CHEMICAL RESISTANCE GUIDE FOR GEOTOUGH EPDM GEOMEMBRANE (5/14)

GeoTough EPDM Geomembranes are not adversely affected by most common materials and chemicals encountered in a geo environment. The factory seam (if present), cement or tape field splices generally have similar chemical resistance properties as the membrane. The best course of action to take if unusual substances will contact the membrane is to evaluate their effect on the membrane in the laboratory. Carlisle SynTec's Laboratory is equipped to perform this testing, interpret the results, and provide a recommendation.

Several factors can increase the affect of a chemical or combination of chemicals on GeoTough EPDM (and other Geomembrane materials).

1. The higher the temperature the greater the affect of the chemical(s) on the membrane.
2. Increasing the concentration of the chemical(s) increases the affect on the membrane.
3. In most cases, continuous exposure is more severe than intermittent (occasional) exposure.
4. Combinations of chemicals are usually more severe than the sum of the affects of the individual chemicals (synergistic effect).

The following chart rates the chemical resistance of GeoTough EPDM membrane according to the following codes:

A = **NEGLIGIBLE EFFECT** – GeoTough EPDM membrane should be suitable for all applications where these environmental conditions exist.

B = **LIMITED ABSORPTION OR EFFECT** - GeoTough EPDM membrane should be suitable for most applications, but testing is recommended to determine the suitability of - GeoTough EPDM in the particular environment.

C = **EXTENSIVE ABSORPTION AND/OR RAPID DEGRADATION POSSIBLE** - GeoTough EPDM may be suitable for applications where only intermittent contact is involved and contact with the membrane is for short periods of time. Testing may be recommended to determine the suitability of EPDM in the particular environment.

D = **EXTENSIVE ATTACK** - The membrane dissolves or disintegrates GeoTough EPDM membranes are not recommended for continuous long term contact with this chemical / environment.

****** = May produce cracking in material under stress.

-- = No data available.

Note: Where a concentration is not shown (blank) the substance is pure or concentrated. 5/14

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Acetic acid (glacial)	97	A	B
Acetic acid	50	A	A
Acetic acid	40	A	A
Acetic acid	10	A	A
Acetone		A	A
Acetophenone	100	B	B
Acriflavine (2% soln in H_2O)	2	A	A
Acrylic emulsions		A	A
Aircraft exhaust (gas & jet - fully burned)		A	A
Airport environment fumes & gases		A	A
Aluminum chloride		A	A
Aluminum fluoride		A	A
Aluminum sulfate		A	A
Alums (all types)		A	A
Ammonia gas (dry)		A	A
Ammonia (aqueous)	30	A	--
Ammonium carbonate	Saturated	A	A
Ammonium chloride	Saturated	A	A
Ammonium fluoride	20	A	A
Ammonium hydroxide	10	A	A
Ammonium metaphosphate	Saturated	A	A
Ammonium nitrate	Saturated	A	A
Ammonium persulfate	Saturated	A	A
Ammonium sulfate	Saturated	A	A
Ammonium sulfide	Saturated	A	A
Ammonium thiocyanate	Saturated	A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Amyl acetate	100	B	C
Amyl alcohol	100	A	B
Amyl chloride	100	C	C
Aniline	100	A	A
Animal fat / grease		B	B
Anisole	100	B	B
Antimony chloride		A	A
Aqua regia		**C	**C
Aviation gasoline (80 to 110 octane) - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		C	D
Aviation turbine fuel	100	C	D
Barium carbonate	Saturated	A	A
Barium chloride	Saturated	A	A
Barium hydroxide		A	A
Barium sulfate	Saturated	A	A
Barium sulfide	Saturated	A	A
Beer		A	A
Benzene	100	C	D
Benzoic acid		A	A
Benzyl alcohol		A	A
Bismuth carbonate	Saturated	A	A
Borax		A	A
Boric acid		A	A
Brine	Saturated	A	A
Bromine liquid	100	D	--

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Bromine water		**C	--
Butyl acetate	100	C	C
Butyl alcohol	100	A	--
Calcium carbonate	Saturated	A	A
Calcium chlorate	Saturated	A	A
Calcium chloride	50	A	A
Calcium hydroxide		A	A
Calcium hypochlorite bleach	20	A	B
Calcium nitrate		A	A
Calcium phosphate	50	A	--
Calcium sulfate		A	A
Calcium sulfite		A	A
Carbon dioxide (dry)		A	A
Carbon dioxide (wet)		A	A
Carbon disulfide	100	B	C
Carbon monoxide		A	A
Carbon tetrachloride	100	C	C
Carbonic acid		A	A
Castor oil	100	B	--
Cetyl alcohol	100	A	--
Chlorine (gas)	100	D	D
Chlorobenzene	100	C	C
Chloroform	100	C	D
Chlorosulfonic acid	100	D	D
Chrome alum		A	A
Chromic/sulfuric acid	100	D	D

