



# **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, a n d 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)

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

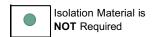
Magnesium

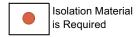
### Anodic End (Least noble)

MOVEMENT OF IONS



#### **TABLE 1: ISOLATION GUIDE FOR CABLE TRAYS AND SUPPORTS**





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**

	Cable Tray Material		
Agent			
Agent	Aluminum	Stainless Steel,304	Stainless Steel,316
Acetone	<b>Ø</b>	<b>Ø</b>	<b>Ø</b>
Acetylene	igoremsize	$\bigcirc$	$\bigcirc$
Aluminum Chloride (Aqu.)	<b>(S)</b>	8	8
Aluminum Fluoride (Sat.)		8	
Aluminum Nitrate (Sat.)			
Aluminum Potassium Sulfate (Alum)		8	
Aluminum Sulfate (Sat.)	<b>(X)</b>		
Ammonium Chloride (Sat.)	8	8	8
Ammonium Hydroxide (Sat.)			
Ammonium Nitrate			
Ammonium Phosphate (10-40%)	8	<b>Ø</b>	
Ammonium Sulfate (10-40%)	8	8	
Barium Chloride (Sat.)		8	
Barium Sulfate			
Barium Sulfide	×		
Benzaldehyde			
Benzene, Benzol	<b>Ø</b>		
Benzine			
Benzoic Acid			
Black Liquor	8		
Bleach (12.5% Active Chlorine)	8		8
Borax	8	<b>②</b>	
Boric Acid	<b>⊘</b>		
Brine Acid			
Bromic acid	8		
Bromine Liquid		8	8
Butadiene, Butylene			
Butane			
Butyl Acetate	$igstyle{igstyle \mathcal{O}}$		
Butyric Acid			
Calcium Bisulfate	X	<b>⊗</b>	
Calcium Bisulfide			
Calcium Bisulfite	8		
Calcium Bromide	8	$\bigcirc$	×
Calcium Carbonate	8	$\bigcirc$	
Calcium Chloride (Sat.)			
Calcium Hydroxide (Sat.)	8		
Calcium Hypochlorite (Sat.)	8	8	
Carbon Bisulfide	Ø		
Carbon Dioxide (Dry)	<b>Ø</b>		
Carbon Dioxide (Wet)	$\bigcirc$		
Carbon Disulfide	<b>Ø</b>		
Carbon Monoxide	$\checkmark$	Ø	Ø
Carbon Tetrachloride	8	<b>⊘</b>	
Carbonic Acid	<u> </u>		
Castor Oil			
Caustic Potash	8		
Cellosolves			
Chlorine (Liquid)			

<b>(</b>	No aggression, excellent behavior
	Aggression light, good behavior (acceptable)
	Moderate aggression, unsuitable(not advisable)
8	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)

	Cable Tray Material		
Agent	Aluminum	Stainless Steel,304	Stainless Steel,316
Chloroform			
Chlorosulfonic Acid		8	8
Clorox (Bleach, 5.5% CL)	8		
Chromic Acid (50%)			
Citric Acid			
Coke Oven Gas			
Copper Chloride	8	×	<b>X</b>
Copper Cyanide	8		
Copper Sulfate	8		
Crysylic Acid (Conc.)			
Cyclohexane			
Detergents		<u> </u>	
Dextrose			
Diesel Fuels			
Diethylamine			
Disodium Phosphate			
Ethers			
Ethyl Acetate			<u> </u>
Ethyl Chloride	0		
Ethylene Chloride			<u> </u>
-		0	
Ethylene Dichloride			
Ethylene Glycol	<b>⊘</b>		
Ethylene Oxide	8		
Fatty Acids	<b>⊘</b>		<b>Ø</b>
Ferric Chloride	8	8	8
Ferric Hydroxide		<b>Ø</b>	<b>Ø</b>
Ferric Nitrate (10-50%)	8		
Ferric Sulfate	8		
Ferrous Chloride (Sat.)	8	×	× ×
Ferrous Sulfate			0
Fluboric Acid	8		
Formaldehyde (50%)	0	<b>S</b>	<b>V</b>
Formic Acid (Anhyd.)	<u> </u>		
Freon 11			
Freon 12			
Freon 22			
Fruit Juices			
Fuel Oil			
Furfural			
Refined Gasoline			
Sour Gasoline	8		
Gelatin			
Glucose			
Glue			
Glycerine	<u> </u>	<b>⊘</b>	$\bigcirc$
Glycols			
Hontano			
Heptane Hexane			
I IEXAITE		lacksquare	

<b>(</b>	No aggression, excellent behavior
	Aggression light, good behavior (acceptable)
	Moderate aggression, unsuitable(not advisable)
<b>S</b>	Aggression strong, not suitable (not used)
	Not available data

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