TECHNICAL SERVICE REPORT Number 15

Chemical Resistance of Rigid Geon® Vinyls Based on Immersion Test

One of the most important properties of PVC material is its exceptional inertness. Rigid Geon® vinyl compounds are part of this group and they offer excellent resistance to a broad range of reagents and mixtures that are corrosive to many other materials. Their resistance to oxidation and moisture make rigid Geon® vinyls useful in outdoor applications and even in the Chemical Processing Industry.

Three generalizations concerning the environmental stability of rigid PVC can be drawn from these immersion tests. First of all, PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. Secondly, PVC is *not* recommended for use with chlorinated or aromatic hydrocarbons, esters or ketones. Finally, the resistance of PVC to certain other fluid mixtures such as fuel oils with moderate aromatic content cannot be determined on the basis of immersion testing alone. For this class of materials, actual use data must be obtained.

It should be noted that in addition to temperature and reagent concentration, other factors such as stress level and product quality can also affect the chemical resistance of a plastic material in product form. Because of this, the final determination of suitability must often depend on some in-service testing which should be done with appropriate care and safety precautions.

This report covers the chemical resistance of normal impact (Type I) and impact modified (Type II) rigid Geon® vinyls. Table 1 tabulates specific immersion data obtained in our Product Application Laboratory for Geon® 8700A, 8750 and 8761 vinyls and the effects of various chemical reagents on their tensile strength. Table 2 indicates the suitability of rigid Geon® vinyls for use with more than 500 reagents. Table 2 is based on test data, experience and information from various sources. Final determination of the suitability of a material is the responsibility of the user because use conditions and required service life can be significant factors in the final decision.

Table 3 gives an indication of the variety of chemicals and mixtures that appear in commercially available paint removers, solvents, drain cleaners, spot removers, etc., that are used by the public. This investigation was done to see what effect these products might have on ASTM D 2665 1½in. Sch. 40 PVC pipe, traps and solvent cement joints under stress. Each assembly consisted of a short inlet pipe, a trap with three solvent cement joints plus an 18 in. long outlet pipe. The assemblies were held in place by clamping the inlet pipe in a vertical position with the trap and outlet pipe cantilevered from it.

To simulate use conditions, each trap was filled with water and then the chemical was poured in until it flowed from the outlet. This exposure continued for 48 hours and then the traps were flushed with water.

The 48-hour exposure of PVC sink traps to various chemicals and drain cleaners caused no failures and no leakage occurred. Some of the traps were softened and attacked slightly by some paint removers and solvents but they regained hardness after the traps were emptied and refilled with water. None of the other chemicals had any affect on the PVC trap assemblies.

These tests show that PVC sink traps are resistant to drain cleaners, detergents plus many of the commonly used solvents and that these products will not cause stress crack failure of PVC. Even the active solvents used in paint removers and metal cleaners only resulted in softening after extended contact and did not cause cracking or leakage.

Note that Plumbing Codes prohibit the dumping of many of these solvents into DWV systems and this is not to be taken as an endorsement of that procedure. Also be aware that the tubular traps made under ASTM F409 would not be equally resistant to this kind of abuse because they have less mass, use mechanical joints and may be made of other plastic materials that have less resistance to chemicals.

Propane	5600	+0.06	5600	--	--
Pyrogallic Acid	5400	+0.44	5700	5400	+1.49
Salicylic Acid	5500	+0.50	5700	5400	+1.94*
Sodium Bichromate	5400	+0.46	5700	5500	+1.32
Sodium Hydroxide (50%)	--	+0.34	--	--	+0.92
Sodium Perchlorate	5500	+0.29	5700	5800	+0.38
Succinic Acid	5300	+0.51	5700	5700	+0.99
69% 68%					
Sulfuric/Nitric (50/50)	--	--	--	--	--
Sulfuric Acid - (60%)	5800	-0.04	6000	6200	+0.05
(70%)	6000	-0.28	6000	6100	+0.82
(80%)	6000	-0.12	6000	6000	+5.38**
(85%)	5900	+0.52	6000	5900	+14.53**
(90%)	5100	+8.62**	6000	5400	+23.32**
(95%)	5000	+23.47**	6000	5400	+30.11**
(96.5%)	--	--	--	--	--
Transformer Oil (Bank 62)	6000	+0.02	--	6200	+0.56
Transformer Oil (Bank 110)	6000	+0.03	--	6100	+0.91
Trimethylamine	4400	+1.85*	5700	3700	+20.57**
Water (Distilled)	--	--	--	--	--

