ELECTRO CHEMICAL
ENGINEERING & MANUFACTURING CO.

EC Duro-Bond
Rubber Sheet Linings

Description

Both Soft Natural Rubber and Hard Natural Rubber Linings are offered by Electro Chemical. Sheet thicknesses of 120 mils (2.3 mm), 150 mils (3.4 mm), and 180 mils (4.6 mm) are available.

Soft Natural Rubber

DURO-BOND S-123 is an uncured, soft three ply rubber sheet lining. The lining consists of a soft ply bonded to the substrate, a semi-hard center ply, and a soft natural outer ply.

Hard Natural Rubber

DURO-BOND SH-160 is an uncured, flexible, hard rubber sheet lining. It is a high grade, duplex rubber sheet lining consisting of a flexible ebonite semi-hard rubber layer backed with a thin layer of soft gum rubber. **DURO-BOND SH-160CL** is the same lining except that it is specifically formulated for chlorine service.

Uses

DURO-BOND S-123 Soft Natural Rubber is used as a general purpose lining material for resistance to chemical agents and abrasion. It is generally resistant to alkalis, numerous acidic and organic chemicals and inorganic salts, and is used for lining equipment such as steel tanks, agitated vessels, agitators and related process equipment. When resistance to a combination of high temperature conditions and abrasive situations is required, **DURO-BOND S-123** proves to be quite useful.

DURO-BOND SH-160 and SH-160CL Hard Natural Rubbers are used as a lining material when resistance to a wide variety of corrosive materials at continuous elevated temperatures is required. **DURO-BOND SH-160** and **DUROBON**D **SH-160CL** resists the low concentration, high temperature conditions generally found in water treatment facilities and other chemical environments including pickling solutions and strong acids at high temperatures.

Advantages

Soft Natural Rubber

The multiple ply construction of **DURO-BOND S-123** offers the advantages of the combined physical properties that are found in both hard and soft rubbers. The soft face ply provides excellent abrasion and impact resistance, the semi-hard center ply provides maximum chemical resistance, and the soft backing ply provides maximum flexibility and adhesion to the substrate.

Hard Natural Rubber

The outer layer of **DURO-BOND SH160** and **SH-160CL** provide the outstanding corrosion resistance to a variety of corrosive materials at continuous elevated temperatures typical of the chemical resistant

qualities of hard rubber. The inner layer that is bonded to the substrate is a flexible semi-hard rubber which resists temperature variations that can cause hard rubber linings to crack.

Since **DURO-BOND SH-160** and **DURO-BOND SH-160CL** are applied while in the soft uncured state, they readily conform to curved surfaces and can be applied to a wide variety of complex equipment. **DURO-BOND SH-160CL** has been specially formulated for service as a corrosion resistant tank lining for use in chlorine service.

When properly applied and steam cured both linings exhibit excellent adhesion bond strength. On blasted steel the 90^{o} peel-pull adhesion is in excess of 25 pounds per linear inch in accordance with ASTM D903.

Service Temperature

The maximum recommended operating temperature for **DURO-BOND S-123**, **SH-160**, and **SH-160CL** is 200 ^{o} F (93^{o}C). At elevated temperatures rubber linings may harden and age prematurely, resulting in cracks and failure. It is sometimes desirable to provide thermal insulation, thereby increasing the service life of the lining. Corrosion resistant brick sheathing joined with one of the Electro Chemical corrosion resistant cements is used in conjunction with **Duro-Bond Rubber Linings** when excessive temperatures are present. A 4" thick brick sheathing will provide a temperature drop of approximately 50 ^{o}F and an 8" brick lining will provide a drop of approximately 100 ^{o}F. When carbon brick are used the temperature drop will be somewhat less.

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 & Manufacturing Co. For resistance of **Duro-Bond Rubber Linings** to chemicals not listed, contact our Engineering Department at:

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

Key to Chemical Resistance Chart:

NR = Not Recommended

Max. Temp (^{o}F) = Maximum at which the lining is recommended for continuous service.

