T.D.S.

- Corrosion -

(CTI-S65002_A02)

Common types of Corrosion

Corrosion is a natural occurrence where materials deteriorate due to chemical reactions with the surrounding environment, often seen when metals come into contact with air or water. Corrosion can lead to reduced strength and functionality, aesthetic deterioration, and potential hazards such as structural failure.

Chemical corrosion is where a material is degraded due to chemical reactions in the environment caused by specific chemicals such as acids, bases, and salts. These chemicals can erode the material's surface and cause it to deteriorate over time.

Environmental corrosion occurs when a material is affected by environmental factors such as temperature, humidity, and atmospheric conditions. A combination of factors, including exposure to moisture, UV radiation, and pollutants in the air, causes this corrosion.

Galvanic corrosion can happen when two different types of metal come into contact with each other in the presence of an electrolyte, such as water or moisture. Cable trays are often made of metals such as aluminum or galvanized steel, which are susceptible to this type of corrosion when in contact with different types of metals. When dissimilar metals are in contact, an electric current flow between them, which causes one metal to corrode more than the other. Several factors can contribute to the likelihood of galvanic corrosion in cable trays:

- The type of metal use in contact.
- The presence of moisture or other electrolytes in the cable tray environment.
- The surface area ratio of the two metals in contact
- The environment in which the cable tray is located (such as marine or industrial environments)

Preventing galvanic corrosion in cable trays can be done by using isolation materials between dissimilar metals, coating one or both metals, and cathodic protection. Refer to Table 1 for Isolation Guide on Cable trays and Supports.

For TOUGHMesh Basket Tray, and TOUGHTray Cable Ladder recommended isolation materials and installation instructions when installed with different steel support material, refer to the following documents to prevent galvanic corrosion:

- TOUGHMesh Basket Tray: **Document No. CTI-S50032**
- TOUGHTray Cable Ladder: **Document No. CTI-S5200X**

A galvanic series lists metals and alloys in order of their relative electrode potentials in a specific environment. In seawater, the electrode potential of a metal is influenced by the concentration of dissolved ions, temperature, and other factors.

Here is an example of a galvanic series in seawater, with the most active (anodic) metal at the bottom and the most noble (cathodic) metal at the top.

Cathodic End (Most noble)

MOVEMENT OF IONS

Platinum Graphite
Hastelloy C
Titanium
Hastelloy B
Incoloy 825
Type 304 Stainless Steel (passive)
Type 316 Stainless Steel (passive)
Silver
Nickel 200
Silver Solder
Nickel - Aluminum Bronze
Lead
Copper Nickel Alloys
Nickel - Silver
Type 410 Stainless Steel (passive)
Manganese Bronze
Admiralty Brass, Aluminum Brass
Lead-Tin Solders
Copper
Naval Brass, Yellow Brass, Red Brass
Type 304 Stainless Steel (active)
Type 316 Stainless Steel (active)
Type 410 Stainless Steel (active)
Austenitic Nickel Cast Iron
Cast Iron, Wrought Iron, Mild Steel
Aluminum - Copper Alloys (2000 series)
Aluminum - Magnesium - Silicon Alloys (6000 series)
Aluminum - Magnesium Alloys (3000 series)
Aluminum (1000 series)
Aluminum - Magnesium Alloys (5000 series)
Aluminum - Zinc Alloys (7000 series)
Zinc
Magnesium Alloys
Magnesium

Anodic End (Least noble)

