

Attachment 3

Firestone Geomembrane Chemical Resistance Chart

Firestone Geomembrane exposure to these chemicals causes no swelling, softening or surface deterioration of the membrane.

Acetamide	Calcium silicate (to 21°C)
Acryimide (to 60°C)	Calcium sulfide (to 80°C)
Acetaldehyde (to 38°C)	Caustic soda (to 50%, to 80°C)
Acetophenone (to 60°C)	Chloroacetone (to 21°C)
Acetylene gas (to 93°C)	Citric acid (to 93°C)
Alum (to 60°C)	Copper II chloride (to 80°C)
Aluminum acetate	Copper cyanide (to 60°C)
Aluminum chloride	Copper nitrate (to 80°C)
Aluminum nitrate	Copper sulfate (to 21°C)
Aluminum sulfate (to 60°C)	Copper sulfide (to 21°C)
Ammonia	
Ammonia gas (cold)	Diiron sulfide
Ammonia gas (hot) (to 60°C)	Diisopropyl ketone (to 21°C)
Ammonia hydroxide (to 10%)	Dimethyl holmiamide
Ammonia hydroxide (concentrated)	Dibutyl cellosolve adipote (to 93°C)
Ammonium carbonate	Dextrose (to 80°C)
Ammonium chloride	Disodium phosphate (to 21°C)
Ammonium nitrate	Diocetyl amine (to 49°C)
Ammonium phosphate	
Ammonium sulfate	Ethyl chloride (to 60°C)
Amyl alcohol	Ethyl silicate (to 21°C)
Arsenic acid (to 60°C)	Ethylene glycol (to 100°C)
Adipic acid (to 60°C)	Ethlendiamine (to 49°C)
	Ethyl alcohol (to 93°C)
Barium chloride (to 80°C)	Ethyl sulfate (to 93°C)
Barium hydroxide	
Barium sulfide	Fluoroboric acid (to 60°C)
Benzaldehyde (to 93°C)	Formaldehyde (to 40%, to 21°C)
Benzyl alcohol	Freon 142B (to 21°C)
Boric acid (to 60°C)	Fluoromethane (to 21°C)
Borium sulfate (to 21°C)	
	Gelatin
Calcium acetate	Glucose
Calcium chloride (to 80°C)	Glue (to 80°C)
Calcium hydrochloride (to 20%, to 21°C)	
Calcium hydroxide (to 80°C)	
Calcium nitrate (to 80°C)	

Hydrochloric acid (to 20%, to 21°C)
 Hydrogen peroxide (to 0.5%, to 21°C)
 Hydrobromic acid (to 20%, to 93°C)
 Hydrogen (to 60°C)
 Hydrogen sulfide (to 60°C)
 Hydroxybutane (to 21°C)

Iron sulfate (to 21°C)
 Iron II chloride (to 80°C)
 Iron II nitrate (to 80°C)
 Isobutyl alcohol (to 71°C)
 Isopropyl acetate (to 71°C)
 Isopropyl alcohol (to 71°C)

Lead sulfate (to 80°C)
 Lactic acid (to 100%, to 60°C)
 Lead acetate (to 93°C)
 Lead nitrate (to 80°C)
 Lead sulfamate (to 60°C)
 Lead chloride (to 80°C)
 Lime, soda (to 21°C)

Magnesium chloride (to 100%, to 80°C)
 Magnesium hydroxide (to 80°C)
 Magnesium sulfate (to 80°C)
 Mercury (to 60°C)
 Mercury II chloride (to 60°C)
 Methyl alcohol (to 80°C)
 Mirabilite (to 21°C)
 Magnesium acetate (to 20%, to 49°C)

Nickel acetate (to 21°C)
 Nickel chloride (to 80°C)
 Nickel sulfate (to 21°C)
 Nitric acid (to 25%, to 21°C)
 Nitrogen, gas (to 21°C)

Octyl alcohol (to 71°C)
 Oxalic acid (to 100%, to 121°C)
 Oxygen, cold (to 21°C)
 zone, [O3] (to 21°C)
 Orthoboric acid (to 21°C)

Phosphoric acid (to 85%, to 93°C)
 Potassium bichromate (to 60°C)
 Potassium bisulfite (to 80°C)
 Potassium carbonate (to 80°C)
 Potassium hydroxide (to 100%, to 93°C)
 Potassium nitrate (to 100%, to 80°C)
 Potassium phosphate (to 21°C)
 Potassium sulfate (to 60°C)
 Propyl alcohol (to 80°C)
 Propylene glycol (to 21°C)

Salicylic acid (to 93°C)
 Salt solution (to 100%, to 80°C)
 Silicone greases (to 60°C)
 Silicone oil (to 60°C)
 Silver nitrate (to 80°C)
 Soap solution (to 100°C)
 Sodium bicarbonate (to 100%, to 100°C)
 Sodium bisulfate (to 80°C)
 Sodium bisulfite (to 100°C)
 Sodium borate (to 60°C)
 Sodium carbonate (to 100%, to 80°C)
 Sodium chloride (to 100%, to 80°C)
 Sodium hydroxide (to 100%, to 21°C)
 Sodium nitrate (to 80°C)
 Sodium perborate (to 100%, to 60°C)
 Sodium phosphate (to 100%, to 80°C)
 Sodium silicate (to 100%, to 80°C)
 Sodium sulfite (to 100%, to 60°C)
 Sodium sulfate (to 100%, to 60°C)
 Sodium thiosulfate (to 60°C)
 Sulfuric acid (to 25%, to 60°C)
 Sulfurous acid (to 20%, to 100°C)
 Sucrose solution (to 121°C)

Tannic acid (to 100%, to 60°C)
 Triethanol amine (to 71°C)

Vinegar (to 60°C)

Zeolite
 Zinc acetate (to 60°C)
 Zinc chloride (to 100%, to 80°C)

Firestone Geomembrane exposed to these chemicals can cause some discoloration, swelling and up to a 30% loss of tensile strength. Limited duration exposure is recommended.