Chemical	Remarks	Max. Temp (^{o}F)
Acetic Acid (dilute)		NR
Acetic Acid (glacial)		NR
Acetic Anhydride		NR
Acetone		NR
Alum: ammonium		200
Alum: chrome		200
Alum: potassium		200
Aluminum Chloride	pH over 6	200
Aluminum Hydroxide		200
Aluminum Sulfate		200
Ammonia: Aqua 18-25%		NR
Ammonia: Gas (dry)		NR
Ammonia (Household)		NR
Ammonium Acetate,	10% pH over 6	150
Ammonium Bromide		175
Ammonium Carbonate		185
Ammonium Chloride	pH over 6	200
Ammonium Flouride		NR
Ammonium Hydroxide		NR
Ammonium Nitrate	pH over 6.5	150
Ammonium Phosphate		200
Ammonium Sulfate		200

Chemical	Remarks	Max. Temp (^{o}F)
Ammonium Sulfide		150
Amyl Alcohol		150
Aniline and Aniline Oil		NR
Aniline Hydrochloride		NR
Aromatic Hydrocarbons		NR
Arsenic Acid		150
Barium Chloride	pH over 6	200
Barium Hydroxide		150
Barium Sulfate		200
Barium Sulfide		175
Barium Sulfite		200
Benzene (coal tar)		NR
Benzene (gasoline type)		NR
Benzoic Acid		150
Black Liquor (sulfate)		185
Bleach		NR

Chemical	Remarks	Max. Temp (°F)
Borax		200
Boric Acid		200
Brine Solution		200
Bromine		NR
Butane		NR
Butyl Acetate		NR
Butyl Alcohol (butanol)		150
Butyric Acid		100
Cadmium Cyanide		150
Calcium Acetate		NR
Calcium Bisulfite		150
Calcium Carbonate		200
Calcium Chloride	pH over 6	200
Calcium Hydroxide		175
Calcium Hypochlorite		NR
Calcium Nitrate	pH over 6.5	200
Calcium Oxide, (dry)		200
Calcium Sulfate		200
Carbolic Acid (phenol)		NR
Carbon Bisulfide		NR
Carbon Dioxide (wet or dry)		175
Carbon Tetrachloride		NR
Carbonic Acid		200
Chloroacetic Acid		100
Chlorinated Hydrocarbons		NR
Chlorine (dry)	SH-160CL	200
Chlorine (wet)	SH-160CL	200
Chlorine Dioxide		NR
Chromic Acid		NR
Citric Acid		150
Copper Carbonate		200
Copper Chloride		100
Copper Cyanide		150
Copper Nitrate	pH over 6.5	150
Copper Sulfate		150
Cottonseed Oil		NR
Cresylic Acid		NR
Ethers		NR
Ethyl Acetate		NR
Ethyl Alcohol	(Ethanol)	100
Ethyl Chloride		NR
Ethylene Glycol		200
Fatty Acids		NR
Ferric Chloride	pH over 6	200
Ferric Hydroxide		150
Ferric Nitrate	pH over 6.5	150
Ferric Sulfate		200
Ferrous Chloride	pH over 6	200
Ferrous Hydroxide		200
Ferrous Nitrate		150
Ferrous Sulfate		200
Fluoboric Acid		200
Fluorine Gas (wet)		NR
Fluorine Gas (dry)		NR
Fluosilicic Acid		200
Formaldehyde, 5%		150
Formaldehyde, 40%		150
Formic Acid		NR
Gasoline		NR
Glauber's Salts (Sodium Sulfate)		200
Hydrobromic Acid		200
Hydrochloric Acid		200
Hydrofluoric Acid		NR
Hydrofluosilicic Acid		200
Hydrogen Peroxide		NR
Hydrogen Sulfide		NR
Hydrogen Sulfite, dry		NR
Hydrogen Sulfite, wet		NR
"Hypo"Photographic Solution	(Sodium Thiosulfate)	200
Hypochlorous Acid		NR
Kerosene		NR
Lacquer Solvents		NR
Lactic Acid	Pure	150
Lead Chloride		150
Lead Sulfate		150
Lime, dry (Calcium Oxide)		200
Lime, flaked (Calcium Hydroxide)		175
Linseed Oil		NR
Magnesium Chloride	pH over 6	200
Magnesium Citrate		150
Magnesium Hydroxide		200
Magnesium Nitrate	pH over 6.5	200
Magnesium Sulfate		200
Malic Acid		150
Manganese Sulfate		150
Mercuric Chloride	pH over 6	200
Mercuric Cyanide		150
Mercuric Nitrate		150
Mercurous Nitrate		150
Methyl Alcohol	Methanol	150
Methyl Chloride		NR
Mineral Oils		NR
Muriatic Acid (Hydrochloric Acid)		180
Nickel Acetate	pH over 6	180
Nickel Chloride	pH over 6	200
Nickel Nitrate	pH over 6.5	200
Nickel Sulfate		200
Niter (Potassium Nitrate)	pH over 6.5	180
Nitric Acid, 5%		NR
Nitric Acid, 10%		NR
Nitric Acid, 25%		NR
Nitric Acid, 40%		NR
Nitrous Acid		150
Oleum (Fuming Sulfuric Acid)		NR
Oxalic Acid		150
Paimitric Acid		NR
Paraffin		NR
Perchloric Acid	(Dihydrate)	NR
Petroleum Oils, Crude		NR
Phenol (Carbolic Acid)		NR
Phosphoric Acid, 85% (Over 85% Use Butyl)		200
Plating Solution, Brass		200
Plating Solution, Cadmium		200
Plating Solution, Chrome		NR
Plating Solution, Copper		200
Plating Solution, Gold		200
Plating Solution, Lead		200
Plating Solution, Nickel		200

