

EC Duro-Bond E-CTFE Lining

Description

Duro-Bond E-CTFE is a laminated sheet lining consisting of a layer of Ethylene Chlorotetrafluoroethylene (E-CTFE) resin laminated to a fabric or vulcanized soft rubber backing that is readily bonded to steel, concrete, or FRP substrates. ECTFE is a partially fluorinated thermoplastic resin that is melt flow processible. Duro-Bond E-CTFE sheet lining is available in thicknesses of 60 mils (1.5 mm) and 90 mils (2.3 mm).

Uses

Duro-Bond E-CTFE is used as a vessel lining material to provide chemical resistance to acids, bases, oxidizing agents, organic solvents and other corrosive media. **Duro-Bond E-CTFE** can be applied to tanks, scrubbing towers, reactors, valves, columns, agitators and other process equipment for handling corrosive materials.

When a combination of chemical, temperature, abrasion and permeation resistance is required **Duro-Bond E-CTFE** is often a cost-effective solution to severe corrosion problems.

Advantages

Duro-Bond E-CTFE fluoropolymer sheet lining exhibits outstanding chemical resistance, being virtually unaffected by many of the corrosive chemicals commonly encountered in the chemical process industry.

Duro-Bond E-CTFE is resistant to strong mineral and oxidizing acids, alkalis, metal etchants, liquid oxygen and essentially all organic solvents. Typical of the fluoropolymers, E-CTFE is attacked by metallic sodium and potassium. Rate of attack is a function of exposure time and temperature.

Duro-Bond E-CTFE sheet lining provides substrate protection by virtue of its excellent permeation resistance. The E-CTFE fluoropolymer has extremely low permeability to water vapor and various other gases. The E-CTFE fluoropolymer also exhibits low permeability to liquid chemicals. It also has excellent resistance to abrasion.

Service Temperature

E-CTFE fluorocarbon resins withstand continuous service temperatures as high as 150° C (300° F). When bonded to a substrate, the maximum recommended service temperature for **Duro-Bond FEP** sheet lining is 110° C (230° F) on a continuous basis, 120° C (250° F) on an intermittent basis.

Chemical Resistance

The information listed may be considered as a basis for recommendation, but not as a guarantee, unless sold and installed by **ELECTRO CHEMICAL ENGINEERING & MFG. CO.** For resistance of **Duro-Bond E-CTFE** to chemicals not listed, contact our Engineering Department at:

inquiry@electrochemical.net or 1-800-235-1885.

Key to Rating:

R = Recommend
NR = Not Recommended
- = No Available Data

<u>Chemical</u>	<u>70°F</u>	<u>150°F</u>	<u>225°F</u>
Acetic Acid, 50%	R	R	R
Acetic Acid, 80%	R	R	-
Acetic Acid, Glacial	R	NR	-
Acetic Anhydride	R	-	-
Acetone	R	R	NR
Acetyl Chloride	R	R	-
Acetylene	R	R	-
Acetyl Nitrile	R	R	-
Acrylonitrile	R	-	-
Adipic Acid	R	R	-
Alcohol, Amyl	R	R	R
Alcohol, Benzyl	R	R	R
Alcohol, Butyl	R	R	R
Alcohol, Diacetone	R	R	NR
Alcohol, Ethyl	R	R	R
Alcohol, Hexyl	R	-	-
Alcohol, Isopropyl	R	R	R
Alcohol, Methyl	R	R	R
Alcohol, Propyl	R	R	R
Allyl Chloride	R	R	R
Alum	R	R	R
Alum, Ammonium	R	R	R
Alum, Chrome	R	R	-
Alum, Potassium	R	R	R
Aluminum Chloride	R	R	R
Aluminum Fluoride	R	R	R
Aluminum Hydroxide	R	R	R
Aluminum Nitrate	R	R	R
Aluminum Oxychloride	R	R	-
Aluminum Sulfate	R	R	R
Ammonia, Gas	R	R	R
Ammonia, Aqua, 10%	R	R	R
Ammonium Acetate	R	R	-
Ammonium Bifluoride	R	R	R
Ammonium Bisulfide	R	R	R
Ammonium Carbonate	R	R	R
Ammonium Chloride	R	R	R
Ammonium Dichromate	R	-	-
Ammonium Fluoride, 25%	R	R	R
Ammonium Hydroxide	R	R	R
Ammonium Metaphosphate	R	R	R
Ammonium Nitrate	R	R	R
Ammonium Persulfate	R	R	-
Ammonium Phosphate	R	R	R
Ammonium Sulfate	R	R	R

