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PRESSURE CONVERSIONS

PSI	kPa	BAR	Kg/cm	PSI	kPa	BAR	Kg/cm	PSI	kPa	BAR	Kg/cm	PSI	kPa	BAR	Kg/cm
10	69	0.7	0.7	260	1793	17.9	18.3	510	3516	35.2	35.9	760	5240	52.4	53.4
20	138	1.4	1.4	270	1862	18.6	19.2	520	3585	35.9	36.6	770	5309	53.1	54.1
30	207	2.1	2.1	280	1931	19.3	19.7	530	3654	36.5	37.3	780	5378	53.8	54.8
40	276	2.8	2.8	290	2000	20.0	20.4	540	3723	37.2	38.0	790	5447	54.5	55.5
50	345	3.4	3.5	300	2069	20.7	21.1	550	3792	37.9	38.7	800	5516	55.2	56.2
60	414	4.1	4.2	310	2137	21.4	21.8	560	3861	38.6	39.4	810	5585	55.8	56.9
70	483	4.8	4.9	320	2206	22.1	22.5	570	3930	39.3	40.1	820	5654	56.5	57.6
80	552	5.5	5.6	330	2275	22.8	23.2	580	3999	40.0	40.8	830	5723	57.2	58.3
90	621	6.2	6.3	340	2344	23.4	23.9	590	4068	40.7	41.5	840	5792	57.9	59.1
100	690	6.9	7.0	350	2413	24.1	24.6	600	4137	41.4	42.2	850	5861	58.6	59.8
110	758	7.6	7.7	360	2482	24.8	25.3	610	4206	42.1	42.9	860	5930	59.3	60.5
120	827	8.3	8.4	370	2551	25.5	26.0	620	4275	42.7	43.6	870	5999	60.0	61.2
130	896	9.0	9.1	380	2620	26.2	26.7	630	4344	43.4	44.3	880	6068	60.7	61.9
140	965	9.7	9.8	390	2689	26.9	27.4	640	4413	44.1	45.0	890	6137	61.4	62.6
150	1034	10.3	10.5	400	2758	27.6	28.1	650	4482	44.8	45.7	900	6206	62.1	63.3
160	1103	11.0	11.2	410	2827	28.3	28.8	660	4551	45.5	46.4	910	6274	62.7	64.0
170	1172	11.7	12.0	420	2896	29.0	29.5	670	4620	46.2	47.1	920	6343	63.4	64.7
180	1241	12.4	12.7	430	2965	29.6	30.2	680	4689	46.9	47.8	930	6412	64.1	65.4
190	1310	13.1	13.4	440	3034	30.3	30.9	690	4758	47.6	48.5	940	6481	64.8	66.1
200	1379	13.8	14.1	450	3103	31.0	31.6	700	4827	48.3	49.2	950	6550	65.5	66.8
210	1448	14.5	14.8	460	3172	31.7	32.3	710	4895	49.0	49.9	960	6619	66.5	67.5
220	1517	15.2	15.5	470	3241	32.4	33.0	720	4964	49.6	50.6	970	6688	66.9	68.2
230	1586	15.9	16.2	480	3310	33.1	33.7	730	5033	50.3	51.3	980	6757	67.6	68.9
240	1655	16.5	16.9	490	3379	33.8	34.4	740	5102	51.0	52.0	990	6826	68.3	69.6
250	1724	17.2	17.6	500	3448	34.5	35.2	750	5171	51.7	52.7	1000	6895	69.0	70.3

145 PSI = 1 mPa = 1000 kPa = 10 BAR

IMPERIAL TO METRIC

Fraction	Inches	mm	Fraction	Inches	mm	Fraction	Inches	mm	Fraction	Inches	mm	Fraction	Inches	mm
1/16	0.062	1.58	9/16	0.562	14.28	1 3/4	1.750	44.45	4 1/4	4.250	107.95	12	12.000	304.80
1/8	0.125	3.17	5/8	0.625	15.87	2	2.00	50.80	4 1/2	4.500	114.30	14	14.000	355.60
3/16	0.187	4.76	13/16	0.812	20.63	2 3/4	2.750	69.85	5 1/2	5.500	139.70			
1/4	0.250	6.35	7/8	0.875	22.22	3	3.000	76.20	6	6.000	152.50			
5/16	0.312	7.93	15/16	0.937	23.81	3 1/4	3.250	82.55	6 1/2	6.500	165.10			
3/8	0.375	9.52	1	1.000	25.40	3 1/2	3.500	88.90	7	7.000	177.80			
7/16	0.437	11.11	1 1/4	1.250	31.75	3 3/4	3.750	92.25	8	8.000	203.20			
1/2	0.500	12.70	1 1/2	1.500	38.10	4	4.000	101.60	10	10.000	254.00			

PULL TEST – FORCE TO PRESSURE CONVERSIONS

Hose ID (Inches)	Force in Pounds					
	50 psi	100 psi	150 psi	200 psi	250 psi	300 psi
1/4	2	5	7	10	12	15
3/8	6	11	17	22	28	33
1/2	10	20	29	39	49	59
3/4	22	44	66	88	110	133
1	39	79	118	157	196	236
1¼	61	123	184	245	307	368
1½	88	177	265	353	442	530
2	157	314	471	628	785	942
2½	245	491	736	982	1227	1473
3	353	707	1060	1414	1767	2121
4	628	1257	1885	2513	3142	3770
6	1414	282	4241	5655	7069	8482
8	2513	5027	7540	10053	12566	15080
10	3927	7854	11781	15708	19635	23562
12	5655	11310	16965	22620	28274	33929

TEMPERATURE CONVERSIONS

°C	°F	°C	°F	°C	°F
-200	-328	0	32	140	284
-180	-292	5	41	160	320
-160	-256	10	50	180	356
-140	-220	15	59	200	392
-120	-184	20	68	212	414
-100	-148	25	77	220	428
-90	-130	30	86	250	482
-80	-112	40	104	300	572
-70	-94	50	122	350	662
-60	-76	60	140	400	752
-50	-58	70	158	450	842
-40	-40	80	176	500	932
-30	-22	90	194	600	1112
-20	-4	100	212	700	1292
-10	14	120	248	800	1472

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

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 0.556$$

TO CONVERT A INTO B MULTIPLY BY C

VOLUME/TIME

A	B	C
US Gallons/Min	Litres/Sec	0.063
Cubic Feet/Min	Litres/Sec	0.472
Pounds/Hour	Kilograms/Hour	0.454
Kilograms/Hour	Pounds/Hour	2.205
Litres/Sec	Cubic Metres/Hour	3.60
Cubic Metres/Hour	Litres/Sec	0.278

PRESSURE

A	B	C
PSI	kPa	6.894
kPa	PSI	0.145
kPa	BAR	0.01
BAR	kPa	100
BAR	PSI	14.5
Ft of H ₂ O	PSI	0.4335
m of H ₂ O	kPa	9.807

VOLUME

A	B	C
Litres	Imp. Gallons	0.222
Litres	US Gallons	0.263
Imp. Gallons	Litres	4.50
US Gallons	Litres	3.785
US Gallons	Imp. Gallons	0.832
Imp. Gallons	US Gallons	1.20
Litres	Cubic Feet	0.035
Litres	Cubic Metres	0.001

LENGTH

A	B	C
Metres	Feet	3.281
Metres	Yards	1.094
Millimetres	Inches	0.0394
Inches	Millimetres	25.4

SPEED/VELOCITY

A	B	C
Feet/Sec	Metres/Min	18.29
Feet/Sec	Metres/Sec	0.305
Metres/Min	Feet/Min	0.055
Metres/Sec	Feet/Min	196.86

WEIGHT CONVERSIONS: POUNDS TO KILOGRAMS

WEIGHT CONVERSIONS											
Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg
0.1	0.045	2.1	0.95	4.1	1.86	6.1	2.77	8.1	3.67	11	4.99
0.2	0.090	2.2	1.00	4.2	1.91	6.2	2.81	8.2	3.72	12	5.44
0.3	0.136	2.3	1.04	4.3	1.95	6.3	2.86	8.3	3.76	13	5.9
0.4	0.181	2.4	1.09	4.4	2.00	6.4	2.9	8.4	3.81	14	6.35
0.5	0.226	2.5	1.13	4.5	2.04	6.5	2.95	8.5	3.86	15	6.80
0.6	0.272	2.6	1.18	4.6	2.09	6.6	2.99	8.6	3.90	16	7.26
0.7	0.317	2.7	1.22	4.7	2.13	6.7	3.04	8.7	3.95	17	7.71
0.8	0.362	2.8	1.27	4.8	2.18	6.8	3.08	8.8	3.99	18	8.16
0.9	0.408	2.9	1.32	4.9	2.22	6.9	3.13	8.9	4.04	19	8.62
1.0	0.45	3.0	1.36	5.0	2.27	7.0	3.18	9.0	4.08	20	9.07
1.1	0.05	3.1	1.41	5.1	2.31	7.1	3.22	9.1	4.13	25	11.34
1.2	0.54	3.2	1.45	5.2	2.36	7.2	3.27	9.2	4.17	30	13.61
1.3	0.59	3.3	1.50	5.3	2.40	7.3	3.31	9.3	4.22	35	15.88
1.4	0.64	3.4	1.54	5.4	2.45	7.4	3.36	9.4	4.26	40	18.14
1.5	0.68	3.5	1.59	5.5	2.49	7.5	3.40	9.5	4.31	45	20.41
1.6	0.73	3.6	1.63	5.6	2.54	7.6	3.45	9.6	4.35	50	22.68
1.7	0.77	3.7	1.68	5.7	2.59	7.7	3.49	9.7	4.40	60	27.22
1.8	0.82	3.8	1.72	5.8	2.63	7.8	3.54	9.8	4.45	70	31.75
1.9	0.86	3.9	1.77	5.9	2.68	7.9	3.58	9.9	4.49	80	36.29
2.0	0.90	4.0	1.81	6.0	2.72	8.0	3.63	10.0	4.53	90	40.82

VACUUM CONVERSIONS

VACUUM CONVERSION						
Pg-psig	Pa-psia	Inches/Hg	Bar	Torr	mm/Hg	Vacuum %
0	14.7	0	0	760	0	0
0.49	14.24	1	33.86	734.6	25.4	3.3
0.98	13.75	2	67.72	709.2	50.8	6.6
1.47	13.26	3	101.58	683.8	76.2	9.9
1.96	12.76	4	135.44	658.4	101.6	13.2
2.45	12.27	5	169.3	633	127	16.5
2.95	11.78	6	203.16	607.6	152.4	19.8
3.44	11.29	7	237.02	582.2	177.8	23.1
3.93	10.8	8	270.88	556.8	203.2	26.4
4.42	10.31	9	304.74	531.4	228.6	29.7
4.91	9.82	10	338.6	506	254	33
5.4	9.33	11	372.46	480.6	279.4	36.3
5.89	8.84	12	406.32	455.2	304.8	39.6
6.38	8.35	13	440.18	429.8	330.2	42.9
6.87	7.86	14	474.04	404.4	355.6	46.2
7.36	7.36	15	507.9	379	381	49.5
7.86	6.87	16	541.76	353.6	406.4	52.8
8.35	6.38	17	575.62	328.2	431.8	56.1
8.84	5.89	18	609.48	302.8	457.2	59.4
9.33	5.4	19	643.34	277.4	482.6	62.7
9.82	4.91	20	677.2	252	508	66
10.31	4.42	21	711.06	226.6	533.4	69.3
10.8	3.93	22	744.92	201.2	558.8	72.6
11.29	3.44	23	778.78	175.8	584.2	75.9
11.78	2.95	24	812.64	150.4	609.6	79.2
12.27	2.45	25	846.5	125	635	82.5
12.76	1.96	26	880.36	99.6	660.4	85.8
13.26	1.47	27	914.22	74.2	685.8	89.1
13.75	0.98	28	948.08	48.8	711.2	92.4
14.24	0.49	29	981.94	23.4	736.6	95.7
14.7	0	29.92	1013	0	760	100

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DIN STANDARD FLANGES: AS 2129 FLANGES

TABLE D																			
Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
Flange OD	95	100	115	120	135	150	165	185	215	255	280	335	405	455	525	580	640	705	825
PCD	67	73	83	87	98	114	127	146	178	210	235	292	356	406	470	521	584	641	756
Thickness*	5	5	5	6	6	8	8	10	10	13	13	13	16	19	22	22	25	29	32
No. Bolts	4	4	4	4	4	4	4	4	4	8	8	8	8	12	12	12	12	16	16
Bolt Size	M12	M12	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M24	M24
Bolt Length^	45	45	45	50	50	60	60	60	65	65	75	70	75	85	100	95	100	110	120
Weight Kg SOW	0.3	0.3	0.4	0.5	0.6	0.9	1.1	1.6	2.1	3.7	4.1	5.1	8.8	11.9	20.2	23.1	30.7	42.4	60.2