Table 1

Geon® 8750 Vinyl
Type I, Grade 2
Cell Class 12464

Chemical Reagent	30 Day Immersions				
	Room Temperature			60°C	
	Tensile Strength (psi)	Weight Change (%)	Original Tensile (psi)	Tensile Strength (psi)	Weight Change (%)
Acetic Acid (20%)	7900	+0.22	7700	8500	+0.71
Acetic Acid (30%)	7700	+0.8	7700	7900	+1.62*
Acetic Acid (Glacial)	7400	+1.14	7700	2900	+12.83**
Acetyl Nitrile	800	+27.62**	7200	900	+28.43**
Ammonium Bisulfate (70%)	8000	0.00	–	8300	+0.06
Butane	7500	+0.07	7700	–	–
Calcium Hypochlorite	8000	+0.21	7900	–	–
Chlorine Gas (Dry)	2000	+31.07**	7500	–	–
Chlorine Gas (Wet)	1500	+32.79**	7500	–	–
Chromic Acid (10%)	7600	+0.35	7800	8700	+0.22
Chromic/Nitric (15/35)	8200	+0.11	8200	8200	+1.06
Crude Oil (Pennsylvania)	8000	+0.17	–	8900	0.00
(Kansas)	–	–	–	–	–
(Sour)	7300	+0.09	–	8200	+0.03
Ferric Acetate	7900	+0.26	7400	8600	+1.02
Fluorine	8000	+0.23	8100	8200	+0.62
Freon- 21	1300	+61.21**	7700	–	–
22	3500	+13.32**	7700	–	–
113	7800	+0.09	7700	–	–
114	7900	+0.25	7700	–	–
Gasoline 500	7900	+0.45	7700	–	–
Gulf Oil (#10 Pride)	–	+0.31	–	–	+0.37
Hydrazine (97% Anhydrous)	6200	+4.18**	7300	–	–
Hydrochloric Acid (30%)	7800	+0.20	7700	8000	+1.26
Hydrochloric Acid (Conc.)	7800	+0.40	7700	7200	+2.15*
Hydrofluoric Acid (70%)	5200	+3.92*	7200	5300	+5.24**
Hydrogen Peroxide (30%)	–	–	–	–	–
Hydrogen Peroxide (50%)	6900	+0.11	7000	7400	+0.38
Lead Nitrate	7300	+0.23	7400	8100	+0.63
Lox Liquid	–	+0.36	–	–	+1.42
Manganese Chloride	7400	+0.24	7400	8100	+0.36
Mercuric Sulfate	7500	+0.28	7400	8000	+0.71
Natural Gas	7900	+0.04	7700	–	–
Nitric Acid (20%)	7500	+0.13	7700	8400	+0.69
Nitric Acid (Conc.)	7500	+0.41	7700	7900	+2.83*
Peracetic Acid (40%)	7140	+0.70	7600	4880	+6.5**
Potassium Bisulfate	7700	+0.24	7400	8500	+0.53
Potassium Amyl Xanthate	7500	+0.30	7900	7700	+2.81*
Potassium Ethyl Xanthate	7200	+0.77	7900	7500	+1.54*
Propane	7200	-0.05	7700	–	–
Pyrogallic Acid	7200	+0.25	7400	8100	+0.74
Salicylic Acid	7500	+0.32	7400	8500	+0.81
Sodium Bichromate	7500	+0.27	7400	8200	+0.73
Sodium Hydroxide (50%)	8024	+0.04	7458	8738	-0.02
Sodium Perchlorate	7300	+0.26	7400	8200	+0.33
Succinic Acid	7900	+0.27	7400	8300	+0.61
68% 63%					
Sulfuric/Nitric (50/50)	6500	+2.72*	7700	3300	+8.68**
Sulfuric Acid - (66%)	7400	-0.06	7700	8600	-0.23
(70%)	7700	-0.26	7700	8800	-0.27
(80%)	7700	-0.21	7700	8100	+1.19
(85%)	7900	+0.12	7700	5700	+13.14**
(90%)	7400	+1.14	7700	5300	+18.02**
(95%)	5400	+6.46**	7700	4800	+25.78**
(96.5%)	4400	+21.29**	–	4700	+38.37**
Transformer Oil (Sunoco 60)	7900	-0.02	–	8500	-0.06
Transformer Oil (Sunoco 110)	7900	-0.21	–	8300	-0.05
Trimethylamine	7300	-0.03	7400	7900	+3.40*
Water (Distilled)	7095	+0.27	7458	9048	+0.79