<u>Chemical</u>	<u>70°F</u>	<u>150°F</u>	<u>225°F</u>
Ammonium Sulfide	R	R	R
Amyl Acetate	R	R	NR
Amyl Chloride	R	R	R
Aniline	R	NR	NR
Anthraquinone	R	R	-
Anthraquinone Sulfonic Acid	R	R	-
Antimony Trichloride	R	-	-
Aqua Regia	R	R	R
Arsenic Acid	R	R	R
Barium Carbonate	R	R	R
Barium Chloride	R	R	R
Barium Hydroxide	R	R	R
Barium Nitrate	R	-	-
Barium Sulfate	R	R	R
Barium Sulfide	R	R	R
Benzaldehyde, 10%	R	R	NR
Benzaldehyde, Above 10%	R	NR	NR
Benzene, Benzol - R up to 176 oF	R	R	NR
Benzene Sulfonic Acid, 10%	R	R	NR
Benzoic Acid	R	R	R
Bismuth Carbonate	R	-	-
Black Liquor	R	R	R
Bleach	R	R	R
Boric Acid	R	R	R
Bromic Acid	R	R	R
Bromine, Liquid	R	R	-
Bromine, Vapor 25%	R	R	NR
Bromine, Water	R	R	R
Bromobenzene	R	NR	NR
Bromotoluene	R	R	NR
Butadiene	R	R	R
Butane	R	R	R
Butyl Acetate	R	R	NR
Butyl Cellosolve	R	-	-
Butylene	R	R	R
Butyl Phenol	R	R	R
Butyl Stearate	R	-	-
Butyric Acid	R	R	-
Cadmium Cyanide	R	R	R
Calcium Bisulfide	R	R	R
Calcium Bisulfite	R	R	R
Calcium Carbonate	R	R	R
Calcium Chlorate	R	R	R
Calcium Chloride	R	R	R
Calcium Hydroxide	R	R	R
Calcium Hypochlorite	R	R	R
Calcium Nitrate	R	R	R
Calcium Oxide	R	R	R
Calcium Sulfate	R	R	R
Caprylic Acid	R	R	R
Carbon Dioxide, Wet or Dry	R	R	R
Carbon Disulfide	R	-	-

Electro Chemical Duro-Bond E-CTFE Lining

Carbon Monoxide	R	R	-
Carbon Tetrachloride	R	R	R
Carbonic Acid	R	R	R
Castor Oil	R	R	R
Cellosolve	R	R	R
Cellosolve Acetate	R	-	-
Chloracetic Acid	R	R	R
Chemical	70°F	150°F	225°F
Chloral Hydrate	R	R	-
Chloramine	R	-	-
Chlorine Gas, Dry	R	R	NR
Chlorine Gas, Wet	R	R	R
Chlorine, Liquid	R	R	R
Chlorine Water, Saturated	R	R	R
Chloracetic Acid	R	R	R
Chlorobenzene - R up to 100°F	R	NR	NR
Chlorobenzyl Chloride	R	NR	NR
Chloroform	R	R	R
Chlorosulfonic Acid	R	-	-
Chromic Acid, 501/o	R	R	R
Citric Acid	R	R	R
Coconut Oil	R	R	R
Copper Carbonate	R	R	-
Copper Chloride	R	R	R
Copper Cyanide	R	R	R
Copper Fluoride	R	R	R
Copper Nitrate	R	R	R
Copper Sulfate	R	R	R
Cottonseed Oil	R	R	R
Cresol	R	R	NR
Cresylic Acid, 50%	R	R	NR
Croton Aldehyde	R	NR	NR
Cupric Fluoride	R	R	R
Cupric Sulfate	R	R	R
Cuprous Chloride	R	R	R
Cyclohexane	R	R	R
Cyclohexanol - R up to 175°F.	R	R	NR
Cyclohexanone	R	NR	NR
Detergents	R	R	R
Dextrin	R	R	R
Dextrose	R	R	R
Dichlorobenzene	R	NR	NR
Dichloroethylene	R	NR	NR
Diesel Fuel	R	R	R
Diethylamine	R	NR	NR
Diethyl Cellosolve	R	R	R
Diethyl Ether	R	-	-
Diglycolic Acid	R	-	-
Dimethylamine	R	NR	NR
Dimethyl Hydrazine	R	NR	NR
Diocetyl Phthalate	R	NR	NR
Dioxane	R	R	NR
Disodium Phosphate	R	R	R
Divinylbenzene	R	NR	-
Ethyl Acetate	R	R	-
Ethyl Acetoacetate	R	-	-