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Chromic acid	80	**B	--
Chromic acid	50	**B	**B
Chromic acid	10	**B	**B
Cider		A	A
Citric acid	10	A	A
Copper Chloride	Saturated	A	A
Copper cyanide	Saturated	A	A
Copper nitrate	Saturated	A	A
Copper fluoride	Saturated	A	A
Copper sulfate	Saturated	A	A
Cottonseed oil		A	A
Cuprous chloride	Saturated	A	A
Cyclohexanol	100	A	B
Cyclohexanone	100	B	C
Decalin	100	C	C
Detergents	2	A	A
Developers (photographic)		A	A
Dibutyl phthalate	100	B	C
Dichloroethylene	100	D	--
Diethanolamine	100	A	A
Diisooctyl phthalate	100	B	C
Emulsifiers		A	A
Ethyl acetate	100	B	B
Ethyl alcohol	96	A	A
Ethylene glycol		A	A
Ethanolamine	100	A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Ethyl ether	100	C	C
Ethyl chloride	100	C	C
Ethylene dichloride	100	B	--
Ethylene oxide	100	B	--
Fatty acids (C_6)	100	D	D
Ferric chloride	Saturated	A	A
Ferric nitrate	Saturated	A	A
Ferric sulfate	Saturated	A	A
Ferrous chloride	Saturated	A	A
Ferrous sulfate	Saturated	A	A
Fluorosilicic acid		A	A
Formaldehyde	40	A	A
Formic acid	100	A	--
Formic acid	10	A	A
Fructose		A	A
Fruit juices		A	A
Furfural	100	C	C
Gasoline - rating is for continuous contact, short term exposure with evaporation does not degrade membrane	100	C	D
Gas liquor		C	--
Gear box oil	100	B	C
Gelatin		A	A
Glucose	20	A	A
Glycerin	100	A	A
Glycol		A	A
Grease - lubricating (petroleum based)		D	D

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Heptane - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		C	D
Hexane - rating is for continuous contact, short term exposure with evaporation does not degrade membrane	100	C	D
Hydrobromic acid	50	**B	**C
Horse Radish Souce		A	A
Hydrochloric acid	30	A	B
Hydrochloric acid	20	A	A
Hydrochloric acid	10	A	A
Hydrochloric acid	2	A	A
50-50 Hydrochloric - Nitric Acid		**B	**D
Hydrofluoric acid	40	A	--
Hydrofluoric acid	60	**B	**C
Hydrogen peroxide	30	A	B
Hydrogen peroxide	10	A	B
Hydrogen peroxide	3	A	A
Hydrogen chloride gas (dry)	100	A	A
Hydrogen sulfide		A	A
Hydroquinone		A	A
Inks		A	A
Iodine tincture		A	--
Isopropyl alcohol	100	A	A
Iso-octane - rating is for continuous contact, short term exposure with evaporation does not degrade membrane)	100	C	D
Jet Fuel (kerosene based) - rating is for		C	D

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
continuous contact, short term exposure with evaporation does not degrade membrane)			
Kerosene - rating is for continuous contact, short term exposure with evaporation does not degrade membrane)		C	D
Ketchup		A	A
Ketones		A	--
Lactic acid	20	A	A
Lanolin	100	A	A
Lead acetate	Saturated	A	A
Linseed oil	100	C	D
Lubricating oil (petroleum based)	100	C	D
Magenta dye (aqu. solution)	2	A	A
Magnesium carbonate	Saturated	A	A
Magnesium chloride	Saturated	A	A
Magnesium hydroxide	Saturated	A	A
Magnesium nitrate	Saturated	A	A
Magnesium sulfate	Saturated	A	A
Magnesium sulfite	Saturated	A	A
Meat juices		A	A
Mercuric chloride	40	A	A
Mercuric cyanide	Saturated	A	A
Mercury	100	A	A
Mercurous nitrate	Saturated	A	A
Methyl ethyl ketone	100	A	B
Methyl alcohol	100	A	A
Methylene chloride	100	A	--