TABLE E																			
Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
Flange OD	95	100	115	120	135	150	165	185	215	255	280	335	405	455	525	580	640	705	825
PCD	67	73	83	87	98	114	127	146	178	210	235	292	356	406	470	521	584	641	756
Thickness*	6	6	7	8	9	10	10	11	13	14	17	19	22	25	29	32	35	38	48
No. Bolts	4	4	4	4	4	4	4	4	8	8	8	8	12	12	12	12	16	16	16
Bolt Size	M12	M12	M12	M12	M12	M16	M16	M16	M16	M16	M20	M20	M20	M24	M24	M24	M24	M24	M30
Bolt Length^	45	45	45	50	50	60	60	60	65	65	70	75	75	90	100	95	100	110	140
Weight Kg SOW	0.3	0.4	0.5	0.6	0.9	1.2	1.3	1.8	2.7	3.9	5.3	7.5	12.1	15.6	26.6	33.6	42.9	55.5	90.3

TABLE H																			
Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
Flange OD	115	115	120	135	140	165	185	205	230	280	305	370	430	490	550	610	675	735	850
PCD	83	83	87	98	105	127	146	165	191	235	260	342	381	438	495	552	610	673	781
Thickness*	13	13	14	17	17	19	19	22	25	29	29	32	35	41	48	54	60	67	76
No. Bolts	4	4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20	24	24
Bolt Size	M16	M16	M16	M16	M16	M16	M16	M16	M16	M20	M20	M20	M24	M24	M27	M27	M30	M30	M33
Bolt Length^	60	60	60	65	65	75	75	75	85	100	100	100	120	120	130	140	160	150	180
Weight Kg SOW	1	1	1.2	1.7	1.8	2.8	3.4	4.7	6.2	10.6	11.8	17.6	23.7	34.1	52.1	68.7	90.8	116	163

* THICKNESS OF FLANGE INCLUDES BOSS FOR SLIP-ONS, BLANKS WILL BE WITHOUT BOSS. #THE EXACT OD OF PIPE MUST BE NOMINATED. ^LENGTHS OF BOLTS FOR PLATE STEEL FLANGES.

DIN STANDARD FLANGES: BS 4504 PN16 FLANGES

DIN - PN16																			
Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
Flange OD	95	105	115	140	150	165	185	200	220	250	285	340	405	460	520	580	640	715	840
PCD	65	75	85	100	110	125	145	160	180	210	240	295	355	410	470	525	585	650	770
Thickness*	14	16	16	16	16	18	18	20	20	22	22	24	28	28	30	32	36	36	44
No. Bolts	4	4	4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20	20
Bolt Size	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M27	M27	M30	M33
Bolt Length^	50	55	55	60	60	65	65	70	75	80	90	90	100	100	120	120	130	140	140
Weight Kg SOW	0.7	1	1.2	1.7	1.9	2.4	3.2	4.1	4.4	5	7.3	9.3	10.1	14.5	24.5	28.8	31	42.8	53.5

* THICKNESS OF FLANGE INCLUDES BOSS FOR SLIP-ONS, BLANKS WILL BE WITHOUT BOSS. #THE EXACT OD OF PIPE MUST BE NOMINATED. ^LENGTHS OF BOLTS FOR PLATE STEEL FLANGES.

ANSI STANDARD FLANGES: FLANGE ASME B16.5 FORGED FLANGES

CLASS 150																			
Nominal Bore Size	15	20	25	32	40	50	65	80	100	125	150#	200#	250	300	350	400	450	500	600
Flange OD	90	100	110	120	130	150	180	190	230	255	280	345	405	485	535	600	635	700	815
PCD	60.5	70	79.5	89	98.5	121	140	153	191	216	242	299	362	432	476	540	578	635	750
Min Thickness - A'	11.5	13	14.5	16	17.5	19.5	22.5	24	24	24	25.5	29	30.5	32	35	37	40	42	48
HUB Length SOW	16	16	17	21	22	25	29	30	33	36	40	44	49	56	57	64	68	73	83
HUB Length W/N	48	52	56	57	62	64	70	70	76	89	89	102	102	114	127	127	140	145	152
Bolt Hole Dia.	16	16	16	16	16	20	20	20	20	22	22	22	26	26	30	30	33	33	36
No. Bolts	4	4	4	4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20
Weight Kg SOW	0.5	0.7	1	1.1	1.4	2.2	3.8	4.1	5.9	6.1	12.7	17.2	27.2	35.4	42.2	52.6	33	65.3	91.6
Weight Kg W/N	0.8	0.9	1.1	1.4	1.8	2.8	4.4	5.2	7.5	9.5	11.3	19.1	25.4	38.1	51.3	63.5	74.9	89.4	122

CLASS 300																			
Nominal Bore Size	15	20	25	32	40	50	65	80	100	125	150#	200#	250	300	350	400	450	500	600
Flange OD	95	120	125	135	155	165	190	210	255	280	320	380	445	520	585	650	710	775	915
PCD	66.5	82.5	89	98.5	115	127	149	169	200	235	270	330	388	451	515	572	629	686	813
Min Thickness - A'	14.5	16	17.5	19.5	21	22.5	25.5	29	32	35	37	41.5	48	51	54	57.5	60.5	63.5	70
HUB Length SOW	22	25	27	27	30	33	38	43	48	51	52	62	67	73	76	83	89	95	106
HUB Length W/N	52	57	62	65	68	70	76	79	86	98	98	111	117	130	143	146	159	162	168
Bolt Hole Dia.	16	20	20	20	22	20	22	22	22	22	22	26	30	33	33	36	36	36	42
No. Bolts	4	4	4	4	4	8	8	8	8	8	12	12	16	16	20	20	24	24	24
Weight Kg SOW	9.7	1.3	1.4	2.0	2.8	3.1	4.5	6.1	9.5	12.7	16.3	25.4	35.4	50.8	72.2	95.3	115	139	222
Weight Kg W/N	0.9	1.4	1.8	2.3	3.1	3.7	5.6	8.2	11.8	16.3	20.0	32.2	45.4	64.4	93.5	113.0	138.0	168	236

* MINIMUM THICKNESS ARE INCLUDING RAISED FACE, BUT EXCLUDING HUB OR WELD NECK ** HUB LENGTH FOR SLIP ON ALSO APPLY TO SCREWED & SOCKET WELD FLANGES
THE EXACT OD OF PIPE MUST BE NOMINATED

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FLOW DATA: AIR FLOW PRESSURE LOSS

This table may be used to determine the pressure loss in a hose connected to rock drills and pneumatic tools. Flow rates are correct for a hose with a smooth inside lining. Hoses with rough inside lining may have a friction loss of as much as 50% greater than the figures given in the table.

AIR FLOW PRESSURE LOSS															
PULSATING FLOW															
Size of Hose	Gauge pressure at line	Cubic feet free air per minute passing through 50 foot lengths of hose													
		20	30	40	50	60	70	80	90	100	110	120	130	140	150
		Loss of pressure in pounds per square inch – 50 foot hose length													
½ in. with couplings at each end	50	1.8	5.0	10.1	18.1										
	60	1.3	4.0	8.4	14.8	23.4									
	70	1.0	3.4	7.0	12.4	20.0	28.4								
	80	.9	2.8	6.0	10.8	17.4	25.2	34.6							
	90	.8	2.4	5.4	9.5	14.8	22.0	30.5	41.0						
	100	.7	2.3	4.8	8.4	13.3	19.3	27.2	36.6						
	110	.6	2.0	4.3	7.6	12.0	17.6	24.6	33.3	44.5					
¾ in. with couplings at each end	50	.4	.8	1.5	2.4	3.5	4.4	6.5	8.5	11.4	14.2				
	60	.3	.6	1.2	1.9	2.8	3.8	5.2	6.8	8.6	11.2				
	70	.2	.5	.9	1.5	2.3	3.2	4.2	5.5	7.0	8.8	11.0			
	80	.2	.5	.8	1.3	1.9	2.8	3.6	4.7	5.8	7.2	8.8	10.6		
	90	.2	.4	.7	1.1	1.6	2.3	3.1	4.0	5.0	6.2	7.5	9.0		
	100	.2	.4	.6	1.0	1.4	2.0	2.7	3.5	4.4	5.4	6.6	7.9	9.4	11.1
	110	.1	.3	.5	.9	1.3	1.8	2.4	3.1	3.9	4.9	5.9	7.1	8.4	9.9
1 in. with couplings at each end	50	.1	.2	.3	.5	.8	1.1	1.5	2.0	2.6	3.5	4.8	7.0		
	60	.1	.2	.3	.4	.6	.8	1.2	1.5	2.0	2.6	3.3	4.2	5.5	7.2
	70		.1	.2	.4	.5	.7	1.0	1.3	1.6	2.0	2.5	3.1	3.8	4.7
	80		.1	.2	.3	.5	.7	.8	1.1	1.4	1.7	2.0	2.4	2.7	3.5
	90		.1	.2	.3	.4	.6	.7	.9	1.2	1.4	1.7	2.0	2.4	2.8
	100		.1	.2	.2	.4	.5	.6	.8	1.0	1.2	1.5	1.8	2.1	2.4
	110		.1	.2	.2	.3	.4	.6	.7	.9	1.1	1.3	1.5	1.8	2.1
1¼ in. with couplings at each end	50			.1	.2	.2	.3	.4	.5	.7	1.1				
	60				.1	.2	.3	.3	.5	.6	.8	1.0	1.2	1.5	
	70				.1	.2	.2	.3	.4	.4	.5	.7	.8	1.0	1.3
	80					.1	.2	.2	.3	.4	.5	.6	.7	.8	1.0
	90					.1	.2	.2	.3	.3	.4	.5	.6	.7	.8
	100						.1	.2	.2	.3	.4	.4	.5	.6	.7
	110						.1	.2	.2	.3	.3	.4	.5	.5	.6
1½ in. with couplings at each end	50						.1	.2	.2	.2	.3	.3	.4	.5	.6
	60							.1	.2	.2	.2	.3	.3	.4	.5
	70								.1	.2	.2	.2	.3	.3	.4
	80									.1	.2	.2	.2	.3	.4
	90										.1	.2	.2	.2	.3
	100											.1	.2	.2	.2
	110												.1	.2	.2

For longer or shorter lengths of hose, the friction loss is proportional to the length. Eg. For 25 feet, half of the above; for 150 feet, three times the above, etc.

RATINGS

All hoses are given either a vacuum or pressure rating, sometimes both. This rating is established by the manufacturer and is based on a number of factors. Abuse or other conditions of service, to which a hose will be subjected are all considered in establishing the safety factor applied to the average burst strength of a hose.



Pressure rating – This is the rating given to a hose that determines the amount of pressure that can be exerted on a hose. All hoses will have a burst pressure and a working pressure. The burst pressure specifies the maximum pressure that the hose can handle without bursting, while the working pressure is the manufacturer's recommended maximum pressure allowance in normal operation. Most industrial hoses have a minimum burst pressure as a factor of the working. Eg 4:1

In the Asia Pacific Region the standard unit of measure for pressure is PSI (Pounds per Square Inch). Other common units are mPa (megapascals) and kPa (kilopascals) The relationship between these measurements can be expressed by $100 \text{ PSI} = 0.69 \text{ mPa} = 690 \text{ kPa}$

Vacuum rating – Hoses can also be given a vacuum or suction rating. This is a measure of the hose's resistance to collapse under suction service. A vacuum is the absence of pressure, either completely or partially. A vacuum is said to exist in a hose if pressures there are less than atmospheric at that particular elevation. Difficulties in measuring vacuum and understanding vacuum ratings might be eliminated if pressure gauges started from absolute zero rather than normal atmospheric pressure. This would result in the readings from 0 to 14.7 PSI representing the vacuum. With hose we are interested in the difference between the pressure inside the hose and the pressure outside which is generally the atmospheric pressure.

In the Asia Pacific Region the most common unit of measurement for vacuum is Hg which refers to the height of mercury. This can be measured in mm (mm/Hg) or inches. 750 mm/Hg is regarded as full vacuum which would indicate a complete absence of pressure inside the hose. Most commercial pumps would not develop a full vacuum and 625 to 700 mm/Hg would be about the limit.

