

CHEMICAL RESISTANCE GUIDE FOR CARLISLE POLYPROPYLENE GEOMEMBRANE SYSTEMS (9/03F)

Carlisle Polypropylene Geomembrane is not adversely affected by most common materials and chemicals encountered in a water containment environment. Since the field seam is heat welded, it is as resistant to chemicals as the base sheet. The best course of action to take if unusual substances will contact the geomembrane is to evaluate their effect on the geomembrane in the laboratory. Carlisle SynTec's Laboratory is equipped to perform this testing, interpret the results, and provide a recommendation. **It is the Specifiers responsibility however to determine if polypropylene (geomembrane and accessories) is "fit-for-use" with the particular material that will come in contact with or be contained by the membrane.**

Several factors can increase the affect of a chemical or combination of chemicals on Carlisle Polypropylene Geomembrane.

1. The higher the temperature the greater the affect of the chemical(s) on the geomembrane.
2. Increasing the concentration of the chemical(s) increases the affect on the geomembrane.
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).

Carlisle Polypropylene Geomembrane Systems shall not be utilized for containment of hazardous materials or waste (poisonous, toxic, corrosive, flammable, etc.). Carlisle polypropylene geosynthetic materials do not have long term chemical resistance to mineral oil, motor oil, gasoline, kerosene, diesel fuel, aviation fuel(s), some organic solvents and gases, bleach (sodium hypochlorite, etc.) solutions and strong oxidizing acids, etc.

The following chart rates the chemical resistance of Geomembrane according to the following codes:

- A = NEGLIGIBLE EFFECT** - Geomembrane should be suitable for all applications where these environmental conditions exist.
- B = LIMITED ABSORPTION OR EFFECT** - Geomembrane should be suitable for most applications, but testing is recommended to determine the suitability of Geomembrane in the particular environment.
- C = EXTENSIVE ABSORPTION AND/OR RAPID DEGRADATION POSSIBLE** - Geomembrane 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 Geomembrane in the particular environment.
- NR = NOT RECOMMENDED** - The membrane dissolves or disintegrates, Geomembrane is not recommended for continuous long term contact with this chemical / environment. NR also applies if the chemical / environment is hazardous (see 3rd paragraph) even if polypropylene is chemically resistant to the 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. 9/03

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

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

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Boric acid		NR	NR
Brine		A	A
Bromine liquid		NR	NR
Bromine water		NR	NR
Butyl acetate		NR	NR
Butyl alcohol		NR	NR
Calcium carbonate		A	A
Calcium chlorate		NR	NR
Calcium chloride	50	A	A
Calcium hydroxide		NR	NR
Calcium hypochlorite bleach	20	NR	NR
Calcium nitrate		NR	NR
Calcium phosphate	50	A	--
Calcium sulfate		A	A
Calcium sulfite		A	A
Carbon dioxide (dry)		A	A
Carbon dioxide (wet)		A	A
Carbon disulfide		NR	NR
Carbon monoxide		NR	NR
Carbon tetrachloride		NR	NR
Carbonic acid		A	A
Castor oil		NR	NR
Cetyl alcohol		A	--
Chlorine (gas)		NR	NR
Chlorobenzene		NR	NR
Chloroform		NR	NR

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Chlorosulfonic acid		NR	NR
Chrome alum		NR	NR
Chromic/sulfuric acid		NR	NR
Chromic acid	80	NR	NR
Chromic acid	50	NR	NR
Chromic acid	10	NR	NR
Cider		A	A
Citric acid	10	A	A
Copper Chloride		NR	NR
Copper cyanide		NR	NR
Copper nitrate		NR	NR
Copper fluoride		NR	NR
Copper sulfate		NR	NR
Cottonseed oil		A	B
Cuprous chloride		A	A
Cyclohexanol		NR	NR
Cyclohexanone		NR	NR
Decalin		NR	NR
Detergents	2	A	A
Developers (photographic)		A	A
Dibutyl phthalate		NR	NR
Dichloroethylene		NR	NR
Diethanolamine		NR	NR
Diisooctyl phthalate		B	C
Emulsifiers		A	A
Ethyl acetate		NR	NR

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Ethyl alcohol	96	NR	NR
Ethylene glycol		NR	NR
Ethanolamine		A	A
Ethyl ether		NR	NR
Ethyl chloride		NR	NR
Ethylene dichloride		NR	NR
Ethylene oxide		NR	NR
Fatty acids (C ₆)		A	A
Ferric chloride		NR	NR
Ferric nitrate		NR	NR
Ferric sulfate		A	A
Ferrous chloride		NR	NR
Ferrous sulfate		NR	NR
Fluorosilicic acid		NR	NR
Formaldehyde	40	NR	NR
Formic acid		NR	NR
Formic acid	10	NR	NR
Fructose		A	A
Fruit juices		A	A
Furfural		NR	NR
Gasoline - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		NR	NR
Gas liquor		NR	NR
Gear box oil		NR	NR
Gelatin		A	A
Glucose	20	A	A

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

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
term exposure with evaporation does not degrade membrane)			
Jet Fuel (kerosene based)		NR	NR
Kerosene		NR	NR
Ketones		NR	NR
Lactic acid	20	A	A
Lanolin		A	A
Lead acetate		NR	NR
Linseed oil		A	A
Lubricating oil (petroleum based)		NR	NR
Magenta dye (aqu. solution)	2	A	A
Magnesium carbonate		A	A
Magnesium chloride		A	A
Magnesium hydroxide		A	A
Magnesium nitrate		NR	NR
Magnesium sulfate		A	A
Magnesium sulfite		A	A
Meat juices		A	A
Mercuric chloride	40	NR	NR
Mercuric cyanide		NR	NR
Mercury		NR	NR
Mercurous nitrate		NR	NR
Methane gas – rating is only for methane gas generated by the containment environment such as animal waste. Generated methane gas must be vented from containment volume. Carlisle PP is not recommended for continuous storage of methane gas.		A	A

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

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

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

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

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

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