Chemical	Remarks	Max. Temp (°F)
Plating Solution, Silver		200
Plating Solution, Tin		200
Plating Solution, Zinc		200
Potassium Alum		200
Potassium Aluminum Sulfate (Alum)		200
Potassium Antimonate		150
Potassium Auricyanide		150
Potassium Bicarbonate		180
Potassium Bichromate	pH over 6	NR
Potassium Bisulfate		200
Potassium Bisulfite		200
Potassium Borate		200
Potassium Bromide		200
Potassium Carbonate		200
Potassium Chlorate		200
Potassium Chloride	pH over 6	200
Potassium Chromate	pH over 6	NR
Potassium Cyanide		200
Potassium Cyprocyanide		200
Potassium Dichromate	pH over 6	NR
Potassium Ferricyanide		NR
Potassium Hydroxide, 25%		200
Potassium Hydroxide Saturated	Over 25%	150
Potassium Iodide	pH over 6.5	200
Potassium Nitrate	pH over 6.5	180
Potassium Permanganate	pH over 7.0	150
Potassium Phosphate	Mono-Di orTri-Basic	200
Potassium Salicylate		200
Potassium Silicate		200
Potassium Sulfate		200
Potassium Sulfide		200
Potassium Sulfite		200
Potassium Thiosulfate		200
Propane		NR
Propionic Acid (dilute)		NR
Propyl Alcohol		150
Rochelle Salts (Potassium Sodium Titrate)		200
Soap Solutions		180
Sodium Antimonate		200
Sodium Bicarbonate		200
Sodium Bisulfate		200
Sodium Borate		200
Sodium Carbonate		200
Sodium Chloride	pH over 6	200
Sodium Cyanide		200
Sodium Dichromate	pH over 6	NR
Sodium Fluoride		NR
Sodium Hydroxide, 25%		200
Sodium Hypochlorite	pH over 9	NR
Sodium Nitrate	pH over 6.5	180
Sodium Perborate		150
Sodium Permanganate	pH over 7.0	200
Sodium Peroxide		NR
Sodium Phosphate	Mono-Di or Tri-Basic	200
Sodium Salicylate		200
Sodium Silicate		200
Sodium Sulfate		200
Sodium Sulfide		200
Sodium Sulfite	pH over 6	200
Sodium Thiosulfate	“Hypo”	200
Stannic Chloride	pH over 6	200
Stannous Chloride	pH over 6	200
Stearic Acid		NR
Sulfur Dioxide, Wet		150
Sulfuric Acid, 5%		185
Sulfuric Acid, 25%		175
Sulfuric Acid, 50%		150
Sulfuric Acid, 75%		NR
Sulfurous Acid		200
Tannic Acid		150
Tartaric Acid		200
Trichloroethylene		NR
Turpentine		NR
Urea		185
Water, Acid Mine		150
Water, Fresh		185
Water, Sea or Salt		200
Zinc Chloride	pH over 6	200
Zinc Sulfate		200