**PRESSURE RATINGS LISTED ARE LISTED AT
AMBIENT TEMPERATURE 20°C**

**REFER TO THE PAGE FURTHER ON FOR
TEMPERATURE vs PRESSURE RATING**

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PERMEATION

GAS – All Rubber and PVC Hose will allow slight amounts of gas permeation. The extent of this permeation depends on the style of hose being used, the material being conveyed, and the pressure and temperature of the materials being conveyed. The gas will generally pass through the tube, reinforcement and the cover. However it is possible for the gas to collect under the cover and cause a blistering effect. To prevent this from occurring several styles of hoses are generally with a perforated cover. This means that the cover will have small holes pricked into it to a level just above the outside of the tube. This allows the gas to migrate under the cover to the holes and be dissipated into the atmosphere. Examples of the types of hoses would be gas, steam and diving hoses.



LIQUID – Liquids do not permeate hose tubes which have been designed correctly for the application. Some permeation could occur if there was a misapplication of hose such as a water hose being used in a petrol application.

SHRINKING OF HOSE IN STORAGE

Powell Industrial packages hose in accordance with the Rubber Manufacturers Association standards for length tolerances. A 20 metre length for example, may actually measure plus 1% or 50 centimetres. This is done to combat the phenomenon of hose shrinking in storage. The flexibility of the rubber compounds allows the reinforcement to gradually contract the hose length, especially hard wall hoses with steel helix wires. Also the hose will tend to elongate to the original length when under pressure.

Application of 10 PSI is generally sufficient to cause the hose to elongate for an accurate measurement.

ELECTRICAL PROPERTIES

In the majority of situations Electrical Properties are not important in Hose applications. The notable and important exceptions occur in two areas requiring nearly opposite electrical properties.

1. Dissipation of static buildup.

2. Insulation against flow of current from high voltage sources or high electrical fields.



To fully understand the difference it is important to note the difference between conductance and resistance in relation to hoses.

Conductance = the ability of a hose to transmit electric current continuously throughout its length.

Resistance = the ability of a hose to prevent the transmission of electric current. Resistance is measured in ohms.

Where dry products are conveyed at high velocities, such as sandblast hose, a static charge can accumulate in the hose. If the hose wall has a high resistance this charge could build to a high level and a point where it may discharge through the hose wall into the atmosphere, a nearby object, or an individual in contact with the hose. In this application a hose that is anti-static will need to be used. This can be done through modified tubes that have special carbon black to reduce the static build up. The hose will then dissipate the static charges through the tube to the couplings. The couplings will then need to be grounded. Alternatively the hose can be manufactured with a static wire (usually stainless or tinned copper) which must also be grounded to the couplings.

At the other extreme hoses that have a very high resistance (low conductance) are used in applications where very high electrical insulation properties are needed. These would include conduit hoses, aluminium pot room hoses and hoses which may come into contact with high voltage lines. These type of hoses are generally referred to as non-conductive.

While the amount of applications requiring these styles of hoses are very few it is important that the correct hoses are used in these applications and the difference between non-conductive and anti-static fully understood.

STEAM

Steam has traditionally been one of the most basic yet least understood components of industry, particularly regarding rubber hose service.

Steam is the gaseous or vapour state of water. Water is heated until it boils and changes from liquid to vapour. With hose we must add one more factor to the equation; Pressure. Pressure has a direct relationship to the amount of heat required to turn water into vapour. The table shows the temperature required at a given pressure to turn water to steam or vapour. The higher the pressure the higher the temperature necessary. Once water has been changed to vapor it will become one of two basic types of steam; Saturated or Superheated SATURATED Steam is created at the boiling point, ie the temperature and pressure where water changes to steam. Saturated steam can be either wet (containing unvaporized water particles) or dry (with no unvaporized water). If the temperature at a given pressure is increased above the point necessary to maintain the steam we now have SUPERHEATED steam. Steam can also become superheated if the pressure drops and the temperature remains unchanged.

Gauge Pressure	Temp. of Satu. Steam (°C)
10	115
25	131
50	148
75	160
100	170
125	178
150	186
175	192
200	198
225	202
250	208

PVC HOSE & HEAT

PVC is a thermoplastic material, and therefore burst pressure varies with temperature. The graph shows variation in burst pressure with temperature for PVC Hoses.

Temp. °C	Burst Pressure %
20	100
30	80
40	60
50	50
60	40

To be used as a guide only

HOSE & HOSE ASSEMBLY WORKING PRESSURE/TEMPERATURE GUIDELINES

Hose working pressure ratings are recommended in accordance with RMA design safety factors at ambient temperatures. DO NOT operate outside of hose temperature limits specified by the hose manufacturer. Even within hose temperature limits, end fittings and hose size can impact performance at higher temperatures. For your safety it is recommended that the following working pressure reductions for the following temperature ranges be considered and complied with when selecting a hose (STAMPED) and when the hose assembly is in service:

- 27°C to 66°C (80°F to 150°F) - reduce working pressure by 15%
- 66°C to 107°C (150°F to 225°F) - reduce working pressure by 30%
- Over 107°C (225°F) - reduce working pressure by 50%

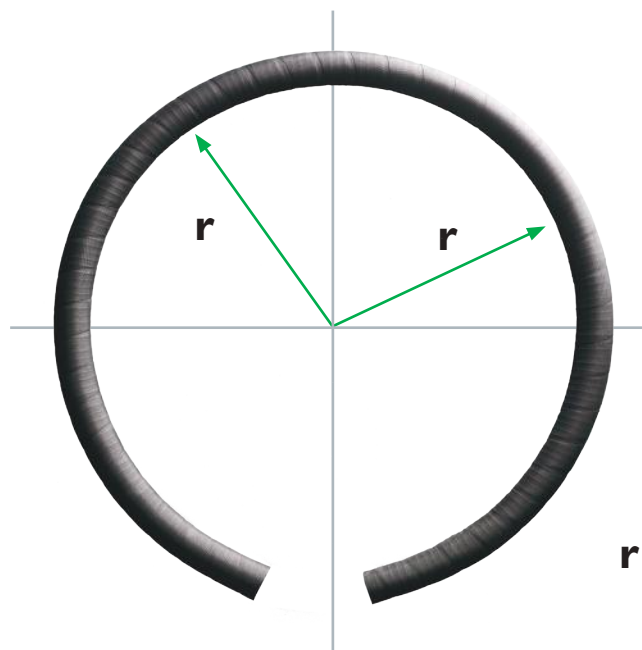
NOTE: Hose and hose assemblies should also not be subjected to storage conditions or used in service applications at temperatures below the minimum specified temperature rating (Eg. -40°F / -40°C) of the hose manufacturer. Hose may be stored at lower temperatures, but must be warmed before working with it.

BEND RADIUS & FLEXIBILITY

The flexibility and minimum bend radius are important factors in hose design and selection. The bend radius (r) is the radius of the arc through which a hose is bent. The minimum bend radius is the tightest arc in which a hose can be bent without kinking or otherwise damaging the hose.

Bending a hose to a tight radius imposes stresses on the structure of the hose which may cause a reduction in the performance, or in extreme cases cause permanent damage to the hose.

The minimum bend radius that a hose will withstand depends upon many factors including the wall thickness, the presence of a wire helix, the type of reinforcing material and the loss of performance that can be tolerated.



Is there are a difference between the terms flexibility and minimum bend radius? Yes. Often they are confused. Flexibility relates to the force required to bend the hose to a specified radius without kinking it. Minimum bend radius refers to the smallest radius before the hose is deemed to be damaged (a reduction in OD occurs or the hose actually kinks).

RUBBER HOSE CONSTRUCTION

Hose is manufactured in the uncured state by forming a cylindrical tube over which a reinforcement and cylindrical cover are applied. In this uncured form, a hose tube will often need support to maintain proper internal diameter and dimensional tolerances while being passed through the various stages of manufacture.

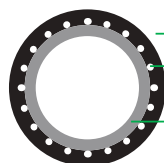
Thus the **Three Basic Methods of Making Hose** have evolved:

Non-Mandrel Style – is generally used for lower working pressures, (less than 500 PSI) smaller diameter (less than 50 mm) and textile reinforced products not requiring stringent dimensional tolerances. This process involves extruding the tube, reinforcing and cover in the unsupported mode (without a mandrel). Generally low pressure air is used inside the tube for minimal support, keeping the tube from flattening during the reinforcing process.

Flexible Mandrel Style - is generally used for mid-range working pressures (up to 5000 PSI) with ID's of 4 mm to 40 mm. When moderate tube processing support is needed and more accurate dimensional tolerances are a concern, flexible mandrels may be utilized. These mandrels are rubber or thermoplastic extrusions, sometimes with a wire core to minimise distortion. Examples of this style of product are Power Steering, Hydraulic, wire braided and air conditioning hoses.

Rigid Mandrel Style – is used where flexible mandrels become quite cumbersome to handle, working pressures are high, or stringent dimensional control is required. The rigid Mandrels are normally aluminium or steel and in food applications Stainless Steel can be used. The Mandrels are generally hollow. The hose tube will be either extruded onto the Mandrel, pneumatically pulled onto the Mandrel or wrapped in sheets onto the Mandrel. Rigid Mandrel products are unique in that they can be manufactured on a horizontally stationary Mandrel that rotates so that hose material can be applied in bias style. The alternative to this is that the Mandrel can be fed through the tubing, reinforcing and covering operations and the various hose components are applied by rotating around the mandrel and spirally fed onto the Mandrel. This style of manufacturing is often referred to a wrapped Hose. (Rubber Type)

Rubber Compound	Properties
Natural (NR)	Excellent physical properties including abrasion and low temperature resistance. Not resistant to fuels and oils.
Styrene Butadiene (SBR)	Good Physical properties, including abrasion resistance. Not resistant to fuels & oils
Nitrile (NBR)	Excellent resistance to petroleum based fluids (moderate resistance to aromatics) Good physical properties.
Neoprene (CR)	Excellent weather and ozone resistance, flame retarding. Moderate resistance to oil and chemicals.
Ethylene Propylene (EPDM)	Excellent resistance to steam, ageing, ozone and chemicals. Not resistant to fuels & oils.
Hypalon (CSM)	Excellent resistance to ozone, weathering and acid. Good abrasion and heat resistance. Fair resistance to petroleum based fluids.
Butyl (IIR)	Very Good weathering resistance, low permeability to air. Good physical properties. Poor resistance to petroleum based fluids.
Cross Linked Poly-ethylene (XLPE)	Excellent resistance to most solvents, chemicals, oils and fuels (including aromatics).



COVER: Outer layer that protects the hoses reinforcement and inner tube.

REINFORCEMENT: Braided or spiral lapped over and around the tube this sheath is designed to add strength to the hoses construction and extend its potential uses. Usually sits between the tube and cover.

INNER TUBE: The channel used to convey the media. This can be made from various compounds, which are selected dependent on the media that the tube has been designed to convey.

CHEMICAL RESISTANCE CHART FOR PVC HOSES

The information contained in these charts is to be used as a guide for the use of PVC hose products. Compound specifications can change without notice. For critical applications consult our technical department. This resistance chart covers both suction and delivery hose types.

The list has been compiled using current knowledge and it is recommended that the resistance should be checked with a sample of the product as compounds and additives frequently change. The list is not intended to be fully comprehensive and exclusion does not necessarily imply that the particular chemical would not be suitable for use with certain PVC products. All information should be used as an indication only and Powell accepts no liability as to its accuracy.

TYPE 1 PVC HOSE

00-200 (NTP) 00-400 (PR) 00-410 (Drum Pump)
00-420 (Drum Pump) 00-610 (PR CVT) 02-400 (Blue Suction)
02-410 (Black Suction) 02-460 (Plutone PH2)

TYPE 2 PVC HOSE

All other PVC Hose

A = Recommended - Little or no effect.
B = Moderate effect - Hose will give satisfactory performance, will be destroyed by the chemical after a period of time.
U = Unsuitable - NOT recommended.