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Milk and its products		A	A
Mineral oil	100	B	C
Mineral spirits - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		C	D
Molasses		A	A
Motor oil (conventional)		B	C
Motor oil (synthetic)		B	C
Mustard (liquid)		A	A
Naphthalene		D	D
Nickel chloride	Saturated	A	A
Nickel nitrate	Saturated	A	A
Nickel sulfate	Saturated	A	A
Nitric acid	Fuming	D	D
Nitric acid	70	**C	D
Nitric acid	60	**C	D
Nitric acid	10	A	A
50-50 Nitric - Hydrochloric Acid		**C	D
50-50 Nitric - Sulfuric Acid		**C	D
Nitrobenzene	100	C	C
Octane - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		C	D
Oleic acid		B	C
Olive oil	100	B	C
Oxalic acid (aqueous)	50	A	B
Paraffin		B	C
Paraffin wax		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Petrol (gasoline) - rating is for continuous contact, short term exposure with evaporation does not degrade membrane	100	C	D
Phenol	100	C	D
Phosphoric acid	95	B	C
Plating solutions, brass		A	A
Plating solutions, cadmium		A	A
Plating solutions, chromium		A	A
Plating solutions, copper		A	A
Plating solutions, gold		A	A
Plating solutions, indium		A	A
Plating solutions, lead		A	A
Plating solutions, nickel		A	A
Plating solutions, rhodium		A	A
Plating solutions, silver		A	A
Plating solutions, tin		A	A
Plating solutions, zinc		A	A
Petroleum ether (B.P. 100-140 °C)	100	C	D
Potassium bicarbonate	Saturated	A	A
Potassium borate	1	A	A
Potassium bromate	10	A	A
Potassium bromide	Saturated	A	A
Potassium carbonate	Saturated	A	A
Potassium chlorate	Saturated	A	A
Potassium chloride	Saturated	A	A
Potassium chromate	40	A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Potassium cyanide	Saturated	A	A
Potassium dichromate	40	A	A
Potassium ferri/ferrocyanide		A	A
Potassium fluoride		A	A
Potassium hydroxide	50	A	A
Potassium hydroxide	10	A	A
Potassium nitrate	Saturated	A	A
Potassium perborate	Saturated	A	A
Potassium perchlorate	10	A	A
Potassium permanganate	20	A	A
Potassium sulfate		A	A
Potassium sulfide		A	A
Potassium sulfite		A	A
Propyl alcohol	100	A	A
Pyridine		B	C
Silicone oil	100	A	A
Soap solution (concentrated)		A	A
Sodium acetate		A	A
Sodium bicarbonate	Saturated	A	A
Sodium bisulfate	Saturated	A	A
Sodium bisulfite	Saturated	A	A
Sodium borate		A	A
Sodium bromide oil solution		A	A
Sodium carbonate	Saturated	A	A
Sodium chlorate	Saturated	A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Sodium chloride	Saturated	A	A
Sodium chlorite	2	A	A
Sodium chlorite	5	A	A
Sodium chlorite	10	A	A
Sodium chlorite	20	A	A
Sodium cyanide	Saturated	A	A
Sodium dichromate	Saturated	A	A
Sodium ferricyanide	Saturated	A	A
Sodium ferrocyanide	Saturated	A	A
Sodium fluoride	Saturated	A	A
Sodium hydroxide	50	A	A
Sodium hydroxide	10	A	A
Sodium hypochlorite	20	A	B
Sodium nitrate		A	A
Sodium nitrate		A	A
Sodium silicate		A	A
Sodium sulfate	Saturated	A	A
Sodium sulfide	25	A	A
Sodium sulfite	Saturated	A	A
Stannous chloride	Saturated	A	A
Stannic chloride	Saturated	A	A
Starch		A	A
Sulfates of calcium and magnesium	Saturated	A	A
Sulfates of potassium and sodium	Saturated	A	A
Sulfur		A	A
Sulfuric acid	98	**C	D
Sulfuric acid	60	B	C

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Sulfuric acid	50	B	C
Sulfuric acid	10	A	A
50-50 Sulfuric - Nitric Acid		**C	D
Sugars and syrups		A	A
Sulfamic acid		A	A
Tallow		B	B
Tannic acid	10	A	A
Tartaric acid		A	A
Tetrahydrofuran	100	C	D
Tetralin	100	C	C
Toluene - rating is for continuous contact, short term exposure with evaporation does not degrade membrane	100	C	D
Transformer oil	100	B	C
Trichloroacetic acid	10	A	A
Trichloroethylene	100	C	C
Triethanolamine	100	A	A
Turpentine	100	C	C
Urea		A	A
Urine		A	A
Vaseline		C	C
Vegetable oils (general)		B	C
Vinegar		A	A
Water (distilled, soft, hard and vapor)		A	A
Wet chlorine gas		--	D
Whisky		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
White paraffin	100	A	B
White spirit	100	B	C
Wines		A	A
Xylene - rating is for continuous contact, short term exposure with evaporation does not degrade membrane	100	C	D
Yeast		A	A
Zinc chloride	Saturated	A	A
Zinc oxide		A	A
Zinc sulfate	Saturated	A	A