TABLE 1: ISOLATION GUIDE FOR CABLE TRAYS AND SUPPORTS

Isolation Material is **NOT** Required

Isolation Material is Required

Cable Tray Material / Finish	Support Material / Finish	Environmental Conditions	Isolation Requirement
Painted Finish	Galvanized Steel	Indoor	
Painted Finish	Stainless Steel	Indoor	
Electrogalvanized Steel	Stainless Steel	Indoor	
TOUGHGalv Steel	Stainless Steel	Indoor	
Stainless Steel	Galvanized Steel	Indoor	
Aluminum	Stainless Steel	Indoor	
Aluminum	Galvanized Steel	Indoor	
Electrogalvanized Steel	Painted Finish	Indoor	
TOUGHGalv Steel	Painted Finish	Indoor	
Stainless Steel	Painted Finish	Indoor	
Aluminum	Painted Finish	Indoor	
Painted Finish	Galvanized Steel	Indoor - Damp/wet Location	
Painted Finish	Stainless Steel	Indoor - Damp/wet Location	
Electrogalvanized Steel	Stainless Steel	Indoor - Damp/wet Location	
TOUGHGalv Steel	Stainless Steel	Indoor - Damp/wet Location	
Stainless Steel	Galvanized Steel	Indoor - Damp/wet Location	
Aluminum	Stainless Steel	Indoor - Damp/wet Location	
Aluminum	Galvanized Steel	Indoor - Damp/wet Location	
Electrogalvanized Steel	Painted Finish	Indoor - Damp/wet Location	
TOUGHGalv Steel	Painted Finish	Indoor - Damp/wet Location	
Stainless Steel	Painted Finish	Indoor - Damp/wet Location	
Aluminum	Painted Finish	Indoor - Damp/wet Location	
Painted Finish	Galvanized Steel	Outdoor - Rural/Moderate Environment	
Painted Finish	Stainless Steel	Outdoor - Rural/Moderate Environment	
Electrogalvanized Steel	Stainless Steel	Outdoor - Rural/Moderate Environment	
TOUGHGalv Steel	Stainless Steel	Outdoor - Rural/Moderate Environment	
Stainless Steel	Galvanized Steel	Outdoor - Rural/Moderate Environment	
Aluminum	Stainless Steel	Outdoor - Rural/Moderate Environment	
Aluminum	Galvanized Steel	Outdoor - Rural/Moderate Environment	
Electrogalvanized Steel	Painted Finish	Outdoor - Rural/Moderate Environment	
TOUGHGalv Steel	Painted Finish	Outdoor - Rural/Moderate Environment	
Stainless Steel	Painted Finish	Outdoor - Rural/Moderate Environment	
Aluminum	Painted Finish	Outdoor - Rural/Moderate Environment	
Painted Finish	Galvanized Steel	Outdoor - Industrial/Marine Environment	
Painted Finish	Stainless Steel	Outdoor - Industrial/Marine Environment	
Electrogalvanized Steel	Stainless Steel	Outdoor - Industrial/Marine Environment	
TOUGHGalv Steel	Stainless Steel	Outdoor - Industrial/Marine Environment	
Stainless Steel	Galvanized Steel	Outdoor - Industrial/Marine Environment	
Aluminum	Stainless Steel	Outdoor - Industrial/Marine Environment	
Aluminum	Galvanized Steel	Outdoor - Industrial/Marine Environment	
Electrogalvanized Steel	Painted Finish	Outdoor - Industrial/Marine Environment	
TOUGHGalv Steel	Painted Finish	Outdoor - Industrial/Marine Environment	
Stainless Steel	Painted Finish	Outdoor - Industrial/Marine Environment	
Aluminum	Painted Finish	Outdoor - Industrial/Marine Environment	