CHEMICAL	TYPE 1	TYPE 2	CHEMICAL	TYPE 1	TYPE 2
Acetaldehyde	U	U	Benzaldehyde	U	U
Acetate Solvents	U	U	Benzene	U	U
Acetic Acid (0-60%)	A	A	Benzoic Acid	A	A
Acetic Acid (Glacial)	U	U	Borax (Sodium tetraborate)	A	A
Acetic Anhydride	U	U	Boric Acid	A	A
Acetone	U	U	Brine	A	A
Acetylene	A	B	Bromine	U	U
Acrylonitrile	A	A	Butane	A	B
Adipic Acid	A	A	Butanol	A	U
Air - Compressed	A	A	Butyle Acetate	U	U
Alcohol - Methyl	A	B	Butyric Acid 20% Solution	A	A
- Butyl	A	B	Calcium Carbonate	A	A
- Ethyl	A	B	Calcium Chloride	A	A
- Propyl	A	B	Calcium Hydroxide	A	A
Aliphatic Hydrocarbons	A	B	Calcium Hypochlorite	A	A
Allyl Chloride	U	U	Carbon Dioxide	A	A
Aluminium Acetate	A	A	Carbon Disulphide	U	U
Aluminium Chloride	A	A	Carbon Monoxide	A	A
Aluminium Hydroxide	A	A	Carbonic Acid	A	A
Aluminium Sulphate	A	A	Carbon Tetrachloride	U	U
Ammonia .88SG Aqueous	A	A	Casein	A	A
Ammonia Dry Gas	A	A	Castor Oil	A	B
Ammonia Liquid	U	U	Caustic Soda	A	A
Ammonia Chloride	A	A	Chlorine Dry Gas	U	U
Ammonium Hydroxide	A	A	Chlorine Water	U	U
Amyl Acetate	U	U	Chlorinated Hydrocarbons	U	U
Aniline	U	U	Chloroform	U	U
Animal Oils	A	U	Chromic Acid	U	U
Aromatic Hydrocarbons	U	U	Citric Acid	A	A
Barium Chloride	A	A	Coal Tar	U	U
Barium Hydroxide	A	A	Copper Chloride	A	A
Barium Sulfide	A	A	Copper Nitrate	A	A

CHEMICAL RESISTANCE PVC HOSE

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CHEMICAL	TYPE ONE	TYPE TWO	CHEMICAL	TYPE ONE	TYPE TWO
Copper Sulphate	A	A	Grease	A	B
Cottonseed Oil	A	B	Heptane	A	B
Creosote	U	U	Hexane	B	U
Cresol	U	U	Hydrobromic Acid	A	A
Cresylic acid	U	U	Hydrochloric Acid	A	A
Cyclohexane	U	U	Hydroflouboric Acid	A	A
Developer Photographic	A	A	Hydrofluoric Acid - <40%	A	A
Detergents (Synthetic)	A	A	Hydrofluoric Acid - >40%	U	U
Dextrin	A	A	Hydrofluosilicic Acid	A	A
Dextrose	A	A	Hydrogen	A	A
Dibutyl Phthalate	U	U	Hydrogen Peroxide	A	A
Dichlorobenzene	U	U	Hydrogen Sulphide	A	A
Dichlorethylene	U	U	Iodine	U	U
Diesel fuels	A	B	Isopropyl Acetate	U	U
Diethylene Glycol	A	A	Kerosene	A	B
Diethyl Ether	U	U	Ketones	U	U
Di-isodecyl Phthalate	U	U	Lactic Acid - 10%	A	A
Diocetyl Phthalate	U	U	Lactic Acid - 100%	U	U
Dry Cleaning fluids	U	U	Lanolin	A	A
Emulsifiers	A	A	Lead Salts	A	A
Ethane	A	A	Linseed Oil	A	B
Ethanol	A	B	Liquid Petroleum Gas	A	B
Ethyl Acetate	U	U	Lubricating Oils	A	B
Ethylene Dichloride	U	U	Magnesium Chloride	A	A
Ethylene Glycol	A	A	Magnesium Hydroxide	A	A
Fatty Acids	A	B	Magnesium Sulphate	A	A
Ferric Chloride	A	A	Malic Acid	A	A
Ferric Sulphate	A	A	Mercury	A	A
Ferrous Chloride	A	A	Metallic Soaps (Water Sol.)	A	A
Ferrous Sulphate	A	A	Methanol	A	B
Fluorine	U	U	Methyl Acetate	U	U
Formaldehyde	A	A	Methyl Bromide	U	U
Formic Acid	A	U	Methyl Ethyl Ketone	U	U
Grape Sugar	A	A	Methylated Spirits	A	B
Glucose	A	A	Methylene Chloride	U	U
Glycerine	A	B	Methylacrylate	U	U
Glycerol	A	B	Mineral Oils	A	B
Glycol	A	B	Monochlorobenzene	U	U

CHEMICAL	TYPE ONE	TYPE TWO	CHEMICAL	TYPE ONE	TYPE TWO
Naphtha	A	A	Sodium Hydroxide	A	A
Napthalene	B	U	Sodium Hypochlorite	B	B
Nitric Acid - up to 50%	A	B	Soft Soap	A	A
Nitric Acid - Above 50%	U	U	Soybean Oil	A	B
Nitrobenzene	U	U	Starch	A	A
Nitrogen Fertilisers	A	A	Stearic Acid	A	A
Octane	A	B	Styrene	U	U
Oleic Acid	A	B	Sulphur	A	A
Oxalic Acid	A	A	Sulphur Dioxide - Dry	A	A
Oxygen	A	A	Sulphur Dioxide - Wet	U	U
Ozone	A	A	Sulphuric Acid-Diluted < 50%	A	A
Palmitic Acid	A	A	Sulphuric Acid < 100%	U	U
Paraffin	A	B	Sulphurous Acid	A	A
Pentane	A	B	Tallow	A	A
Perchloroethylene	U	U	Tannic Acid	A	A
Petrol	A	B	Tartaric Acid	A	A
Petrol/Benzene	A	B	Tetra Ethyl Lead	A	B
Petroleum Ether	A	B	Tetrahydrofuran	B	U
Phenol	U	U	Toluene	U	U
Phosgene	U	U	Transformer Oil	A	B
Phosphoric Acid	A	A	Tricesyl Phosphate	U	U
Phosphorus	U	U	Trichlorethylene	U	U
Photographic - Developers	A	A	Triethanolamine	A	A
Photographic - Emulsions	A	A	Turpentine	A	B
Photographic - Fixing Solutions	A	A	Urea	A	A
Picric Acid	A	A	Vegetable Oil	A	B
Polyglycol Ethers	U	U	Vinegar	A	A
Potassium Hydroxide	A	A	Vinyl Acetate	U	U
Propane	A	B	Vinyl Chloride	A	A
Propylene Glycol	A	B	Water	A	A
Refrigerant Gases	U	U	Wetting Agents	A	A
Sea Water	A	A	Wine and Spirits	A	A
Sodium Dicarbonate	A	A	White Spirits	A	B
Sodium Carbonate	A	A	Xylene	U	U
Sodium Chloride	A	A	Yeast	A	A
Sodium Cyanide	A	A	Zinc Chloride	A	A
Sodium Fluoride	A	A	Zinc Sulphate	A	A

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CHEMICAL RESISTANCE GENERAL

- A = No effect (Acceptable)**
B = Minor effect (Acceptable)
C = Moderate effect effect (Questionable)
D = Severe effect (Not recommended)

These recommendations are based upon information from material suppliers and careful examination of available published information and are believed to be accurate. However, since the resistance of metals, plastics and elastomers can be affected by concentrations, temperature, presence of other chemicals and other factors, this information should be considered as a general guide rather than an unqualified guarantee. Ultimately, the customer must determine the suitability of the material used in various solutions. All recommendations assume ambient temperatures unless otherwise noted.

CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypro- pylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Acetaldehyde	A	A	B	-	A	A	B	B	B	D	B	C
Acetamide	B	A	-	-	-	-	-	A	-	A	A	D
Acetate Solv.	B	A	B	C	A	A	D	D	-	D	-	-
Acetic Acid, Glacial	B	A	B	C	A	D	B	D	B	C	B	C
Acetic Acid 20%	-	A	-	C	A	D	A	C	-	C	-	-
Acetic Acid 80%	-	A	-	C	A	D	B	C	-	D	-	-
Acetic Acid	B	A	B	C	A	D	A	C	-	C	B	C
Acetic Anhydride	A	A	B	D	A	D	A	A	C	B	B	C
Acetone	A	A	A	A	A	A	B	D	B	C	A	D
Acetyl Chloride	C	A	-	-	A	-	-	-	-	-	-	A
Acetylene	A	A	A	-	-	A	D	A	C	B	A	C
Acrylonitrile	A	C	B	-	-	-	B	D	-	D	D	-
Aluminum Chloride 20%	D	C	B	-	-	A	A	A	-	A	A	A
Aluminum Chloride	D	C	D	-	A	D	A	A	C	A	-	-
Aluminum Flouride	D	C	-	-	A	D	A	A	C	A	-	C
Aluminum Hydroxide	A	A	A	-	A	A	A	A	-	A	-	A
Alum Potassium Sulfate (ALUM), 10%	A	-	A	-	A	A	-	-	-	A	-	A
Alum Potassium Sulfate (ALUM) 100%	D	A	B	-	A	D	A	A	-	A	-	A
Aluminum Sulfate	C	C	A	C	A	A	A	A	-	A	A	A
Amines	A	A	A	-	A	A	-	D	C	B	B	C
Ammonia 10%	-	A	-	-	A	A	A	D	-	A	-	-
Ammonia Anhydrous	B	A	B	-	A	A	A	B	B	A	A	D
Ammonia, Liquids	A	A	D	-	A	-	A	B	B	A	A	D
Ammonia, Nitrate	A	A	C	-	-	-	A	A	-	C	-	-
Ammonium Bifluoride	C	A	D	-	-	-	A	A	-	A	-	-
Ammonium Carbonate	A	A	C	-	A	A	A	D	C	A	A	-
Ammonium Casenite	-	A	-	-	-	-	-	-	-	A	-	-
Ammonium Chloride	A	C	C	C	A	A	A	A	C	A	A	A
Ammonium Hydroxide	A	A	C	D	A	A	A	B	B	A	A	C
Ammonium Nitrate	A	A	B	D	A	D	A	A	C	A	A	A
Ammonium Oxalate	A	A	-	-	-	-	-	A	-	A	-	-
Ammonium Persulfate	A	A	C	-	A	D	A	A	-	A	A	A
Ammonium Phosphate, Dibasic	A	A	B	-	A	A	A	A	B	A	A	A
Ammonium Phosphate, Monobasic	A	A	B	-	A	A	A	A	B	A	A	A

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Ammonium Phosphate, Tribasic	A	A	B	-	A	A	A	A	B	A	A	A
Ammonium Sulfate	A	B	B	C	A	D	A	A	B	A	A	A
Ammonium Thio-Sulfate	-	A	-	-	-	-	-	A	-	A	-	-
Amyl-Acetate	A	A	B	-	A	B	D	D	D	D	A	D
Amyl Alcohol	A	A	B	-	A	A	A	B	D	A	A	C
Amyl Chloride	C	B	D	-	A	C	D	D	-	D	D	D
Aniline	A	A	C	-	A	C	B	D	C	D	B	D
Anti-Freeze	A	A	A	B	A	A	A	A	C	A	A	A
Antimony Plating 130° F	-	A	-	-	A	D	A	A	D	A	-	-
Antimony Trichloride	D	D	D	-	A	D	-	-	-	C	-	A
Aqua Regia	D	D	D	-	A	D	C	D	C	D	D	D
(80%, HCl, 20%, HNO)	D	D	D	-	A	D	C	D	C	D	D	D
Arochlor 1248	-	-	-	-	-	-	-	D	-	D	B	D
Aromatic Hydrocarbons	-	A	A	-	-	-	-	D	-	D	D	D
Arsenic Acid	A	A	D	B	A	A	A	A	-	A	-	C
Arsenic Plating 110° F	-	A	-	-	A	A	A	A	D	A	-	-
Asphalt	B	A	C	-	-	A	A	B	C	B	D	D
Barium Carbonate	A	A	B	-	A	A	A	A	-	A	-	A
Barium Chloride	A	A	D	-	A	B	A	A	B	A	A	A
Barium Cyanide	-	A	-	-	-	-	-	C	-	A	A	-
Barium Hydroxide	C	A	D	-	A	A	A	A	C	A	A	A
Barium Nitrate	A	A	-	-	-	-	-	A	-	A	A	-
Barium Sulfate	A	A	D	-	A	A	A	A	D	A	A	-
Barium Sulfide	A	A	D	-	A	A	A	A	C	A	A	A
Beer	A	A	A	B	A	D	D	D	C	A	A	A
Beet Sugar Liquids	A	A	A	B	A	A	A	A	-	B	A	A
Benzaldehyde	A	A	B	-	A	C	D	D	B	D	A	D
Benzene	A	A	B	A	A	A	D	D	-	D	D	D
Benzoic Acid	A	A	B	-	A	D	D	D	-	D	D	D
Benzol	A	A	B	A	A	A	A	D	-	D	-	-
Benzyl Alcohol	A	A	B	C	-	A	A	D	-	B	B	D
Borax (Sodium Borate)	A	A	C	B	A	A	A	B	C	A	A	C
Boric Acid	A	A	B	C	A	A	A	A	-	A	A	A
Brewery Slop	-	A	-	-	-	-	-	A	-	A	-	-