Physical Properties

	DURO-BOND S-123 (Soft Rubber)	DURO-BOND SH-160 (Hard Rubber)	DURO-BOND SH-160CL (Hard Rubber, Cl_2)
Specific Gravity	1.1	1.14	1.34
Tensile Strength (minimum psi)	750	1500	1400
Elongation (maximum)	100	10%.	10%
Hardness Shore "A" (after cure)	65+5	85 ± 5	90 ± 5
Water Absorption (max by volume) (immersion for 96 hrs.@ 212°F)	15%	15%	15%
Color	Black	Black	Black
Thickness	3/16”,1/4”,3/8”	1/8", 3/16", 1/4	1/8", 3/16", 1/4"
Abrasion Resistance	Excellent	Excellent	Excellent

Application

The installation of **Duro-Bond S-123**, **DURO-BOND SH-160** and **SH-160CL** sheet linings is described in the following steps:

1. The metal surfaces are sand or grit blasted to a gray-white metal.
2. One coat of primer is applied immediately after blasting metal to prevent rusting. Additional coats of primer are applied, if necessary.
3. The required coats of intermediate or tie cement are applied allowing sufficient drying time so that the coat being applied does not lift the preceding coat.
4. Edges of all sheets are skived at an angle from the top surface to the bottom of the sheet. A closed skive construction commonly known as a down skive is used.
5. The sheet is wiped with the recommended solvent and allowed to dry before application. The sheet is then applied using the minimum number of seams consistent with good lining practice. Edges should overlap approximately 2" unless restricted by dimensional tolerances. During application, sheets are rolled and all seams and corners carefully stitched to eliminate all trapped air between lining and cemented surfaces.
6. Steam is required to vulcanize all natural rubber linings to produce the required physical and chemical properties and adhesion to the metal substrate.

Method of Testing

All lined surfaces are inspected for blisters, lifted edges and surface defects. Any special dimensional tolerances required after lining are also checked.

All areas are spark tested for leaks using a dielectric spark tester adjusted to 5,000 volts. The tester is moved constantly and quickly over the lining surface to prevent a burn through.

Repair Procedures

Most defects will be blisters between lining and substrate, blow holes where the lining is actually ruptured, small cracks in the lining or physical damage which may result in a scuffed or broken lining.

If a defect occurs, the defective lining is removed to a point where firm adhesion to the substrate is found, a suitable repair made with the same or equivalent lining material usually using a chemical cure method and subsequently testing the repaired areas as described in "Method of Testing".

Additional Information

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

Electro Chemical Engineering & Manufacturing Co.
750 Broad Street
Emmaus, Pa 18049
Phone: 610-965-9061
FAX: 610-965-2595

Electro Chemical Engineering & Manufacturing Co.
P.O. Box 1107
Port Allen, LA 70767
Phone: 225-336-0202
FAX: 225-336-0205

The data provided herein falls within the normal range of product properties, but they should not be used to establish specification limits nor used alone as the basis of design. Electro Chemical Engineering & Manufacturing Co. assumes no obligation or liability for any advice furnished by it or for results obtained with respect to these products. All such data and advice is provided gratis and Buyer assumes sole responsibility for results obtained in reliance thereon.