Ethyl Acrylate	R	R	NR
Ethyl Chloride	R	R	R
Ethyl Chloroacetate	R	-	-
Ethyl Ether	R	R	-
Ethylene Bromide	R	R	R
Ethylene Chloride	R	R	R
Ethylene Chlorohydrin	R	NR	NR
Chemical	70°F	150°F	225°F
Ethylene Diamine	R	NR	NR
Ethylene Dichloride	R	NR	NR
Ethylene Glycol	R	R	R
Ethylene Oxide	R	R	R
Fatty Acids	R	R	R
Ferric Chloride	R	R	R
Ferric Nitrate	R	R	R
Ferric Sulfate	R	R	R
Ferrous Chloride	R	R	R
Ferrous Nitrate	R	R	R
Ferrous Sulfate	R	R	R
Fluorine Gas, Wet	R	-	-
Fluoboric Acid	R	-	-
Fluosilicic Acid	R	R	R
Formaldehyde, 37%			
Containing up to 15% Methanol	R	R	-
Formaldehyde, 50%	R	-	-
Formic Acid, 90%	R	R	NR
Freon	R	R	-
Gallic Acid	R	R	-
Gasoline	R	R	R
Glucose	R	R	R
Glycerine	R	R	R
Glycolic Acid	R	R	-
Glycols	R	R	R
Heptane	R	R	R
Hexane	R	R	R
Hydrobromic Acid, 50%	R	R	R
Hydrochloric Acid, 38%	R	R	R
Hydrocyanic Acid, 1 0%	R	R	R
Hydrofluoric Acid, 50%	R	R	R
Hydrofluosilicic Acid	R	R	R
Hydrogen	R	R	R
Hydrogen Cyanide	R	R	R
Hydrogen Peroxide, 90%	R	R	-
Hydrogen Phosphide	R	R	-
Hydrogen Sulfide, Dry	R	R	R
Hydrogen Sulfide, Aqueous Sol.	R	R	-
Hydroquinone	R	R	R
Hypochlorous Acid	R	R	R
Iodine	R	R	R
Isopropyl Ether	R	-	-
Isooctane	R	-	-
Jet Fuel	R	R	R
Kerosene	R	R	R
Lactic Acid, 25%	R	R	-
Lactic Acid, 80%	R	-	-
Lard Oil	R	R	R