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminum	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Bromine (Wet)	D	D	D	-	A	D	D	D	D	D	D	D
Butadiene	A	A	A	A	A	A	-	A	-	B	A	-
Butanes	A	A	A	A	A	A	D	A	D	B	D	D
Butanol	A	A	A	-	A	-	-	-	-	-	-	-
Butter	B	A	A	-	-	-	-	A	-	B	A	D
Buttermilk	A	A	A	-	A	A	-	A	-	A	-	D
Butylene	-	A	A	A	A	-	-	B	-	-	D	D
Butyl Acetate	-	C	A	-	A	-	D	B	D	D	B	D
Butyl Alcohol	A	A	B	C	A	A	B	A	D	A	A	A
Butyric Acid	B	A	B	-	A	D	A	D	-	D	B	-
Calcium Bisulfate	D	A	D	D	A	A	-	A	C	C	-	A
Calcium Bisulfide	-	B	C	-	A	A	A	A	-	A	D	-
Calcium Bisulfite	D	A	C	-	A	A	A	A	-	A	-	A
Calcium Carbonate	A	A	C	-	A	A	A	A	-	A	-	A
Calcium Chlorate	C	A	-	-	A	A	-	-	-	A	-	A
Calcium Chloride	A	D	C	-	A	A	A	A	B	D	A	A
Calcium Hydroxide	A	A	C	-	A	A	A	A	C	A	A	A
Calcium Hypochlorite	A	C	C	-	A	D	A	B	C	D	A	C
Calcium Sulfate	A	A	B	-	A	A	A	A	-	D	-	C
Calgon	A	A	-	-	-	-	A	A	-	A	-	-
Cane Juice	A	A	B	C	-	A	D	A	-	A	-	A
Carbolic Acid (See Phenol)	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Bisulfide	A	A	A	-	-	A	D	D	-	D	D	D
Carbon Dioxide (Wet)	A	A	C	C	A	-	-	-	-	-	-	-
Carbon Disulfide	B	A	C	C	A	A	D	D	-	D	D	D
Carbon Monoxide	A	A	A	-	-	A	A	A	B	B	A	C
Carbon Tetrachloride	C	B	C	A	A	A	D	C	C	D	-	D
Carbonated Water	A	A	A	-	-	A	A	A	-	A	A	-
Carbonic	A	B	A	-	A	A	A	B	B	A	A	A
Catsup	A	A	D	-	-	A	A	A	-	C	-	-
Chloracetic Acid	D	D	C	-	A	D	D	D	-	D	B	D
Chloric Acid	D	D	-	-	A	-	-	D	-	D	-	-
Chlorinated Glue	A	A	D	-	-	C	-	C	-	D	B	D
Chlorine, Anhydrous Liquid	D	D	D	-	A	D	D	D	-	D	B	D

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Chlorine (Dry)	A	A	D	B	A	-	-	-	-	D	-	D
Chlorine Water	-	D	D	D	A	D	D	D	C	D	-	-
Chlorobenzene (Mono)	A	A	B	-	A	A	D	D	-	D	D	D
Chlorosulfonic Acid	D	-	D	-	A	D	D	D	D	D	D	D
Chlorox (Bleach)	A	A	C	-	A	D	D	C	-	B	B	D
Chocolate Syrup	A	A	A	-	-	A	A	A	-	A	-	D
Chromic Acid 5%	A	A	C	D	-	D	A	D	C	D	A	B
Chromic Acid 10%	B	-	-	D	A	D	A	D	-	D	-	-
Chromic Acid 30%	B	-	-	D	A	D	A	D	-	D	-	-
Chromic Acid 50%	B	B	C	D	A	D	B	D	-	D	A	D
Cider	A	A	B	-	-	-	-	A	-	A	-	-
Citric Acid	A	A	C	C	A	C	B	D	C	A	A	A
Citric Oils	A	A	C	-	-	-	A	A	C	D	-	-
Coffee	A	A	A	-	A	A	A	A	-	A	-	A
Copper Chloride	D	D	D	-	A	D	A	A	-	A	A	A
Copper Cyanide	A	A	D	-	A	A	A	B	-	A	A	A
Copper Floroborate	D	D	D	-	A	-	-	B	-	A	-	A
Copper Nitrate	A	A	D	-	A	D	A	A	-	A	-	-
Copper Sulfate (5% Solution)	A	A	D	D	A	D	A	A	C	A	-	C
Copper Sulfate	B	-	-	D	A	C	A	B	-	A	A	-
Cream	A	A	A	-	-	A	A	A	-	C	-	-
Cresols	A	A	B	C	-	-	C	D	D	D	D	D
Cresylic Acid	A	A	C	-	A	D	-	D	-	D	D	D
Cyclohexane	A	-	A	-	-	-	D	A	D	D	D	D
Cyanic Acid	A	-	-	-	-	-	-	C	-	D	-	-
Detergents	A	A	A	-	-	A	A	A	-	B	A	C
Diacetone Alcohol	A	A	A	C	-	A	D	D	-	D	A	D
Dichlorethane	A	A	-	-	A	A	-	-	-	D	-	D
Diesel Fuel	A	A	A	-	-	-	D	A	-	D	D	D
Diethylamine	A	-	A	-	A	-	C	B	-	B	B	C
Diethylene Glycol	A	-	-	-	-	A	-	A	C	A	A	A
Diphenyl Oxide	A	-	-	-	-	-	-	D	-	D	D	D
Dyes	A	A	B	-	-	-	-	-	-	C	-	-
Epsom Salts(Magnesium Sulfate)	A	A	A	-	-	-	A	A	-	A	-	C

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Ethane	A	-	A	-	-	-	-	A	-	B	D	D
Ethanolamine	A	A	-	-	-	-	-	B	C	B	-	C
Ether	A	A	A	A	-	C	-	D	-	D	C	D
Ethyl Acetate	A	A	B	-	A	A	C	D	C	D	B	D
Ethyl Alcohol	A	A	B	C	-	A	A	A	B	A	B	A
Ethyl Chloride	A	A	B	-	A	A	D	D	D	C	A	A
Ethyl Sulfate	D	-	-	-	-	-	-	A	-	-	-	-
Ethylene Chloride	A	A	C	-	A	-	D	D	D	D	C	D
Ethylene Dichloride	A	A	D	-	A	A	A	D	D	D	C	D
Ethylene Glycol	A	A	A	B	A	A	A	A	C	A	A	A
Ethylene Oxide	-	A	A	-	A	A	-	D	D	D	C	D
Fatty Acids	A	A	B	-	A	A	A	C	C	B	C	C
Ferric Chloride	D	D	D	D	A	D	A	D	C	B	A	A
Ferric Nitrate	A	A	D	-	A	D	A	A	D	A	A	A
Ferric Sulfate	A	C	D	D	A	A	A	B	C	A	-	A
Ferrous Chloride	D	D	D	-	A	D	A	B	C	A	-	A
Ferrous Sulfate	A	C	D	-	A	D	A	B	-	A	-	A
Fluboric Acid	D	B	-	-	A	C	A	B	-	A	-	-
Fluorine	D	D	D	-	C	D	-	-	-	-	-	-
Fluosilicic Acid	-	B	D	-	A	D	A	A	-	A	-	-
Formaldehyde 40%	-	A	-	-	A	D	A	B	B	A	-	-
Formaldehyde	A	A	A	B	A	A	A	C	B	D	B	C
Formic Acid	A	B	D	C	A	D	A	D	C	D	A	C
Freon 11	-	A	B	-	A	A	-	C	D	D	D	D
Freon 12 (wet)	-	D	B	-	A	A	A	A	D	B	B	D
Freon 22	-	A	B	-	-	A	-	D	D	A	A	A
Freon 113	-	A	B	-	-	A	-	A	D	A	-	D
Freon T.F.	-	A	B	-	-	A	D	A	D	A	D	D
Fruit Juice	A	A	B	-	D	A	A	A	-	A	-	-
Fuel Oils	A	A	A	-	A	A	B	A	C	B	D	D
Furan Resin	A	A	A	-	A	-	-	D	-	D	-	D
Furfural	A	A	A	-	A	A	D	D	D	D	B	D
Gallic Acid	A	A	A	-	A	A	-	A	-	-	-	-
Gasoline	A	A	A	-	A	A	C	A	D	D	C	D

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Gelatin	A	A	A	C	A	A	A	A	-	A	A	A
Glucose	-	A	A	A	A	A	A	A	B	A	A	A
Glue P.V.A.	B	A	B	-	A	A	-	A	-	A	-	-
Glycerine	A	A	A	B	A	A	A	A	B	A	A	A
Cycolic Acid	-	-	-	-	-	-	A	A	-	A	-	-
Gold Monocyanide	-	A	-	-	-	-	-	A	-	A	-	-
Grape Juice	A	A	B	-	-	-	-	A	-	A	-	-
Grease	A	A	A	-	A	A	-	A	-	D	-	-
Heptane	-	A	A	-	A	A	D	A	-	B	D	-
Hexane	A	A	A	-	A	A	C	A	B	B	D	D
Hexyl Alcohol	A	A	A	C	-	A	A	A	D	B	A	A
Honey	A	A	A	-	-	A	A	A	-	A	A	-
Hydraulic Oils (Petroleum)	A	A	A	-	A	A	D	A	-	B	D	D
Hydraulic Oils (Synthetic)	A	A	A	-	-	A	D	C	D	-	-	-
Hydrazine	A	A	-	-	-	-	-	B	D	B	A	C
Hydrobromic Acid 20%	-	D	-	-	A	D	A	D	-	C	-	-
Hydrobromic Acid	D	D	D	-	A	D	B	D	D	D	A	A
Hydrochloric Acid (Dry Gas)	C	A	D	-	A	-	-	-	-	-	A	-
Hydrochloric Acid (20%)	D	D	D	-	A	D	A	C	-	C	A	C
Hydrochloric Acid (37%)	D	D	D	-	A	D	A	C	C	C	C	D
Hydrochloric Acid 100%	D	D	D	-	A	D	-	D	-	C	-	A
Hydrocyanic Acid	A	A	A	D	A	A	A	C	-	B	-	A
Hydrocyanic Acid (Gas 10%)	D	D	-	-	A	-	-	-	-	C	A	C
Hydrofluoric Acid (20%) ¹	D	D	D	-	A	D	A	D	-	C	A	C
Hydrofluoric Acid (75%)	C	D	D	-	A	D	B	D	D	D	C	C
Hydrofluoric Acid 100%	D	D	D	-	A	-	-	D	-	D	-	D
Hydrofluosilicic Acid (20%)	D	D	D	-	A	D	A	B	-	B	A	A
Hydrofluosilicic Acid	D	D	C	-	A	-	-	-	D	A	-	-
Hydrogen Gas	A	A	A	-	A	-	-	-	-	-	-	-
Hydrogen Peroxide 10%	C	C	A	D	A	B	-	A	-	D	-	C
Hydrogen Peroxide 30%	-	B	-	D	A	B	A	D	-	C	-	-
Hydrogen Peroxide	A	B	A	D	A	B	A	D	C	D	C	C
Hydrogen Sulfide, Aqueous Solution	A	A	C	C	A	B	A	C	-	B	A	D
Hydrogen Sulfide (Dry)	C	A	D	C	A	B	-	-	-	-	-	A

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Hydroxyacetic Acid (70%)	-	-	D	-	-	-	-	A	-	A	A	-
Ink	A	A	C	-	-	A	-	A	-	A	-	-
Iodine	D	D	D	-	A	D	D	B	-	D	B	D
Iodine (In Alcohol)	-	B	-	-	A	D	B	D	-	D	-	-
Iodoform	D	A	A	-	A	A	-	-	-	-	-	-
Isobutyl Alcohol	A	A	B	C	-	A	-	C	B	A	A	A
Isopropyl Alcohol	A	A	B	C	-	A	A	C	C	B	A	A
Isopropyl Acetate	-	B	C	-	-	-	-	D	-	D	B	D
Isopropyl Ether	-	A	A	-	A	-	D	B	-	D	D	D
Isotane	-	-	A	-	-	-	D	A	-	-	-	D
Jet Fuel (JP3,JP4,JP5)	A	A	A	-	A	A	D	A	D	D	D	D
Kerosene	A	A	A	A	A	A	D	A	D	D	A	D
Ketones	A	A	B	-	A	A	D	D	-	D	D	C
Lacquers	A	A	A	C	-	A	A	D	-	D	-	D
Lacquer Thinners	-	A	-	C	A	A	B	D	-	D	A	-
Lactic Acid	A	B	C	-	A	C	A	B	-	A	B	A
Lard	A	A	A	-	-	A	A	A	C	B	-	D
Latex	A	A	A	-	-	A	-	A	-	C	A	-
Lead Acetate	A	A	D	-	A	A	A	B	-	D	A	A
Lead Fluoborate Plating	-	C	-	-	A	D	A	B	-	C	-	-
Lead Sulfamate	-	-	-	-	-	-	A	B	C	A	D	C
Ligroin	-	A	-	-	-	-	D	A	-	B	A	D
Lime	A	A	C	-	-	-	-	A	C	B	D	-
Lubricants	A	A	A	-	A	A	A	A	C	D	-	D
Magnesium Carbonate	A	A	-	-	-	-	A	A	-	A	A	-
Magnesium Chloride	B	B	D	C	A	A	A	A	-	A	A	A
Magnesium Hydroxide	A	A	D	B	A	A	A	B	-	B	-	C
Magnesium Nitrate	A	A	-	-	A	A	A	A	-	A	-	-
Magnesium Oxide	A	A	-	-	-	-	-	A	-	A	A	-
Magnesium Sulfate	B	A	B	B	A	A	A	A	-	A	D	C
Maleic Acid	A	A	B	-	A	A	C	D	-	A	D	D
Maleic Anhydride	-	-	-	-	-	-	-	D	-	D	-	D
Malic Acid	A	A	C	-	A	A	-	-	-	A	-	A
Mash	A	A	-	-	-	-	-	A	-	A	-	-