Table 1

Geon® 8761 Vinyl
Type I, Grade 1
Cell Class 12454-B

Chemical Reagent	30 Days at Room Temperature		Original	30 Days at 60°C	
	Tensile Strength (psi)	Weight Change (%)	Tensile (psi)	Tensile Strength (psi)	Weight Change (%)
Nitric Acid (30%)	7700	+0.25	7000	8300	+0.49
Nitric Acid (60%)	7500	+0.18	7000	7700	+2.31*
Nitric Acid (Conc.)	7500	+0.41	7000	7900	+2.83*
Acetic Acid (20%)	7900	+0.22	7000	8500	+0.71
Acetic Acid (80%)	7700	+0.08	7000	7600	+1.62*
Glacial Acetic Acid	7400	+1.14	7000	2900	+12.83**
Hydrochloric Acid (30%)	7600	+0.17	7000	7900	+0.97
Hydrochloric Acid (Conc.)	7600	+0.03	7000	7000	+1.55*
Sulfuric Acid (80%)	7500	+0.03	7000	8600	+0.05
Sulfuric Acid (85%/o)	7800	+0.08	7000	8800	-0.02
Sulfuric Acid (90%)	7700	-0.02	7000	8300	+1.25
Sulfuric Acid (95%)	7700	-0.03	7000	6600	+7.62**

Table 2

Chemical Resistance of Rigid Geon® Vinyl

Reagent	Temperature 72°F	Temperature 140°F
-A-		
Acetaldehyde	NR	NR
Acetic Acid, pure	NR	NR
Acetic Acid, 10%	R	R
Acetic Acid, 20%, Type I	R	R
Type II	R	NR
Acetic Acid, 80%, Type I Grade 1	R	R
Type I Grade 2	R	NR
Type II	R	NR
Acetic Acid, Glacial, Type I	R	NR
Type II	NR	NR
Acetic Anhydride	NR	NR
Acetone	NR	NR
Acetyl Nitrile	NR	NR
Acetylene	R	R
Acrylic Acid Ethyl Ester	NR	NR
Adipic Acid	R	R
Alcohols Methyl	R	R
Butyl	R	NR
Propyl	R	R
Allyl Alcohol, 96%, Type I	R	NR
Type II	NR	NR
Allyl Chloride	NR	NR
Alum	R	R
Alum, Chrome	R	R
Alum, Potassium	R	R
Aluminum Alum	R	R
Aluminum Chloride	R	R
Aluminum Fluoride	R	R
Aluminum Hydroxide	R	R
Aluminum Oxylchloride	R	R
Aluminum Nitrate	R	R
Aluminum Sulfate	R	R
Ammonia (Gas-dry)	R	R
Ammonia (Liquid)	NR	NR
Ammonium Acetate	R	R
Ammonium Alum	R	R
Ammonium Bifluoride	R	R
Ammonium Bisulfate, Type I	R	R
Ammonium Carbonate	R	R
Ammonium Chloride	R	R
Ammonium Dichromate	R	
Ammonium Fluoride, 25%, Type I	R	NR
Type II	NR	NR
Ammonium Hydroxide	R	R
Ammonium Hydroxide, 10%	R	R
Ammonium Hydroxide, 28%	R	R
Ammonium Metaphosphate	R	R
Ammonium Nitrate	R	R
Ammonium Persulfate	R	R
Ammonium Phosphate	R	R
Ammonium Sulfate	R	R
Ammonium Sulfide	R	R
Ammonium Thiocyanate	R	R
Amyl Acetate	NR	NR
Amyl Alcohol, Type I	R	NR
Type II	NR	NR
Amyl Chloride	NR	NR
Aniline	NR	NR
Aniline Chlorohydrate	NR	NR
Aniline Hydrochloride	NR	NR
Anthraquinone, Type II	R	NR
Anthraquinonesulfonic Acid	R	R
Antimony Trichloride	R	R
Aqua Regia	NR	NR
Aromatic Hydrocarbons	NR	NR
Arsenic Acid, 80%	R	R
Arsenic Trioxide (Powder)	R	
Arylsulfonic Acid, Type I	R	R
Type II	R	NR
-B-		
Barium Nitrate	R	
Barium Carbonate	R	R
Barium Chloride	R	R
Barium Hydroxide (10%)	R	R
Barium Sulfate	R	R
Barium Sulfide	R	R
Beer	R	R
Beet Sugar Liquors	R	R
Benzaldehyde, 10%, Type I	R	NR
Type II	NR	NR
Benzaldehyde, above 10%	NR	NR
Benzalkonium Chloride	R	
Benzene	NR	NR
Benzoic Acid	R	R
Bismuth Carbonate	R	R
Black Liquor	R	R
Bleach (12% Cl)	R	R
Borax	R	R
Boric Acid	R	R
Breeder Pellets (Fish deriv.)	R	R
Brine (Acid)	R	
Bromic Acid	R	R
Bromine, Liquid	NR	NR
Bromine, Vapor (25%)	R	R
Bromine Water, Type I	R	R
Type II	NR	NR
Bromobenzene	NR	NR
Bromotoluene	NR	NR
Butadiene, Type I	R	R
Type II	NR	NR
Butane, Type I	R	R
Type II	NR	NR
Butanol, Primary, Type I	R	R
Type II	NR	NR
Butanol, Secondary, Type I	R	NR
Type II	NR	NR
Butyl Acetate, Type I	R	NR
Type II	NR	NR