Electro Chemical Duro-Bond E-CTFE Lining

Lauric Acid	R	R	R
Lauryl Chloride	R	R	R
Lead Acetate	R	R	R
Lead Chloride	R	R	R
Lead Nitrate	R	R	R
Lead Sulfate	R	R	R
Lemon Oil	R	R	R
Chemical	70°F	150°F	225°F
Linoleic Acid	R	R	R
Linoleic Oil	R	R	R
Linseed Oil	R	R	R
Lithium Bromide	R	R	-
Lubricating Oil	R	R	R
Magnesium Carbonate	R	R	R
Magnesium Chloride	R	R	R
Magnesium Hydroxide	R	R	R
Magnesium Nitrate	R	R	R
Magnesium Sulfate	R	R	R
Maleic Acid	R	R	R
Malic Acid	R	R	R
Mercuric Chloride	R	R	R
Mercuric Cyanide	R	R	R
Mercuric Sulfate	R	R	R
Mercurous Nitrate	R	R	R
Mercury	R	R	R
Methane	R	R	R
Methoxyethyl Oleate	R	-	-
Methylamine	R	NR	NR
Methyl Bromide	R	R	R
Methyl Cellosolve	R	R	R
Methyl Chloride	R	R	R
Methyl Chloroform	R	R	NR
Methyl Ethyl Ketone	R	R	NR
Methyl Isobutyl Ketone	R	R	NR
Methyl Methacrylate	R	-	-
1-Methyl-2-Pyrrolidinone	R	R	NR
Methyl Sulfate	R	R	R
Methyl Sulfuric Acid	R	R	-
Methylene Bromide	R	NR	NR
Methylene Chloride	R	NR	NR
Methylene Iodine	R	NR	NR
Mineral Oil	R	R	R
Naphtha	R	R	R
Naphthalene	R	R	-
Natural Gas	R	R	-
Nickel Acetate	R	-	-
Nickel Chloride	R	R	R
Nickel Nitrate	R	R	R
Nickel Sulfate	R	R	R
Nicotine	R	R	-
Nicotinic Acid	R	R	R
Nitric Acid, 40%	R	R	R
Nitric Acid, 50%	R	R	NR
Nitric Acid, 100%	R	R	NR
Nitrobenzene - R up to 100OF	R	NR	NR
Nitrous Acid, 10%	R	R	R

Nitrous Oxide	R	-	-
Oils, Vegetable	R	R	R
Oleic Acid	R	R	R
Oleum	R	NR	NR
Oxalic Acid	R	R	NR
Oxygen, Gas	R	R	R
Ozone	R	R	R
Chemical	70°F	150°F	225°F
Palmitic Acid	R	R	R
Paraffin	R	R	-
Perchloric Acid, 70%	R	R	-
Perphosphate	R	-	-
Petroleum Oils	R	R	-
Phenol, 10%	R	R	NR
Phenylthydrazine	R	-	-
Phosphoric Acid, 85%	R	R	R
Phosphorus Yellow	R	-	-
Phosphorus Pentoxide	R	R	R
Phosphorus Trichloride	R	R	R
Photographic Solutions	R	R	-
Picric Acid	R	-	-
Plating Solutions	R	R	-
Potassium Aluminum Sulfate	R	R	R
Potassium Bichromate	R	R	R
Potassium Bisulfate	R	R	R
Potassium Borate	R	R	-
Potassium Bromide	R	R	R
Potassium Carbonate	R	R	R
Potassium Chlorate	R	R	R
Potassium Chloride	R	R	R
Potassium Chromate	R	R	R
Potassium Cyanide	R	R	R
Potassium Dichromate	R	R	R
Potassium Ferricyanide	R	R	R
Potassium Ferrocyanide	R	R	R
Potassium Hydroxide	R	R	-
Potassium Iodide	R	R	R
Potassium Nitrate	R	R	R
Potassium Perchlorate	R	-	-
Potassium Permanganate, 25%	R	R	R
Potassium Persulfate	R	R	-
Potassium Sulfate	R	R	R
Propane	R	R	R
Propyl Acetate - R up to 122OF	R	NR	NR
Propylene Oxide	NR	NR	NR
Pyridine	NR	NR	NR
Pyrogallia Acid	R	R	-
Salicylic Acid	R	R	-
Salicylaldehyde	R	NR	NR
Silicic Acid	R	-	-
Silicone Oil	R	-	-
Silver Cyanide	R	R	R
Silver Nitrate	R	R	R
Silver Sulfate	R	R	R
Sodium Acetate	R	R	R
Sodium Benzoate	R	R	R