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Mayonnaise	A	A	D	-	A	A	A	A	-	-	-	-
Melamine	D	D	-	-	-	-	-	C	-	-	-	-
Mercuric Chloride (Dilute Solution)	D	D	D	D	A	A	A	A	-	A	A	A
Mercuric Cyanide	A	A	D	-	A	-	A	A	-	-	-	-
Mercury	A	A	C	D	A	A	A	A	-	A	A	A
Methanol (See Alcohol Methyl)	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Acetate	-	A	A	-	A	-	-	D	D	B	B	D
Methyl Acetone	-	A	A	-	A	-	-	D	-	D	-	-
Methyl Alcohol 10%	-	A	C	-	A	A	-	B	-	-	-	A
Methyl Alcohol	A	A	B	C	A	A	A	B	-	A	A	A
Methyl Bromide	-	-	-	-	-	-	-	B	-	D	D	D
Methyl Butyl Ketone	-	A	A	-	-	-	-	D	C	D	A	D
Methyl Cellosolve	-	-	A	-	-	-	A	D	-	D	B	D
Methyl Chloride	C	A	D	-	A	A	D	D	D	D	C	D
Methyl Dichloride	-	-	-	-	-	-	-	D	-	D	D	D
Methyl Ethyl Ketone	A	A	A	-	A	A	A	D	C	D	A	D
Methyl Isobutyl Ketone	-	A	-	-	A	A	C	D	C	D	C	D
Methyl Isopropyl Ketone	-	A	-	-	-	A	-	D	B	D	B	D
Methyl Methacrylate	-	-	-	-	-	-	-	D	-	D	D	D
Methylamine	-	A	A	-	-	-	-	B	-	-	-	-
Methylene Chloride	A	A	A	C	A	D	D	D	-	D	D	D
Milk	A	A	A	C	-	A	A	A	B	A	A	A
Molasses	A	A	A	B	-	A	A	A	-	A	-	-
Mustard	A	A	B	-	-	A	A	B	C	C	-	-
Naptha	A	A	A	-	A	A	A	B	D	D	D	D
Napthalene	A	B	B	-	A	-	B	D	-	D	D	D
Nickel Chloride	A	B	D	-	A	A	A	A	-	A	A	A
Nickel Sulfate	A	B	D	C	A	A	A	A	-	A	A	C
Nitric Acid (10% Solution)	A	A	D	-	A	D	A	D	-	D	B	D
Nitric Acid (20% Solution)	A	A	D	-	A	D	A	D	-	D	D	D
Nitric Acid (50% Solution)	A	A	D	-	A	D	D	D	-	D	D	D
Nitric Acid (Concentrated Solution)	D	B	B	D	A	D	D	D	-	D	D	D
Nitrobenzene	A	B	C	-	A	C	C	D	D	D	D	D
Oil - Aniline	A	A	C	-	A	C	A	D	-	D	B	D

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Oil - Anise	A	A	-	-	-	-	-	-	-	D	-	-
Oil - Bay	A	A	-	-	-	-	-	-	-	D	-	-
Oil - Bone	A	A	-	-	-	-	-	A	-	D	-	-
Oil - Castor	A	A	A	-	-	-	-	A	-	A	B	A
Oil - Cinnamon	A	A	-	-	A	-	A	-	-	D	-	-
Oil - Citric	A	A	-	-	-	A	A	A	-	D	-	-
Oil - Clove	A	A	-	-	-	A	B	A	-	-	-	-
Oil - Coconut	A	A	B	-	-	A	A	A	-	A	A	D
Oil - Cod Liver	A	A	B	-	-	A	A	A	-	B	A	D
Oil - Corn	A	A	B	-	-	A	A	A	-	D	C	D
Oil - Cotton Seed	A	A	B	-	A	A	A	A	-	D	C	D
Oil - Cresote	A	A	A	-	-	-	D	A	-	B	D	D
Oil - Diesel Fuel (2D,3D,4D,5D)	A	A	A	-	-	A	A	A	-	D	D	D
Oil - Fuel (1,2,3,5A,5B,6)	A	A	A	-	A	-	B	B	-	D	D	D
Oil - Ginger	A	A	-	-	-	-	-	A	-	A	-	-
Oil - Hydraulic (See Hydraulic)				-					-		-	
Oil - Lemon	A	A	-	-	-	-	D	-	-	D	-	-
Oil - Linseed	A	A	A	-	-	A	A	A	-	D	D	D
Oil - Mineral	A	A	A	-	-	A	B	A	-	B	D	D
Oil - Olive	A	A	A	-	A	A	A	A	C	B	-	D
Oil - Orange	A	A	-	-	A	A	A	A	-	D	-	-
Oil - Palm	A	A	A	-	-	A	-	A	-	D	-	-
Oil - Peanut	A	A	A	-	-	-	D	A	-	D	-	D
Oil - Peppermint	A	A	-	-	-	-	D	D	-	D	-	-
Oil - Pine	A	A	A	-	A	-	-	A	-	D	-	D
Oil - Rape Seed	A	A	-	-	-	-	-	B	-	D	-	D
Oil - Rosin	A	A	A	-	-	A	A	A	-	-	-	-
Oil - Sesame Seed	A	A	A	-	-	-	-	A	-	D	-	-
Oil - Silicone	A	A	-	-	-	A	A	A	-	A	-	A
Oil - Soybean	A	A	A	-	-	A	A	A	-	D	-	D
Oil - Sperm	A	A	-	-	-	-	-	A	-	D	-	-
Oil - Tanning	A	A	-	-	-	-	-	A	-	D	-	-
Oil - Turbine	A	A	A	-	-	-	-	A	-	D	-	D
Octyl Alcohol	A	A	A	C	-	A	-	B	-	B	A	C

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Oleic Acid	A	A	B	C	A	A	C	B	D	D	D	D
Oleum 25%	-	-	-	-	A	-	-	D	D	D	D	-
Oleum	-	A	B	C	A	-	D	C	D	D	D	D
Oxalic Acid (cold)	A	B	C	C	A	D	A	B	C	B	A	C
Paraffin	A	A	A	-	A	A	A	A	-	-	-	-
Pentane	C	C	A	-	A	A	-	A	-	B	D	D
Perchloroethylenen	A	A	A	-	A	-	D	C	D	D	D	D
Petrolatum	-	A	B	-	A	A	-	A	-	B	A	D
Phenol 10%	A	A	A	-	A	D	-	D	-	C	D	C
Phenol (Carbolic Acid)	A	A	B	D	A	D	B	D	-	D	D	D
Phosphoric Acid (to 40% Solution)	B	A	D	D	A	D	A	D	-	D	B	C
Phosphoric Acid (40%-100% Solution)	C	B	D	D	A	D	A	D	-	D	B	C
Phosphoric Acid (Crude)	D	C	D	D	A	D	-	D	-	D	B	-
Phosphoric Anhydride (Dry or Moist)	A	A	-	D	A	-	-	D	-	D	-	A
Phosphoric Anhydride (Molten)	A	A	D	D	A	A	-	C	-	D	-	D
Photographic (Developer)	C	A	C	-	-	-	A	A	-	A	-	-
Phthalic Anhydride	A	B	B	-	A	A	-	C	-	-	-	-
Picric Acid	A	A	C	D	A	A	-	A	D	A	-	A
Potash	A	-	C	-	-	A	A	A	-	B	-	B
Potassium Bicarbonate	A	-	C	-	A	A	A	A	-	A	-	B
Potassium Bromide	A	-	C	-	A	C	A	A	-	A	A	B
Potassium Carbonate	A	-	C	-	A	A	A	B	-	A	-	B
Potassium Chlorate	A	A	B	-	A	D	A	A	-	A	-	B
Potassium Chloride	A	A	B	C	A	B	A	A	-	A	A	A
Potassium Chromate	-	B	A	-	-	-	-	A	-	A	-	B
Potassium Cyanide Solutions	A	B	D	-	A	A	A	A	-	A	A	A
Potassium Dichromate	A	A	A	-	A	D	A	A	-	A	A	A
Potassium Ferrocyanide	A	-	C	-	A	A	-	D	-	-	-	A
Potassium Hydroxide (50%)	B	B	D	D	A	A	A	B	C	A	A	C
Potassium Nitrate	A	B	B	-	A	C	A	A	-	A	A	A
Potassium Permanganate	A	B	B	-	A	D	B	A	-	A	-	B
Potassium Sulfate	A	B	A	B	A	C	A	A	C	A	A	C
Potassium Sulfide	A	-	B	-	A	-	-	A	-	-	-	-
Propane (Liquified)	A	-	A	A	A	A	D	A	D	B	D	D

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Propyl Alcohol	A	A	A	-	A	A	A	A	B	A	A	A
Propylene Glycol	B	-	A	-	A	B	-	A	-	C	-	-
Pyridine	C	-	B	-	A	-	B	D	-	D	B	D
Pyrogalllic Acid	A	A	B	-	A	A	-	A	-	-	-	-
Rhodium Plating 120° F	-	D	-	-	A	D	A	A	-	B	-	-
Rosins	A	A	A	C	A	A	A	A	-	-	-	-
Rum	A	-	-	-	-	A	A	A	-	A	-	-
Rust Inhibitors	A	-	-	-	-	-	A	A	-	C	-	-
Sea Water	A	A	C	-	A	A	A	A	B	B	A	A
Shellac (Bleached)	A	-	A	B	A	A	A	A	-	-	-	-
Shellac (Orange)	A	-	A	C	A	A	A	A	-	-	-	-
Silicone	B	-	B	-	-	A	A	A	B	A	A	A
Silver Bromide	C	C	D	-	-	-	-	-	-	-	-	-
Silver Nitrate	A	B	D	-	A	A	A	C	-	A	C	A
Silver Plating 80-120° F	-	A	-	-	A	A	A	A	-	A	-	-
Soap Solutions	A	A	C	-	A	A	A	A	B	B	-	C
Soda Ash (See Sodium Carbonate)												
Sodium Acetate	A	A	B	-	A	A	A	D	-	C	-	A
Sodium Aluminate	-	-	C	-	A	A	-	A	-	A	A	B
Sodium Bicarbonate	A	A	A	A	A	A	A	A	C	A	A	A
Sodium Bisulfate	A	-	D	C	A	C	A	A	C	A	-	A
Sodium Bisulfite	A	-	A	-	A	D	A	A	C	A	-	A
Sodium Borate	A	-	C	-	A	A	-	-	B	A	-	-
Sodium Carbonate	A	B	C	B	A	A	A	A	-	A	A	A
Sodium Chlorate	A	-	B	-	A	A	A	D	-	A	-	A
Sodium Chloride	A	C	C	C	A	A	A	A	C	A	A	B
Sodium Chromate	A	A	D	-	A	A	A	A	-	A	-	-
Sodium Cyanide	A	-	D	D	A	C	A	A	D	A	A	A
Sodium Fluoride	C	-	C	-	A	A	-	D	-	D	-	D
Sodium Hydrosulfite	-	-	A	-	A	A	-	-	-	A	-	A
Sodium Hydroxide (20%)	A	A	D	D	A	C	A	A	D	B	A	A
Sodium Hydroxide (50% Solution)	A	B	D	D	A	C	A	D	D	C	-	A
Sodium Hydroxide (80% Solution)	A	D	D	D	A	C	A	D	D	C	-	B
Sodium Hypochlorite (to 20%)	C	C	C	D	A	A	D	C	D	D	B	C