Reagent	Temperature 72°F	140°F
Butyl Alcohol, Type I	R	R
Type II	R	NR
Butyl Cellosolve	R	
Butyl Mercaptan, Type II	NR	NR
Butyl Phenol	R	NR
Butyl Stearate	R	
Butynediol, Type I	R	NR
Type II	NR	NR
Butyric Acid, Type I	R	NR
Type II	NR	NR
-C-		
Cadmium Cyanide	R	R
Caffeine Citrate (Sat.)	R	
Calcium Bisulfide	R	R
Calcium Bisulfite	R	R
Calcium Bisulfite Bleach Liquor	R	
Calcium Carbonate	R	R
Calcium Chlorate	R	R
Calcium Chloride	R	R
Calcium Hydroxide	R	R
Copper Hypochlorite	R	R
Calcium Nitrate	R	R
Calcium Oxide, Type I	R	R
Calcium Sulfate	R	R
Camphor (Crystals)	R	
Cane Sugar Liquors	R	R
Carbitol	R	
Carbon Dioxide	R	R
Carbon Dioxide-Aqueous Solution	R	R
Carbon Disulfide	NR	NR
Carbon Monoxide	R	R
Carbon Tetrachloride, Type I	R	NR
Type II	NR	NR
Carbonic Acid	R	R
Castor Oil	R	R
Caustic Potash	R	R
Cellosolve	R	NR
Cellosolve Acetate	R	
Chloracetic Acid, Type I	R	R
Type II	R	NR
Chloral Hydrate	R	R
Chloramine	R	
Chloric Acid, 20%	R	R
Chloride (Water)	R	R
Chlorinated Solvents	NR	
Chlorine (Dry-liquid)	NR	NR
Chlorine (Liquid) (under pressure)	NR	
Chlorine Gas (Dry)	NR	NR
Chlorine Gas (Wet)	NR	NR
Chlorine Water	R	R
Chloroacetic Acid	R	NR
Chloroacetyl Chloride	R	
Chlorobenzene	NR	NR
Chloroform	NR	NR
Chloropicrin	NR	
Chlorosulfonic Acid	R	NR
Chlorox Bleach Solution	R	

Reagent	Temperature 72°F	140°F
Chrome Alum	R	R
Chromic Acid, 10%	R	R
Chromic Acid, 50%	NR	NR
Chromic/Nitric Acid, Type I	R	R
15%-35% Type II	NR	NR
Chromic/Sulfuric/Water, 50/15/35 Type I	R	NR
Citric Acid	R	R
Coconut Oil Alcohol, Type I	R	R
Copper Carbonate	R	R
Copper Chloride	R	R
Copper Cyanide	R	R
Copper Fluoride	R	R
Copper Nitrate	R	R
Copper Sulfate	R	R
Corn Syrup	R	R
Cottonseed Oil	R	R
Cresol, Type I	NR	NR
Type II	NR	NR
Cresylic Acid, 50%, Type I	R	R
Type II	R	NR
Crotonaldehyde	NR	NR
Crude Oil, Type I	R	R
Type II	R	NR
Cupric Fluoride	R	R
Cupric Sulfate	R	R
Cuprous Chloride	R	R
Cyclanones, Type I	R	R
Cyclohexane	NR	NR
Cyclohexanol	NR	NR
Cyclohexanone	NR	NR
-D-		
D.D.T. (Xylene Base)	NR	NR
Desocyephedrine Hydrochloride	R	
Detergents	R	R
Dextrin	R	R
Dextrose	R	R
Diacetone Alcohol	R	
Diazo Salts	R	R
Dibutoxy Ethyl Phthalate	NR	NR
Dibutyl Phthalate	NR	NR
Dibutyl Sebacate	R	NR
Dichlorobenzene	NR	NR
Diesel Fuels	R	
Diethyl Ether	R	
Diglycolic Acid	R	R
Dimethyl Hydrazine	NR	NR
Dimethylamine, Type I	R	R
Type II	NR	NR
Dioctylphthalate	NR	NR
1,4 - Dioxane	NR	NR
Disodium Phosphate	R	R
Distilled Water	R	R
-E-		
Epsom Salt	R	
Esters	NR	NR