TABLE 2: CORROSION RESISTANCE GUIDE

Agent	Cable Tray Material		
	Aluminum	Stainless Steel,304	Stainless Steel,316
Acetone	✓	✓	✓
Acetylene	✓	✓	✓
Aluminum Chloride (Aqu.)	✗	✗	✗
Aluminum Fluoride (Sat.)	●	✗	●
Aluminum Nitrate (Sat.)	!	●	●
Aluminum Potassium Sulfate (Alum)	●	✗	●
Aluminum Sulfate (Sat.)	✗	○	●
Ammonium Chloride (Sat.)	✗	✗	✗
Ammonium Hydroxide (Sat.)	●	●	●
Ammonium Nitrate	●	○	○
Ammonium Phosphate (10-40%)	✗	✓	●
Ammonium Sulfate (10-40%)	✗	✗	●
Barium Chloride (Sat.)	○	✗	○
Barium Sulfate	●	●	●
Barium Sulfide	✗	●	●
Benzaldehyde	●	●	●
Benzene, Benzol	✓	●	●
Benzine	○	○	○
Benzoic Acid	●	●	●
Black Liquor	✗	●	●
Bleach (12.5% Active Chlorine)	✗	○	✗
Borax	✗	✓	✓
Boric Acid	✓	○	○
Brine Acid	○	○	○
Bromic acid	✗	○	○
Bromine Liquid	●	✗	✗
Butadiene, Butylene	●	●	●
Butane	●	●	●
Butyl Acetate	✓	●	●
Butyric Acid	●	●	●
Calcium Bisulfate	✗	✗	●
Calcium Bisulfide	○	○	●
Calcium Bisulfite	✗	○	●
Calcium Bromide	✗	✓	✗
Calcium Carbonate	✗	✓	●
Calcium Chloride (Sat.)	○	○	○
Calcium Hydroxide (Sat.)	✗	●	●
Calcium Hypochlorite (Sat.)	✗	✗	●
Carbon Bisulfide	✓	●	●
Carbon Dioxide (Dry)	✓	●	●
Carbon Dioxide (Wet)	✓	●	●
Carbon Disulfide	✓	●	●
Carbon Monoxide	✓	✓	✓
Carbon Tetrachloride	✗	✓	○
Carbonic Acid	✓	●	●
Castor Oil	●	●	●
Caustic Potash	✗	○	●
Cellosolves	●	●	●
Chlorine (Liquid)	○	○	!

●	No aggression, excellent behavior
●	Aggression light, good behavior (acceptable)
!	Moderate aggression, unsuitable(not advisable)
✗	Aggression strong, not suitable (not used)
○	Not available data

Ratings given are based at 70°F (21°C).

TABLE 2: CORROSION RESISTANCE GUIDE (cont'd)

Agent	Cable Tray Material		
	Aluminum	Stainless Steel,304	Stainless Steel,316
Chloroform	○	○	○
Chlorosulfonic Acid	○	✗	✗
Clorox (Bleach, 5.5% CL)	✗	○	●
Chromic Acid (50%)	●	!	○
Citric Acid	!	○	○
Coke Oven Gas	●	●	●
Copper Chloride	✗	✗	✗
Copper Cyanide	✗	●	●
Copper Sulfate	✗	○	●
Crysylic Acid (Conc.)	●	●	●
Cyclohexane	●	●	●
Detergents	●	✓	●
Dextrose	●	○	○
Diesel Fuels	✓	✓	✓
Diethylamine	●	●	●
Disodium Phosphate	○	○	✓
Ethers			✓
Ethyl Acetate	○	●	●
Ethyl Chloride	○	○	✓
Ethylene Chloride	○	○	○
Ethylene Dichloride	○	●	●
Ethylene Glycol	✓	●	●
Ethylene Oxide	✗	●	●
Fatty Acids	✓	○	✓
Ferric Chloride	✗	✗	✗
Ferric Hydroxide	○	✓	✓
Ferric Nitrate (10-50%)	✗	●	●
Ferric Sulfate	✗	○	○
Ferrous Chloride (Sat.)	✗	✗	✗
Ferrous Sulfate	●	●	○
Fluboric Acid	✗	○	○
Formaldehyde (50%)	○	✓	✓
Formic Acid (Anhyd.)	✓	○	○
Freon 11	●	●	●
Freon 12	●	●	●
Freon 22	●	●	●
Fruit Juices	●	●	●
Fuel Oil	●	●	●
Furfural	●	●	●
Refined Gasoline	●	●	●
Sour Gasoline	✗	●	●
Gelatin	●	●	●
Glucose	●	●	●
Glue	●	○	●
Glycerine	✓	✓	✓
Glycols	●	●	●
Heptane	●	●	●
Hexane	●	✓	✓

✓	No aggression, excellent behavior
●	Aggression light, good behavior (acceptable)
!	Moderate aggression, unsuitable(not advisable)
✗	Aggression strong, not suitable (not used)
○	Not available data

Ratings given are based at 70°F (21°C).