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CHEMICAL	304 S/Steel	316 S/Steel	Aluminium	Brass	Teflon	Nylon	Polypropylene	Nitrile	Silicone	Neoprene	EPDM	Natural Rubber
Sodium Hypochlorite	-	A	D	-	A	A	A	B	C	A	-	-
Sodium Hyposulfate	A	A	D	-	A	-	-	-	-	C	-	C
Sodium Metaphosphate	-	A	A	C	A	A	D	A	-	B	A	A
Sodium Metasilicate	-	A	B	-	A	-	-	A	D	A	-	-
Sodium Nitrate	A	A	A	C	A	A	A	C	D	B	A	C
Sodium Perborate	-	C	B	C	A	A	A	B	D	B	A	C
Sodium Peroxide	A	A	C	C	A	D	-	C	D	B	A	C
Sodium Polyphosphate (Mono, Di, Tribasic)	A	A	D	-	A	-	-	A	-	D	A	A
Sodium Silicate	A	B	C	C	A	A	A	A	-	A	A	A
Sodium Sulfate	A	A	B	B	A	A	A	A	-	A	A	C
Sodium Sulfide	A	B	D	D	A	A	A	C	-	A	A	C
Sodium Sulfite	C	C	C	-	A	D	-	A	-	A	-	A
Sodium Tetraborate	-	A	-	-	-	-	-	A	-	-	-	-
Sodium Thiosulphate ("Hypo")	A	A	B	D	A	A	A	B	-	A	A	C
Sorghum	A	A	-	-	-	A	-	A	-	A	-	-
Soy Sauce	A	A	A	-	-	A	-	A	-	A	-	D
Stannic Chloride	D	D	D	-	A	A	A	A	D	A	A	A
Stannic Fluoborate	-	A	-	-	-	-	-	A	-	A	-	-
Stannous Chloride	D	C	D	-	A	D	-	C	D	D	-	A
Starch	A	A	A	-	A	A	-	A	-	A	-	-
Stearic Acid	A	A	B	C	A	A	D	B	D	B	B	C
Stoddard Solvent	A	A	A	A	A	A	D	B	D	D	D	D
Styrene	A	A	A	-	A	-	-	D	D	D	D	D
Sugar (Liquids)	A	A	A	-	A	A	A	A	-	B	-	A
Sulfate Liquors	C	C	B	-	-	-	A	-	-	C	-	-
Sulfur Chloride	D	D	D	D	A	A	D	D	-	D	D	D
Sulfur Dioxide	A	A	A	-	A	D	D	D	C	B	A	D
Sulfur Trioxide (Dry)	A	C	A	-	A	D	-	D	-	D	B	C
Sulfuric Acid (to 10%)	D	C	C	D	A	D	A	C	-	D	D	C
Sulfuric Acid (10%-75%)	D	D	D	D	A	D	A	D	-	D	D	D
Sulfuric Acid 75%-100%	-	D	-	D	A	D	B	D	-	D	-	-
Sulfurous Acid	C	B	C	-	A	D	A	C	D	B	B	C
Sulfuryl Chloride	-	-	-	-	A	-	-	-	-	-	-	-
Syrup	A	A	A	-	-	A	A	A	-	B	-	A

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Tallow	A	A	A	-	-	A	-	A	-	-	-	-
Tannic Acid	A	A	C	-	A	D	A	D	C	A	A	A
Tanning Liquors	A	A	C	-	A	-	A	C	-	-	-	-
Tartaric Acid	A	B	C	C	A	A	A	D	C	A	-	A
Tetrachlorethane	-	A	-	-	A	A	A	D	-	-	D	D
Tetrahydrofuran	A	A	D	-	A	A	C	D	-	D	B	D
Tin-Fluoborate Plating 100° F	-	C	-	-	A	D	A	B	-	C	-	-
Tin-Lead Plating 100° F	-	C	-	-	A	D	A	B	-	C	-	-
Toluene, Toluol	A	A	A	A	A	A	D	D	D	D	D	D
Tomato Juice	A	A	A	-	A	A	A	A	-	A	-	-
Trichlorethane	C	A	C	-	A	-	-	D	D	D	D	D
Trichlorethylene	A	A	B	A	A	C	D	D	D	D	D	D
Trichloropropane	-	A	-	-	-	-	-	A	-	A	-	-
Tricresylphosphate	-	A	-	-	A	-	-	D	-	D	A	-
Triethylamine	-	-	-	-	-	-	-	A	D	B	-	-
Turpentine	A	A	C	C	A	A	B	D	-	D	D	D
Urine	A	A	B	-	-	A	A	A	-	D	A	-
Varnish (Use Viton® for Aromatic)	A	A	A	B	A	A	A	B	C	D	-	D
Vegetable Juice	A	A	A	-	-	A	-	A	B	D	-	D
Vinegar	A	A	D	B	A	A	A	C	-	B	A	C
Water, Fresh	A	A	A	C	A	A	A	A	-	B	A	A
Water, Salt	A	A	B	C	-	A	A	A	-	B	A	A
Water, Acid , Mine	A	A	C	D	-	A	A	A	-	B	-	B
Water, Distilled , Lab Grade 7	A	A	B	-	A	A	A	A	-	B	A	A
Weed Killers	A	A	C	-	-	A	-	B	-	C	-	-
Whey	A	A	B	-	-	-	-	A	-	-	-	-
Whiskey and Wines	A	A	D	B	A	A	A	A	B	A	A	A
White Liquor (Pulp Mill)	A	A	-	-	A	A	A	A	-	A	-	-
White Water (Paper Mill)	A	A	-	-	-	A	A	-	-	A	-	-
Xylene	A	A	A	A	A	A	D	D	D	D	D	D
Zinc Chloride	A	B	D	D	A	A	A	A	-	A	A	A
Zinc Hydrosulfate	A	A	D	C	A	A	A	A	-	A	A	C
Zinc Hydrosulphite	-	A	D	-	-	-	-	A	-	A	A	-
Zinc Sulfate	A	A	D	C	A	A	A	A	-	A	A	C

TERMS & CONDITIONS OF AGREEMENT

These are the terms and conditions upon which POWELL INDUSTRIAL PTY LTD ABN 36 010 035 346 may supply goods and services on credit to an accepted monthly credit account customer ("the Customer"):-

"I/We acknowledge that the information provided in this Credit Account Application ("Application") and accompanying Guarantee has been given to the Supplier for the purposes of its assessing the financial standing and credit worthiness of each of us and I/we:-

1. INTERPRETATION

- 1.1 The headings used in this Agreement do not form part of these terms and conditions and are for convenience only.
- 1.2 Where the context admits or requires, words importing the singular shall include the plural, those denoting a given gender shall include all other genders and those denoting natural persons shall include corporations
- 1.3 These terms and conditions shall apply mutatis mutandis as between the Customer and any subsidiary or related entity of the Supplier as those terms are defined in the Corporations Act 2001 except where:-
 - 1.3.1. there is a written credit agreement between the parties; or
 - 1.3.2. the resulting agreement constitutes a breach of any legislation.

2. ACCOUNT TERMS

- 2.1. The Supplier may in its absolute discretion refuse the Customer credit facilities or suspend or discontinue the supply of goods and services to the Customer or to increase or vary the Customer's credit limit at any time without any obligation to provide to the Customer or the Customer's guarantors, a reason for such action.
- 2.2 All goods or services delivered to the Customer by the Supplier in any calendar month must be paid for in full by the Customer on or before the Supplier's last trading day in the month following the month in which the goods or services were delivered or provided ("the Due Date").
- 2.3 If the Customer fails to make full payment by the Due Date interest will be charged at a rate which is 8% per annum above the Commonwealth Bank of Australia's Corporate Overdraft Reference Rate as published in the Australian Financial Review calculated on daily balances on monies owed by the Customer to the Supplier both before and (as a separate and independent obligation) after any judgment.
- 2.4. The Customer will pay the Supplier for any and all of the Supplier's expenses including but not limited to any legal costs (on an indemnity basis), stamp duties and other expenses payable under these terms and conditions together with any collection costs or dishonoured cheque fees incurred in connection with the enforcement of, or the preservation of any rights under these terms and conditions. Such costs, duties and other expenses as well as interest payable pursuant to clause 2.3 may be recovered as a liquidated debt.
- 2.5. Any payments received by the Supplier from the Customer shall be applied first to any costs, duty, commission or other expenses referred to in 2.4, then to interest and then to the remainder of monies outstanding.
- 2.6. The Customer shall not deduct any amount from the amount due on any Supplier invoice or statement. The Customer shall not make any claim on the Supplier if any amounts are outstanding from the Customer to the Supplier. The Customer is not entitled to set off any amounts against its outstanding debts to the Supplier.

3. GENERAL

- 3.1. Unless agreed to in writing by the Supplier, any variation of these terms and conditions, including any terms and conditions of the Customer's order deviating from or inconsistent with these terms and conditions, is rejected by the Supplier.
- 3.2. The Supplier may vary these terms and conditions by a notice of variation in writing to the Customer. The Customer agrees that the purchase of any goods or services after the date of a notice of variation will be deemed to be an acceptance of such varied terms and conditions by the Customer.
- 3.3. Should there be any variation to any of the information supplied by the Customer to the Supplier in the credit account application or in the structure or nature of the Customer's business (such as a conversion to or from a Company or trust) the Customer shall notify the Supplier in writing within 7 days of such variation.
- 3.4. These terms and conditions and all obligations hereunder shall be binding on the Customer's personal representatives, successors and permitted assigns and shall be for the benefit of the Supplier's successors and assigns.

- 3.5. Where the Customer is comprised of the names of two or more persons then each person is jointly and severally liable to pay all monies owed by the Customer to the Supplier.
- 3.6. Where there is any inconsistency between these terms and conditions (including any updated versions of these terms and conditions) and any subsequent agreement with the Customer for the supply of goods or services by the Supplier, then such subsequent agreement shall only prevail to the extent that it is inconsistent with these terms and conditions (including any updated versions of these terms and conditions).
- 3.7. The waiver of any of these terms and conditions by the Supplier shall not be construed as a continuing waiver of that term or condition and the Supplier shall be entitled to require compliance with all of these terms and conditions at any time.
- 3.8. If any provisions of these terms and conditions are inconsistent with the Personal Property Securities Act 2009 ("PPSA"), the PPSA shall prevail to the extent of that inconsistency.

4. EVIDENCE OF MONIES PAYABLE

A statement in writing signed by any director, secretary, administration manager or credit manager of the Supplier stating the balance of the monies due to the Supplier by the Customer shall be prima facie evidence of the amount of indebtedness of the Customer to the Supplier at the date of that statement.

5. CREDIT LIMIT

- 5.1. Any credit limit is solely for the benefit of the Supplier.
- 5.2. The obligations of the Customer under this Agreement remain unchanged if the credit limit is exceeded or not specified at any time.

6. DEFAULT

If there is any default by the Customer in making due payment to the Supplier of any monies owing by the Customer, or if an administrator, liquidator or provisional liquidator or receiver and manager or controller is appointed in respect of the Customer or the Customer goes into bankruptcy or commits any act of bankruptcy, or if there is a breach by the Customer of any of these terms) and conditions then:-

- 6.1. All monies payable by the Customer to the Supplier shall at the Supplier's election become immediately due and payable notwithstanding that the due date for payment of any of the monies shall not have expired;
- 6.2. The Supplier may terminate this Agreement forthwith.

7. RETENTION OF TITLE

- 7.1. The goods shall be at the sole risk of the Customer as soon as they are dispatched from the Supplier's premises;
- 7.2. Property and title to the goods will not pass to the Customer until those goods and all other amounts owed to the Supplier by the Customer have been paid for in full and until then:-
 - 7.2.1. The Customer will hold the goods as a fiduciary and bailee for the Supplier;
 - 7.2.2. The goods must be stored separately and in a manner enabling them to be identified as goods of the Supplier and cross-referenced to particular invoices and the Customer acknowledges that if it should process or mix the goods with other products or items such that the goods are no longer separately identifiable then the Customer and Supplier will be owners in common of the new product;
 - 7.2.3. The Customer may sell the goods in the ordinary course of its business as bailee for the Supplier and will hold the proceeds of sale in a separate account on trust for the Supplier and account to the Supplier for those proceeds; and
 - 7.2.4. The Customer shall not deal with the money of the supplier in any way which may be adverse to the Supplier;
 - 7.2.5. The Customers shall not charge the goods in any way nor grant or otherwise give any interest in the goods while they remain the property of the Supplier
 - 7.2.6. The Supplier may require the Customer to return the goods to it on demand. If the Customer fails to return the goods to the Supplier or the Supplier's agent may (as the warrantee of the client) enter upon and into land and premises owned, occupied or used by the Customer, or any premises where the goods are situated to inspect or repossess the goods;

HOSSES

BRASS
SCREWED

PNEUMATICS

HOSE REELS

RUBBER

ACCESSORIES &
CONSUMABLES

CHARTS &
TABLES

TERMS & CONDITIONS OF AGREEMENT

HOSES

BRASS
SCREWED

PNEUMATICS

HOSE REELS

RUBBER

ACCESSORIES &
CONSUMABLES

CHARTS &
TABLES

- 7.2.7. The Supplier shall have the right of stopping the goods in transit whether or not delivery has been made.
- 7.3. Despite clause 7.2 the Supplier will be entitled to issue proceedings to recover the price of the goods sold notwithstanding that the ownership of the goods may not have passed to the Customer;
- 7.4. The Customer shall insure the goods against theft or any damage until such goods have been paid for or until they are sold by the Customer which ever occurs first and the Supplier will be entitled to call for details of the insurance policy. If the Customer does not insure the goods or fails to supply the details of its insurance policy the Customer will reimburse the Supplier for the costs of any insurance which the Supplier may reasonably arrange in respect of the goods supplied to the Customer.