Reagent	Temperature 72°F	140°F
Ethers	NR	NR
Ethyl Acetate	NR	NR
Ethyl Acrylate	NR	NR
Ethyl Alcohol, Type I	R	R
Type II	R	NR
Ethyl Chloride	NR	NR
Ethyl Chloroacetate	NR	NR
Ethyl Ether	NR	NR
Ethylene Bromide	NR	NR
Ethylene Chlorohydrin	NR	NR
Ethylene Dichloride	NR	NR
Ethylene Glycol	R	R
Ethylene Oxide	NR	NR
-F-		
Fatty Acids	R	R
Ferric Acetate	R	NR
Ferric Chloride	R	R
Ferric Hydroxide	R	R
Ferric Nitrate	R	R
Ferric Sulfate	R	R
Ferrous Chloride	R	R
Ferrous Hydroxide	R	
Ferrous Nitrate	R	
Ferrous Sulfate	R	R
Fish Solubles	R	R
Fluoroboric Acid	R	R
Fluorine Gas (Wet)	R	NR
Fluorine Gas, Type I	R	NR
Type II	NR	NR
Fluorosilicic Acid, 25%	R	R
Formaldehyde, Type I	R	R
Type II	NR	NR
Formic Acid	R	NR
Fructose	R	R
Fruit Juices and Pulp	R	R
Furfural	NR	NR
Freon II, Type I	R	R
Type II	NR	NR
Freon 12	R	R
Freon 21	NR	NR
Freon 22	NR	NR
Freon 113	R	
Freon 114	R	
Carene 500, Type I	R	
Type II	NR	
-G-		
Gallic Acid	R	R
Gas (Coke Oven)	NR	NR
Glucose	R	R
Glycerine	R	R
Glycol	R	R
Glycolic Acid	R	R
Grapesugar	R	R
Green Liquor	R	R

Reagent	Temperature 72°F	140°F
-H-		
Heptane, Type I	R	R
Type II	R	NR
Hercolyn	R	
Hexane, Type I	R	NR
Type II	NR	NR
Hexanol, Tertiary, Type I	R	R
Type II	R	NR
Hydrobromic Acid, 20%	R	R
Hydrochloric Acid, 10%	R	R
Hydrochloric Acid, 30%	R	R
Hydrochloric Acid, Type I Grade 1	R	R
Conc. Type I Grade 2	R	NR
Type II	R	NR
Hydrochloric Acid Pickling	R	R
Hydrocyanic Acid	R	R
Hydrofluoric Acid, 48%	R	NR
Hydrofluoric Acid, 50%, Type I	R	NR
Type II	NR	NR
Hydrofluoric Acid, 70%	NR	NR
Hydrofluorsilicic Acid	R	R
Hydrogen	R	R
Hydrogen Peroxide, 30%	R	R
Hydrogen Peroxide, 50%	R	R
Hydrogen Peroxide, 90%	R	R
Hydrogen Phosphide, Type I	R	R
Type II	NR	NR
Hydrogen Sulfide	R	R
Hydroquinone	R	R
Hydroxylamine Sulfate	R	R
Hypochlorine Acid	R	R
Hypochiorite	R	
Hypochlorous Acid	R	R
Hydrazine (Anhydrous) 97%	NR	NR
-I-		
Iodine	NR	NR
Iodine Solution (10%)	NR	NR
-K-		
Kerosene	R	R
Ketones	NR	NR
Kraft Liquors	R	R
-L-		
Lactic Acid, 25%	R	R
Lactic Acid, 80%	R	
Lard Oil	R	R
Lauric Acid	R	R
Lauryl Chloride, Type I	R	
Type II	R	NR
Lead Acetate	R	R
Lead Chloride	R	R
Lead Nitrate	R	R
Lead Sulfate	R	R
Linoleic Acid	R	R