Electro Chemical Duro-Bond E-CTFE Lining

	R	R	R		R	R	R
Sodium Bicarbonate	R	R	R	Sulfur Dioxide, Dry	R	R	R
Sodium Bichromate	R	R	-	Sulfur Dioxide, Wet	R	R	-
Sodium Bisulfate	R	R	R	Sulfuric Acid, 80%	R	R	R
Sodium Bisulfite	R	R	R	Chemical	70°F	150°F	225°F
Sodium Bromide	R	R	R	Sulfuric Acid, 90%	R	R	-
Sodium Carbonate	R	R	R	Sulfuric Acid, 98%	R	R	-
Sodium Chlorate	R	R	R	Sulfuric Acid, 100%	R	-	-
Chemical	70°F	150°F	225°F	Sulfurous Acid	R	R	R
Sodium Chloride	R	R	R	Tall Oil	R	R	R
Sodium Cyanide	R	R	R	Tannic Acid	R	R	R
Sodium Dichromate	R	R	-	Tanning Liquor	R	R	R
Sodium Fluoride	R	R	R	Tartaric Acid	R	R	R
Sodium Hydroxide, 50%	R	R	R	Tetraethyl Lead	R	R	R
Sodium Hydroxide, 70%	R	R	-	Tetrahydrofurane	NR	NR	NR
Sodium Hypochlorite	R	R	R	Tetrahydrofuran	NR	NR	NR
Sodium Iodide	R	R	-	Thionyl Chloride	R	R	-
Sodium Metaphosphate	R	R	R	Toluene	R	R	NR
Sodium Nitrate	R	R	R	Tributyl Phosphate	R	NR	NR
Sodium Nitrite	R	R	R	Trichloroacetic Acid	R	R	NR
Sodium Perchlorate	R	-	-	Trichloroethylene	R	R	R
Sodium Peroxide	R	R	R	Triethanolamine	R	NR	NR
Sodium Phosphate	R	R	R	Triethylamine	R	R	NR
Sodium Silicate	R	R	R	Trisodium Phosphate	R	R	R
Sodium Sulfate	R	R	R	Turpentine	R	R	R
Sodium Sulfide	R	R	R	Urea	R	R	R
Sodium Sulfite	R	R	R	Urine	R	R	-
Sodium Thiosulfate	R	R	R	Vaseline	R	R	-
Stannic Chloride	R	R	R	Vinagar	R	R	R
Stannous Chloride	R	R	R	Vinyl Acetate	R	R	R
Starch	R	R	-	Water	R	R	R
Stearic Acid	R	R	-	Xylene	R	R	-
Succinic Acid	R	R	R	Zinc Chloride	R	R	R
Sulfate Liquor	R	-	-	Zinc Nitrate	R	R	R
Sulfite Liquor	R	-	-	Zinc Sulfate	R	R	R
Sulfur Chloride	R	-	-				

Physical Properties

The normal physical properties of the E-CTFE sheeting are shown in the following table.

Chemical characterization	Thermoplastic fluorocarbon polymer
Color	Clear to translucent, depending on thickness
Odor	None
Melting point	240°C
Upper Service Temperature	160°C
Density (23°C)	1.69 g/cm ³
Tensile Strength (N/mm ²)	42 -48
Elongation at Break	200%
Solubility in water	Insoluble
Explosion limits	None
Hardness Durometer	D 75
Water absorption	< 0.03
Oxygen Index (%)	> 30
Flammability	V-0
Thermal Expansion Coefficient	5 - 8 x 10 ⁻⁵

23 -150°C (mm/mm/°C)

Application

The method of application is as follows:

1. The surface to be lined is properly cleaned and grit blasted to a white metal finish to provide a suitable surface for bonding. (See Electro Chemical Technical Bulletin #1, "Specification for Welded Steel Tanks, Stacks, Ducts or Other Fabricated Equipment for Protective Linings and/or Coatings".)
2. The Duro-Bond E-CTFE laminate is cut into panels to cover the entire area to be lined with a minimum amount of joints to be welded.
3. The panels are then cemented into position and the seams welded with Duro-Bond ECTFE rod and E-CTFE cap strip using a thermoplastic welding gun with nitrogen gas as the inert atmosphere.

Method of Testing

All lined surfaces are visually inspected for surface defects. Any special dimensional tolerances required after lining are also checked.

All lined areas are then spark tested for pinhole leaks using a dielectric spark tester adjusted to 10,000 volts. The tester is moved constantly and quickly over the lining surface to prevent a burn through.

Repair Procedures

Duro-Bond E-CTFE sheet lining can be shop or field repaired. The repairs to defective or damaged areas in the sheet lining are accomplished by cutting out the faulty area, grinding or grit blasting the substrate surface, preparing a piece of sheet of the same dimension, cementing it into position and subsequently welding the joints as described under Application. The repaired area is then inspected and spark tested to insure lining integrity.

Additional Information

For additional technical or safety information, contact us at 1-800-235-1885, www.electrochemical.net, or inquiry@electrochemical.net.

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