Acetic acid (to 10%, to 21°C)	Methyl acetate (to 71°C)
Acetic anhydride	Methyl ethyl ketone (to 93°C)
Acetone	Mono ethanol amine (to 60°C)
Anhydrofluoric acid	Methyl cellosolve (to 93°C)
Aniline (to 93°C)	Nitric acid (to 35%, to 21°C)
Aniline dye	Nitrobenzene (to 60°C)
Animal fats (10%, to 60°C)	Nitro ethane (to 21°C)
Butyl acetate (to 60°C)	Nitromethane (to 49°C)
Butyl alcohol (to 121°C)	Olive oil (to 21°C)
Carbinol (to 21°C)	Palmitic acid diluted (to 50%, to 21°C)
Carbonic acid (to 85°C)	Picric acid (to 21°C)
Carbonic acid gas (to 85°C)	Propyl acetate (to 21°C)
Caster oil (to 60°C)	Pyridine (to 71°C)
Chromic acid (to 25%, to 21°C)	Stearic acid concentrated (to 60°C)
Cottonseed oil (to 80°C)	Sodium hypochlorite (to 5%, to 21°C)
Cyclohexanone (to 21°C)	Sulfuric acid (to 25%, to 60°C)
Dibutylphtalate (to 121°C)	Sulfuric acid gas (to 50%, to 100°C)
Dibenziether (to 21°C)	Sulfurous acid (to 20%, to 100°C)
Diethylene glycol (to 60°C)	Sulfurous acid gas (to 21°C)
Diocylphthalate (at 60°C)	Triethanol amine (to 71°C)
Dioxane (to 71°C)	Urea (to 93°C)
Epichlorohydrin (to 21°C)	Vegetable oil (to 93°C)
Ethanolamine (to 21°C)	
Ethyl acetate (to 70°C)	
Ethyl acrylate (to 21°C)	
Ethyl cellulose (to 21°C)	
Freon 12 (to 21°C)	
Furfural (to 71°C)	
Glycerin (to 93°C)	
Hydrochloric acid (to 25%, to 80°C)	
Hydrofluoric acid	
Hydrogen peroxide (to 100%, to 21°C)	
Hypochlorous acid (at 50% to 60°C)	
Linseed oil (at 21°C)	

Firestone Geomembrane exposure to these chemicals is expected to cause deterioration of the membrane. EXPOSURE TO THESE CHEMICALS IS NOT RECOMMENDED.

Acrylonitrile	Ethyl benzene
Acrylonitrile	Ethylene oxide
Amyl acetate	Ethylenedichloride
Amyl naphthalene	Ethyl bromide
Animal fats (concentrated)	Ethyl butyrate
Aqua regia	
ASTM oil no. 1	Freon 11
ASTM oil no. 2	Freon 21
ASTM oil no. 3	Freon 113
ASTM fuel oil A	Fuel oil
ASTM fuel oil B	Furan
ASTM fuel oil C	Furfural (at 100°C)
Acetyl chloride	
	Gasoline
Benzene	Glacial acetic acid
Benzyl chloride	
Benzine	Hexane
Butane	Hexyl alcohol
Butyl acrylate	Hexylene
Butyl acetate (above 60°C)	Hydrochloric acid (above 20%, above 21°C)
Butyl stearate (21°C or higher)	Hydrofluoric acid (at 25% or above at 100°C, 100% conc. at 60°C)
	Hypochlorous acid (at 75% or above at 21°C or higher)
Biphenyl	η -Heptane
	Hydrogen peroxide (to 100%, above 21°C)
Carbolic acid	
Carbon disulfide	Itexylene
Carbon tetrachloride	Isooctane
Chlorine gas (wet)	Isopropyl ether
Chloro benzene	Isoamyl chloride
Chloro naphthalene	Isoamyl ether
Chloro sulfonic acid	Isoamyl phthalate
Chloroform	Isobutylnamide
Chlorotolehe	
Chromic acid (to 25%, above 21°C)	Jet Fuel
Cresol(s)	J.P. fuel oil
Creosote oil	
Cyclohexanol	Lacquer
Corn oil	Lard oil
Cyclohexane	Linolenic acid
Cyclohexanone	Liquid petronium gas
Dibutylether	Malic acid
Diclorobenzene	Mercaptan
Diethylether	Methyl isobutyl ketone
Dipentene	Methyl methacrylate
Diisopropyl ether	Methylene dichloride
Dibutylamine	Mineral oil
Dextron	

Monochlorbenzene	Terpene
Mineral Naphtha	Tetraln
	Trachloroethane
Naptha	Toluene
Napthalene	Trichloroethylene
Natural gas	Turpentine oil
Nitric acid (above 30%, at 21°C or higher	Tall oil
Nitric acid (above 60%)	Tartaric acid
	Tetrahydrofuron [THF] (at 21°C)
	Trichloromethane
Oxygen (above 21°C)	Tung oil (at 77°C)
Oleic acid	
Octane	Xylene
Pyridine	Varnish
Perchloroethylene	Vinyl benzene
Petrol (gasoline)	
Petroleum, hydraulic fluid	Wood tar
Pinene	
Pine oil	
Piperidine	
Propane	
Propylene	
Palm oil (at 21°C)	
Phenol (at 21°C)	
Pyrole	
Solene	
Styrene	
Sulfuric acid (concentrated)	
Sulfur monochloride	
Sulfur dichloride	
Sulfur trioxide	

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