Reagent	Temperature 72°F	140°F
Linoleic Oil, Type I	R	R
Type II	R	NR
Linseed Oil	R	R
Liquors, Type I	R	R
Type II	NR	NR
Lithium Bromide	R	R
Lubricating Oil, ASTM #1	R	R
ASTM #2	R	R
ASTM #3, Type I	R	R
Type II	R	NR
Lux Liquid	R	NR
-M-		
Machine Oil	R	R
Magnesium Carbonate	R	R
Magnesium Chloride	R	R
Magnesium Citrate, Type I	R	R
Magnesium Hydroxide	R	R
Magnesium Nitrate	R	R
Magnesium Sulfate	R	R
Manganese Chloride	R	R
Manganese Sulfate (Sat.)	R	R
Manganese Sulfate (10%)	R	R
Manganese Sulfate (20%)	R	R
Maleic Acid	R	R
Malic Acid	R	R
Manufactured Gas	R	R
Mercural Ointment, Blue (5%)	R	
Mercuric Chloride	R	R
Mercuric Cyanide	R	R
Mercurous Nitrate	R	R
Mercury	R	R
Mercury Ointment (Ammoniated)	R	
Methylene Chlorobromide	NR	NR
Methoxyethyl Oleate	R	
Methyl Alcohol	R	R
Methyl Cellosolve	NR	NR
Methyl Chloride	NR	NR
Methyl Ethyl Ketone	NR	NR
Methyl Iso-Butyl Ketone	NR	NR
Methyl Methacrylate	R	
Methyl Salicylate	R	
Methyl Sulfate	R	NR
Methyl Sulfuric Acid	R	R
Methylamine	NR	NR
Methylene Bromide	NR	NR
Methylene Chloride	NR	NR
Methylene Iodine	NR	NR
Milk	R	R
Mineral Oils	R	R
Mixed Acids	R	R
Molasses	R	R
Muriatic Acid	R	R
-N-		
Naphtha, Type I	R	R
Type II	R	NR
Naphthalene	NR	NR

Reagent	Temperature 72°F	140°F
Natural Gas	R	R
Nickel Acetate	R	
Nickel Chloride	R	R
Nickel Nitrate	R	R
Nickel Sulfate	R	R
Nicotine	R	R
Nicotine Acid	R	R
Nitric Acid 84% + Sulfuric Acid 16%	R	
Nitric Acid, Anhydrous	NR	NR
Nitric Acid, 10%, Type I	R	R
Type II	R	NR
Nitric Acid, 30%, Type I	R	R
Type II	R	NR
Nitric Acid, 60%, Type I	R	R
Type II	R	NR
Nitric Acid, 68%, Type I	R	NR
Type II	NR	NR
Nitrobenzene	NR	NR
Nitroglycerine	NR	NR
Nitrous Oxide	R	NR
Nitroglycol	NR	NR
-O-		
Ocenol, Type I	R	R
Oils and Fats	R	R
Oils, Sour Crude	R	R
Oleic Acid	R	R
Oleum	NR	NR
Oxalic Acid	R	R
Oxygen	R	R
Ozone	R	R
-P-		
Palmitic Acid, 10%	R	R
Palmitic Acid, 70%, Type I	R	NR
Type II	NR	NR
Paraffin, Type I	R	R
Peracetic Acid, 40%, Type I	R	NR
Type II	NR	NR
Perchloric Acid, 10%,	R	R
Perchioric Acid, 15%, Type I	R	NR
Type II	NR	NR
Perchloric Acid, 70%, Type I	R	NR
Type II	NR	NR
Perphosphate	R	
Petroleum Liquifier	R	R
Petroleum Oils (Sour)	R	NR
Phenol	NR	NR
Phenylhydrazine	NR	NR
Phenylhydrazine Hydrochloride	NR	NR
Phosgene, Liquid	NR	NR
Phosgene, Gas, Type I	R	
Type II	R	R
Phosphoric Acid, 10%	R	R
Phosphoric Acid, 25%	R	R
Phosphoric Acid, 50%	R	R
Phosphoric Acid, 75%	R	R

