

Attachment 3

Firestone Geomembrane Chemical Resistance Chart

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

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| 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 | Fluorobdc 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) | Floromethane (to 21°C) |
| Borium sulfate (to 21°C) | |
| | Gelatin |
| Calcium acetate | Glucose |
| Calcium chloride (to 80°C) | Glue (to 80°C) |
| Calcium hydrochlodte (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.

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| 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) | |
| Aniline dye | Nitric acid (to 35%, to 21°C) |
| Animal fats (10%, to 60°C) | Nitrobenzene (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) | |
| Carbonic acid (to 85°C) | Palmitic acid diluted (to 50%, to 21°C) |
| Carbonic acid gas (to 85°C) | Picric acid (to 21°C) |
| Caster oil (to 60°C) | Propyl acetate (to 21°C) |
| Chromic acid (to 25%, to 21°C) | Pyridine (to 71°C) |
| Cottonseed oil (to 80°C) | |
| Cyclohexanone (to 21°C) | Stearic acid concentrated (to 60°C) |
| | Sodium hypochlorite (to 5%, to 21°C) |
| Dibutylphtalate (to 121°C) | Sulfuric acid (to 25%, to 60°C) |
| Dibenziether (to 21°C) | Sulfuric acid gas (to 50%, to 100°C) |
| Diethylene glycol (to 60°C) | Sulfurous acid (to 20%, to 100°C) |
| Diocylphthalate (at 60°C) | Sulfurous acid gas (to 21°C) |
| Dioxane (to 71°C) | |
| | Triethanol amine (to 71°C) |
| Epichlorohydrin (to 21°C) | |
| Ethanolamine (to 21°C) | Urea (to 93°C) |
| Ethyl acetate (to 70°C) | |
| Ethyl acrylate (to 21°C) | Vegetable oil (to 93°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.

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| 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 | Isobutylamide |
| 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 | |

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|---|---------------------------------|
| Monochlorobenzene | 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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