled TFE

Carbon filled TFE is an excellent seat material for steam applications as well as high efficiency oil-based thermal fluids. Fillers including graphite enable this seat material to have a better cycle life than other filled or reinforced TFE seats. Temperature range is -20°F to 500°F. Chemical resistance is equal to other TFE seats.

THERMOPLASTIC MATERIALS

UPVC (Unplasticised PVC)

Unplasticised Polyvinyl Chloride is the most widely used of all plastics and commonly used for pressure pipes. It is rigid, suitable for above and below ground applications. UPVC has good chemical resistance and is odorless and tasteless. It is for use with liquids and gasses with temperatures +32°F to +140°F (for higher temperatures see CPVC) at a wide range of operating pressures. Some poorer quality PVC can leach chemicals into that water which can build up in recirculation systems, however most modern pipe is built to specific standards (e.g. BS3505/6, ASTM D 1785, ASTM D 2241, DIN 8061/2, KIWA 49, BS4346 PART 1, DIN 8063) and as long as the pipe is rated as such, there should be no problems. UPVC is usually joined using a push fit solvent cement joint, requiring no special tools.

CPVC (Corzan™) (Chlorinated PVC)

Chlorinated polyvinyl chloride, or CPVC, has been offering the process industry superior corrosion resistance, mechanical strength, and excellent life-cycle economics in a single package. Conceptually, CPVC is a PVC homopolymer that has been subjected to a chlorination reaction. It is generally inert to most mineral acids, bases, salts, and paraffinic hydrocarbon solutions. CPVC is not recommended for use with chlorinated or aromatic hydrocarbons, esters, or ketones. The upper temperature limit on Corzan™ CPVC is 200°F. There is no lower temperature limit on Corzan™ CPVC and the material will withstand pressure. At very cold temperatures, the material will become brittle and the impact strength will decline.