Reagent	Temperature 72°F	140°F	Reagent	Temperature 72°F	140°F
Phosphoric Acid, 85%	R	R	Plating Solutions (continued):		
Phosphorous (Yellow), Type I	R	NR	Tin	R	R
Type II	R	NR	Zinc	R	R
Phosphorous Pentoxide, Type I	R	NR	Pyridine, Type I	NR	NR
Type II	R	NR	Pyrogallic Acid	R	NR
Phosphorous Trichloride	NR	NR	Propylene Oxide	NR	NR
Photographic Solutions:					
DK #3	R	R	-R-		
Dektal Developer	R	R	Rayon Coagulating Bath	R	R
Kodak Fixer	R	R	Refinery Crudes	R	R
Kodak Short Stop	R	R	Rochelle Salts, Type I	R	R
Picric Acid	NR	NR			
Potash (Sat. Aq.), Type I	R	R	-S-		
Potassium Alum	R	R	Salicylic Acid	R	R
Potassium Amyl Xanthate, Type I	R	NR	Santicizer	NR	
Type II	NR	NR	Sea Water	R	R
Potassium Bicarbonate	R	R	Selenic Acid	R	R
Potassium Bisulfate	R	R	Sewerage	R	R
Potassium Borate	R	R	Silicic Acid	R	R
Potassium Bromate	R	R	Silver Cyanide	R	R
Potassium Bromide	R	R	Silver Nitrate	R	R
Potassium Carbonate	R	R	Silver Plating Solution	R	R
Potassium Chromate	R	R	Silver Sulfate	R	R
Potassium Chlorate	R	R	Soaps	R	R
Potassium Chloride	R	R	Sodium Acetate	R	R
Potassium Cyanide	R	R	Sodium Alum	R	R
Potassium Dichromate	R	R	Sodium Benzoate	R	R
Potassium Ethyl Xanthate, Type I	R	NR	Sodium Bicarbonate	R	R
Type II	NR	NR	Sodium Bichromate	R	R
Potassium Ferricyanide	R	R	Sodium Bisulfate	R	R
Potassium Ferrocyanide	R	R	Sodium Bisulfite	R	R
Potassium Fluoride	R	R	Sodium Bromide	R	R
Potassium Hydroxide	R	R	Sodium Carbonate	R	R
Potassium Nitrate	R	R	Sodium Chlorate	R	NR
Potassium Perborate	R	R	Sodium Chloride	R	R
Potassium Perchlorate	R	R	Sodium Chlorite	NR	NR
Potassium Permanganate, 10%	R	R	Sodium Cyanide	R	R
Type I, 25%	R	NR	Sodium Dichromate	R	R
Type II	R	at 125°F	Sodium Ferricyanide	R	R
Potassium Persulfate	R	R	Sodium Ferrocyanide	R	R
Potassium Sulfate	R	R	Sodium Fluoride	R	R
Propane	R	R	Sodium Hydroxide, 10%	R	R
Propane Gas	R	R	Sodium Hydroxide, 30%	R	R
Propargyl Alcohol, Type I	R	R	Sodium Hydroxide, 50%	R	R
Type II	R	NR	Sodium Hypochlorite	R	
Propyl Alcohol, Type I	R	R	Sodium Nitrate	R	R
Type II	R	NR	Sodium Nitrite	R	R
Propylene Dichloride	NR	NR	Sodium Peroxide, 8750	R	R
Plating Solutions:			Sodium Perchlorate	R	R
Brass	R	R	Sodium Sulfate	R	R
Cadmium	R	R	Sodium Sulfide	R	R
Copper	R	R	Sodium Sulfite	R	R
Gold	R	R	Sodium Thiosulfate	R	R
Indium	R	R	Sour Crude Oil (West Texas)	R	R
Lead	R	R	Stannic Chloride	R	R
Nickel	R	R	Stannous Chloride	R	R
Rhodium	R	R	Starch	R	R
Silver	R	R	Stearic Acid	R	R

Reagent	Temperature 72°F	140°F
Stoddards Solvent	NR	NR
Succinic Acid	R	R
Sulfite Liquor	R	R
Sulfur	R	R
Sulfur Dioxide, (Dry)	R	R
Sulfur Dioxide, (Wet), Type I	R	NR
Type II	NR	NR
Sulfur Trioxide	R	R
Sulfuric Acid, 3%	R	R
Sulfuric Acid, 10%	R	R
Sulfuric Acid, 2O%	R	R
Sulfuric Acid, 33%	R	R
Sulfuric Acid, 50%	R	R
Sulfuric Acid, 70%	R	R
Sulfuric Acid, 80%,Type I	R	R
Type II	NR	NR
Sulfuric Acid, 85%, Type I	R	R
Type II	NR	NR
Sulfuric Acid, 90%		
Type I Grade 1	R	NR
Type I Grade 2	NR	NR
Type II	NR	NR
Sulfuric Acid, 95%		
Type I Grade l	R	NR
Type I Grade 2	NR	NR
Type II	NR	NR
Sulfuric Acid Pickling	R	R
Sulfuric/Nitric (50/50)	NR	NR
69% 68%		
Sulfurous Acid	R	R
-T-		
Tall Oil	R	R
Tannic Acid	R	R
Tanning Liquors	R	R
Tartaric Acid	R	R
Tetra Sodium Pyrophosphate	R	R
Tetraethyl Lead, Type I	R	
Type II	R	NR
Tetrahydrodurane	NR	NR
Thionyl Chloride	NR	NR
Thread Cutting Oil	R	
Tirpineol	R	
Titanium Tetrachloride	R	NR

