CHEMICAL RESISTANCE GUIDE FOR FLEX TPO MEMBRANE SYSTEMS (1/06F)

Flex Thermoplastic Polyolefin (TPO) roof membranes are not adversely affected by most common materials and chemicals encountered in a roof 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 membrane, is to evaluate their effect on the membrane in the laboratory. Flex'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 Flex TPO (and other single-ply roof membrane 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 use of common sense is required on circumstances where a roof (or portions thereof) become covered with a foreign material. A good example is fast food restaurants. Flex TPO is recommended for use on fast food restaurants, providing that the membrane does not become covered with an excessive layer or pond of fats/greases that is left unattended for extended periods of time. A standardized and consistent roof-cleaning program must be in effect to mitigate any prolonged exposure to excessive fats/greases.

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

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

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

C = **EXTENSIVE ABSORPTION AND/OR RAPID DEGRADATION POSSIBLE** – Flex TPO 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 TPO in the particular environment.

D = **EXTENSIVE ATTACK** - The membrane dissolves or disintegrates, Flex TPO is 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. 1/06

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		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		A	A
Ammonium chloride		A	A
Ammonium fluoride	20	A	A
Ammonium hydroxide	10	A	A
Ammonium metaphosphate		A	A
Ammonium nitrate		A	A
Ammonium persulfate		A	A
Ammonium sulfate		A	A
Ammonium sulfide		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Ammonium thiocyanate		A	A
Amyl acetate		B	C
Amyl alcohol		A	B
Amyl chloride		C	C
Aniline		A	A
Animal fat / grease		A	B
Anisole		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		C	D
Barium carbonate		A	A
Barium chloride		A	A
Barium hydroxide		A	A
Barium sulfate		A	A
Barium sulfide		A	A
Beer		A	A
Benzene		C	D
Benzoic acid		A	A
Benzyl alcohol		A	A
Bismuth carbonate		A	A
Borax		A	A
Boric acid		A	A
Brine		A	A
Bromine liquid		D	--

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Bromine water		**C	--
Butyl acetate		C	C
Butyl alcohol		A	--
Calcium carbonate		A	A
Calcium chlorate		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		B	C
Carbon monoxide		A	A
Carbon tetrachloride		C	C
Carbonic acid		A	A
Castor oil		A	--
Cetyl alcohol		A	--
Chlorine (gas)		D	D
Chlorobenzene		C	C
Chloroform		C	D
Chlorosulfonic acid		D	D
Chrome alum		A	A
Chromic/sulfuric acid		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		A	A
Copper cyanide		A	A
Copper nitrate		A	A
Copper fluoride		A	A
Copper sulfate		A	A
Cottonseed oil		A	B
Cuprous chloride		A	A
Cyclohexanol		A	B
Cyclohexanone		B	C
Decalin		C	C
Detergents	2	A	A
Developers (photographic)		A	A
Dibutyl phthalate		B	C
Dichloroethylene		C	--
Diethanolamine		A	A
Diisooctyl phthalate		B	C
Emulsifiers		A	A
Ethyl acetate		B	B
Ethyl alcohol	96	A	A
Ethylene glycol		A	A

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

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Grease - lubricating (petroleum based)		B	C
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		C	D
Hydrobromic acid	50	**B	**C
Horse Radish Souce		A	A
Hydrochloric acid	30	A	A
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)		A	A
Hydrogen sulfide		A	A
Hydroquinone		A	A
Inks		A	A
Iodine tincture		A	--
Isopropyl alcohol		A	A
Iso-octane - rating is for continuous contact, short term exposure with evaporation does not		C	D

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
degrade membrane)			
Jet Fuel (kerosene based)		C	D
Kerosene		C	D
Ketchup		A	A
Ketones		A	--
Lactic acid	20	A	A
Lanolin		A	A
Lead acetate		A	A
Linseed oil		A	A
Lubricating oil (petroleum based)		B	C
Magenta dye (aqu. solution)	2	A	A
Magnesium carbonate		A	A
Magnesium chloride		A	A
Magnesium hydroxide		A	A
Magnesium nitrate		A	A
Magnesium sulfate		A	A
Magnesium sulfite		A	A
Meat juices		A	A
Mercuric chloride	40	A	A
Mercuric cyanide		A	A
Mercury		A	A
Mercurous nitrate		A	A
Methyl ethyl ketone		A	B
Methyl alcohol		A	A
Methylene chloride		A	--
Milk and its products		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Mineral oil		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		A	A
Nickel chloride		A	A
Nickel nitrate		A	A
Nickel sulfate		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		A	A
Octane - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		C	D
Oleic acid		A	B
Olive oil		A	A
Oxalic acid (aqueous)	50	A	B
Paraffin		A	B
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		C	D
Phenol		A	A
Phosphoric acid	95	A	B
Plastic Roof Cement		C	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)		C	D
Potassium bicarbonate		A	A
Potassium borate	1	A	A
Potassium bromate	10	A	A
Potassium bromide		A	A
Potassium carbonate		A	A
Potassium chlorate		A	A
Potassium chloride		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Potassium chromate	40	A	A
Potassium cyanide		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		A	A
Potassium perborate		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		A	A
Pyridine		A	--
Roof Cement		C	C
Silicone oil		A	A
Soap solution (concentrated)		A	A
Sodium acetate		A	A
Sodium bicarbonate		A	A
Sodium bisulfate		A	A
Sodium bisulfite		A	A
Sodium borate		A	A
Sodium bromide oil solution		A	A
Sodium carbonate		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Sodium chlorate		A	A
Sodium chloride		A	A
Sodium chlorite	2	A	A
Sodium chlorite	5	A	A
Sodium chlorite	10	A	A
Sodium chlorite	20	A	A
Sodium cyanide		A	A
Sodium dichromate		A	A
Sodium ferricyanide		A	A
Sodium ferrocyanide		A	A
Sodium fluoride		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		A	A
Sodium sulfide	25	A	A
Sodium sulfite		A	A
Stannous chloride		A	A
Stannic chloride		A	A
Starch		A	A
Sulfates of calcium and magnesium		A	A
Sulfates of potassium and sodium		A	A
Sulfur		A	A

Environment	Concentration %	Temperature °F (°C)	
		70 (21)	140 (60)
Sulfuric acid	98	**C	D
Sulfuric acid	60	B	C
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		A	B
Tannic acid	10	A	A
Tartaric acid		A	A
Tetrahydrofuran		C	D
Tetralin		C	C
Toluene - rating is for continuous contact, short term exposure with evaporation does not degrade membrane		C	D
Transformer oil		B	C
Trichloroacetic acid	10	A	A
Trichloroethylene		C	C
Triethanolamine		A	A
Turpentine		C	C
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

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