8. PERSONAL PROPERTY SECURITIES ACT 2009 (PPSA)

- 8.1 In this clause:-
- 8.1.1. A Financing Statement has meaning given to it by the PPSA;
- 8.1.2. Financing Change Statement has the meaning given to it by the PPSA;
- 8.1.3. Security Agreement means the Security Agreement under the PPSA created between the Customer and the Supplier by these terms and conditions; and
- 8.1.4. Security interest has the meaning given to it by the PPSA.
- 8.2 Upon assenting to these terms and conditions in writing the Customer acknowledges and agrees that these terms and conditions:-
- 8.2.1. Constitute a Security Agreement for the purposes of the PPSA;
- 8.2.2. Create a security interest in:-
- (a) All goods previously supplied by the Supplier to the Customer (if any);
- (b) All goods that will be supplied in the future by the Supplier to the Customer;
- 8.3 The Customer undertakes to:-
- 8.3.1. Promptly sign any future documents and/or provide any further information (such information is to be complete, accurate and up to date in all respects) which the Supplier may reasonably require to:-
- (a) Register a Financing Statement or Financing Change Statement in relation to a security interest of the Personal Property Securities Register;
- (b) Register any other documents required to be registered by the PPSA; or
- (c) Correct a defect in the Statement referred to in clause 8.3.1 (a) or 8.3.1 (b).
- 8.3.2 Indemnify, and upon demand reimburse, the Supplier for all expenses incurred in registering a Financing Change Statement on the Personal Property Security Register established by the PPSA or releasing any goods charges;
- 8.3.3 Not register a Financing Change Statement in respect of security interest without the prior written consent of the Supplier;
- 8.3.4 Not register or permit to be registered a Financing Statement or a Financing Change Statement in relation to the goods in favour of a third party without the prior written consent of the Supplier; and
- 8.3.5 Immediately advise the Supplier of any material change in its business practices of selling the goods which would result in a change in the nature of proceeds derived from such sales;
- 8.4 The Supplier and the customer agree that section 96, 115 and 125 of the PPSA do not apply to the Security Agreement created by these terms and conditions.
- 8.5 The Customer hereby waives its right to receive notices under Sections 95, 118 121(4), 130, 132(3)(d) and 132(4) of the PPSA;
- 8.6 The Customer waives its rights as a Grantor and/or Debtor under Sections 142 and 143 of the PPSA;
- 8.7 Unless otherwise agreed to in writing by the Supplier, the Customer waives its right to receive a Verification Statement in accordance with Section 157 of the PPSA;
- 8.8 The Customer shall unconditionally ratify any actions taken by the Supplier under clauses 8.3 and 8.5.

9. CONSUMER ACT 2010 (CCA) AND FAIR TRADING ACTS (FTA)

- 9.1 Nothing in this Agreement is intended to have the effect of contracting out of any applicable provisions of the CCA or the FTA in each of the States and Territories of Australia (including any substitute to those Acts or re-enactment thereof), except to the extent permitted by those Acts where applicable.
- 9.2 Where the Customer buys Goods and/or Services as a consumer these terms and conditions shall be subject to any laws or legislation governing the rights of consumers and shall not affect the consumer's statutory rights.

10. SEVERANCE

In the event that the whole or any part or parts of any clause in this Agreement is found to be unenforceable by a Court then such clause or part thereof shall be to that extent severed from these terms and conditions without effect to the validity and enforceability of the remainder of these terms and conditions.

11. JURISDICTION

- 11.1 These terms and conditions shall be governed by and construed in accordance with the laws of the State of Queensland. The parties submit to the exclusive jurisdiction of the Courts in Brisbane;
- 11.2 The parties agree that proceedings may be commenced in any court in Brisbane and consent to that Court having jurisdiction by virtue of this clause notwithstanding that the Court would not have such jurisdiction with this consent;

12. NOTICE

Notice required to be given by the Customer to the Supplier pursuant to these terms and conditions may be delivered personally or sent by post to the Credit Manager of the Supplier at the Supplier's postal address at PO Box 1213, Archerfield BC QLD 4108 and unless the contrary is proved shall be taken as delivered when received by the Supplier. Notice to be given to the Customer by the Supplier may be delivered personally or sent by post to the Customer's last known address and shall be taken as delivered on the second business day following posting.

- 12.1 The Supplier's invoices and statements are deemed to be received by the Customer on the second business day after posting by ordinary pre-paid post.

13. CHARGING CLAUSE

- 13.1 To secure payment of all monies which are or may become payable by the Customer to the Supplier under this Agreement the Customer (or where the Customer is comprised of two or more persons then each person jointly and severally) hereby charges with the due payment of all of those monies all of the Customer's interest in real property wherever located both present and future and the Customer consents to the Supplier lodging a caveat or caveats over such property to protect its interest.
- 13.2 Upon demand by the Supplier, the Customer agrees to immediately execute a mortgage or other instrument in terms satisfactory to the Supplier to further secure the Customer's indebtedness to the Supplier.
- 13.3 Should the Customer fail within a reasonable time of such demand to execute such mortgage or other instrument then the Customer appoints irrevocably the credit manager or a duly authorised officer of the Supplier to be the Customer's lawful attorney to execute any such mortgage or other instrument.

14. GST

- 14.1 In this clause the expressions "GST", "input tax credit", "tax invoice", "recipient" and "taxable supply" have the meanings given to those expressions in the "A New Tax System (Goods and Services Tax) Act 1999.
- 14.2 With the exception of any amount payable under this clause 12, unless otherwise expressly stated all amounts stated to be payable by the Customer under these terms and conditions are exclusive of GST.
- 14.3 If GST is imposed on any supply made under or in accordance with these terms and conditions, the recipient of the taxable supply must pay to the Supplier an additional amount equal to the GST payable on or for the taxable supply. Payment of the additional amount will be made at the same time as payment for the taxable supply is required to be made in accordance with this document, subject to the provision of a tax invoice.

15. TRUST AND TRUSTEES

Where the Customer is a trustee:-

- 15.1 The Customer agrees to produce a stamped copy of the trust deed (including all amendments) with this Agreement and also at any time in the future when requested by the Supplier in writing.
- 15.2 The Customer warrants that it has full power and authority to enter into this Agreement on behalf of the trust and that it shall be bound by the terms of this Agreement both personally and as trustee.

16. CLIENT SPECIFICATION/SPECIAL ORDERS/INTELLECTUAL PROPERTY

If any goods are manufactured by the Supplier to the design or specification of the Customer, the Customer warrants to the Supplier that any drawings, plans, specifications and other design information provided to the Supplier for the manufacture of such goods are accurate and correct in all respects and do not infringe upon the intellectual property rights of any third party including any copyright, patents, designs or trademarks of the third party.

17. FORCE MAJEURE

The Supplier shall not be liable for any delay or for the consequences of any delay in performing or failure to perform any of its obligations under this Agreement if such delay is due in full or in part to any cause whatsoever beyond its reasonable control. Such delay or failure shall not constitute a breach of this Agreement and the Supplier shall be entitled at its option to either extend the time for delivery or performance for a reasonable period or to determine the contract without any recourse by the Customer to any claim for damages.

18. QUOTATION

Where the Supplier quotes for supply of goods or services to the Customer, the quotation is open for acceptance for 30 days unless a different period is stated in the quotation.

19. ADDITIONAL CHARGES

The following are not included in the price of goods and services of the Supplier and are payable by the Customer:-

- 19.1 Delivery and insurance charges;
- 19.2 Any sales, goods and services or consumption taxes, stamp duty and any other taxes, fees or other government levies or charges which may be imposed with respect to this Agreement, or the goods or services but excluding any income tax payable by the Supplier on its own income.

20. DELIVERY

- 20.1 Delivery of goods to the Customer occurs when they are dispatched from the Supplier's premises.
- 20.2 Delivery dates are estimates only. The Supplier will notify the Customer when goods are available for delivery. The goods will be dispatched to an address or addresses nominated by the Customer. If requested by the Customer the Supplier will arrange on behalf of the Customer for goods to be sent to the Customer at another address. If the Customer is not present at the specified address for delivery then the Supplier may unload the goods at that address and the goods shall be deemed to be received by the Customer and the Supplier shall not be liable for any claims, costs or losses suffered by the Customer.
- 20.3 Delivery may be made by instalments. Each instalment will be treated as a separate delivery with the price being apportioned in accordance with the proportion of goods delivered.

21. ACCEPTANCE

- 21.1 The Customer must within 2 working days after delivery inspect the goods and give the Supplier written notice of damage, shortages or anything else not in accordance with this Agreement.
- 21.2 The Customer agrees to keep goods referred to in a notice given under this clause (and in the case of shortages the remainder of the goods delivered) in the condition in which they were delivered until the Supplier has inspected them. The Supplier agrees to inspect the goods as soon as reasonably practicable after receipt of the notice.
- 21.3 Goods are taken to be as ordered if:-
 - 21.3.1 The Customer does not give the notice referred to in this clause; or
 - 21.3.2 The goods referred to in a notice are used or damaged after delivery.
- 21.4 If the Supplier delivers less than the full quantity of goods the Customer may not reject those goods delivered;

- 21.5 If the Supplier delivers extra or different goods the Customer may reject only the extra or different goods.

22. CANCELLATION

- 22.1 The Supplier is not bound to accept cancellation of an order nor the return of goods from the Customer except by prior arrangement. If such an arrangement has been made then:-
 - 22.1.1 The goods must be returned within 14 days of delivery;
 - 22.1.2 A restocking fee may be charged by the Supplier to the Customer. The fee will be calculated with reference to the cost to the Supplier;
 - 22.1.3 Outward and inward freight and transport charges are the responsibility of the Customer. If not prepaid by the Customer they will be deducted from any credit.
- 22.2 The following goods cannot be returned to the Supplier by the Customer for credit:-
 - 22.2.1 Goods are specifically made, modified or imported for the Customer;
 - 22.2.2 Goods altered or damaged by the Customer.

23. LIABILITY OF THE SUPPLIER

- 23.1 If under any law, any terms which apply to the supply of goods or services under this Agreement cannot legally be excluded, restricted or modified then those terms apply to the extent required by that law.
- 23.2 All terms which would otherwise be implied are excluded except as stated in this Agreement.
- 23.3 To the extent permitted by law the Supplier's sole liability for any breach of any term is limited:-
 - 23.3.1 In the case of goods supplied by the Supplier, to any one of the following as determined by the Supplier :-
 - (a) The replacement of the goods or supply of equivalent goods;
 - (b) The repair of the goods;
 - (c) The payment of the cost of replacing the goods or acquiring equivalent goods;
 - (d) The payment of the cost of having the goods repaired;
 - 23.3.2 In the case of services supplied by the Supplier, to any one of the following:-
 - (a) The supplying of the services again;
 - (b) The payment of the cost of having the services supplied again.
- 23.4 The Customer does not rely on any representation, warranty or other term made by or on behalf of the Supplier which is not set out in this Agreement;
- 23.5 The Supplier is not liable for any damage, economic loss or loss of profits whether direct, indirect, general, special or consequential:-
 - 23.5.1 Arising out of a breach of an implied or expressed term; or
 - 23.5.2 Suffered as a result of the negligence of the Supplier or its employees or agents, apart from liability as set out in clause 2.1;
- 23.6 The Customer acknowledges and agrees that:-
 - 23.6.1 He Customer has read and understood the Privacy Act 1988 (Cth) Statement and Authority which is attached to these terms and conditions;
 - 23.6.2 The Privacy Act 1988 (Cth) Statement and Authority is incorporated into and forms part of these terms and conditions;
 - 23.6.3 For the purpose of assessing whether to accept the Customer for credit that the Supplier may obtain from a credit reporting agency a credit report containing personal information about the Customer.

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