Reagent	Temperature 72°F	140°F
Toluol or Toluene	NR	NR
Transformer Oil	R	R
Tributyl Phosphate	NR	NR
Tributyl Citrate	R	
Trichloroacetic Acid	R	
Trichloroethylene	NR	NR
Triethanolamine	R	NR
Trilones	NR	NR
Trimethyl Propane, Type I	R	R
Type II	R	NR
Trisodium Phosphate	R	R
Turpentine, Type I	R	R
Type II	NR	NR
Trimethylamine, Type I	R	NR
Type II	NR	NR
-U-		
Urea	R	R
Urine	R	R
-V-		
Vaseline	NR	NR
Vegetable Oil	R	
Vinegar	R	R
Vinyl Acetate	NR	NR
-W-		
Water Acid Mine	R	R
Water Deionized	R	R
Water Demineralized	R	R
Water Distilled, Water Fresh	R	R
Water Salt	R	R
Whiskey	R	R
White Liquor	R	R
Wines	R	R
-X-		
Xylene or Xylol	NR	NR
-Z-		
Zinc Chloride	R	R
Zinc Nitrate	R	R
Zinc Sulfate	R	R

R -Recommended

NR-Not Recommended

Blank spaces indicate lack of specific recommendations.

Table 3

Chemical Resistance Tests on Stressed PVC Sink Traps* Vinyl

	Product	Test Results
Fireproof Energine	No effect.	
Metal Klean - methylene, chloride, toluene, ammonia	Softening noted at 23 hrs.; deflection of outlet pipe noted at 48 hrs. No leakage.	
Wash Away Paint Remover - methylene chloride, methanol	Softening noted at 23 hrs.; deflection of outlet pipe noted at 48 hrs. No leakage.	
Dexall Wood Patch Thinner - toluene, acetone, isopropyl alcohol, hydrocarbons	Softening noted at 23 hrs.; deflection of outlet pipe noted at 48 hrs. No leakage.	
Paint Reducer - toluene	No effect.	
Lacquer Thinner - butanol	No effect.	
Glid Strip	Softening noted at 23 hrs.; deflection of outlet pipe noted at 48 hrs. No leakage.	
Strypeeze - methylene chloride, methanol, acetone	No effect.	
Kwikeeze - methylene chloride, toluene, methanol, acetone	No effect.	
Gum Out-xylene	No effect.	
Trend - detergent	No effect.	
Joy - detergent	No effect.	
Drano - trichloroethane	No effect.	
Sani-flush - sodium bisulfate monopotassium peroxysulfate	No effect.	
Nu-Bol	No effect.	
Swan - detergent	No effect.	
Hercules Sizzle - hydrochloric acid	No effect.	
Mechanics Carburetor Cleaner - chlorinated hydrocarbons	Slight softening noted at 48 hrs.; no deflection or leakage.	
Cresote - coal tar product	No effect.	
El Pico Wax Free - methanol	Softening noted at 23 hrs.; deflection of outlet pipe noted at 48 hrs. No leakage.	
Magic Fireproof Spot Remover	No effect.	
Ortho Orthorix Spray - - ethylene dichloride	No effect.	
Samsons Paint Remover - methanol acetone	Slight softening noted at 48 hrs.; no deflection or leakage.	
Mule Kick Waste Pipe Cleaner	No effect.	
Mule Kick Bowl Cleaner	No effect.	
Cloroben P-T - orthodichlorobenzene	No effect.	
S-T Drain Opener - sulfuric acid	No effect.	
Drain Snake - sulfuric acid	No effect.	
Calci Solve	No effect.	
Plumbers Ideal	No effect.	
McKay Parts Dip - chlorinated hydrocarbon	Slight softening noted at 48 hrs.; no deflection or leakage.	
SW Exsolvent Paint Thinner	No effect.	
Magic Cloud Bio - detergent ammonia	No effect.	
Clobber - sulfuric acid	No effect.	
Liquid Snake - sulfuric acid	No effect.	

*Traps tested were made of Geon® 85297 which is a Type I Grade 1 compound specially developed by the Geon® Chemical Group for use in PVC fittings.

Note: All PVC traps that softened regained hardness after flushing and refilling with water. All traps sustained a 15 foot head of water for 3 days without leakage. Seven of the traps showed some degree of interior exfoliation.

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