

Dissimilar Metal and Chemical Compound Corrosion

Most metals used in construction projects are chosen for their strength, corrosion resistance and longevity. However, some metals do not perform well when placed in contact with certain other metals or exposed to certain chemical compounds. Awareness of these situations is critical to understand how dissimilar metal and chemical compound corrosion can affect a DECRA roof system installation.

Common causes for accelerated metal roof corrosion include:

- Galvanic reaction due to dissimilar metals
- Trapped moisture
- Excessive contact with chemically contaminated water

What Is Dissimilar Metal Corrosion?

Galvanic corrosion – also known as “Electrolytic Corrosion” or “Bimetallic Corrosion” – refers to accelerated corrosion induced when two dissimilar metals are coupled by an electrolyte. When this coupling effect forms, one of the metals in the couple becomes the anode and corrodes faster than it would by itself. The other metal becomes the cathode and corrodes slower than it would alone.

For dissimilar metal corrosion to occur, two conditions are required:

1. The different metals (or their oxide layers) are galvanically incompatible with each other
2. Metals are in electrolytic contact – joined to each other by moisture

Galvanic Incompatibility

Putting two different metals in electrolytic contact with each other can create an electrochemical reaction. This is where the “less noble” metal acts as an anode and the “more noble” metal acts as a cathode. The anode passes electrons through the electrolyte to the cathode, causing oxidation. When this happens, the anode loses mass – corrosion occurs. Thus, the weaker, anode metal (or metallic coating) fails via corrosion.

Metals in Electrolytic Contact

An electrolyte is simply a fluid that conducts electricity. Almost any fluid falls into this category, including rainwater and snow-melt water. For galvanic activity to occur there must be moisture present that couples the two metals electrically. Accelerated corrosion occurs when rainwater becomes more acidic – sulfurous and nitrous oxides from air pollution mixing with rainwater can accelerate corrosion.

Also, chlorides contained in seawater or de-icing salt create strong electrolytes that also accelerate corrosion.

Precautions

When installing a DECRA roof system, use extreme caution to avoid contact of the DECRA roof system components with copper. This includes exposure to pressure-treated wood (when treated with chemicals containing copper-ion solutions), water runoff from copper plumbing such as HVAC copper pipe drains, copper flashing, copper downspouts and other copper-containing products. Copper salts can quickly stain and corrode the roof surface.

Chemical corrosion can also occur when no metals appear to be involved. For example, wood treated with copper-ion chemical compounds provides corrosive copper salts. When the treated wood becomes wet, the corrosive solution becomes water-borne and will attack the roof metal.

With DECRA roof system components using steel coated with an aluminum-zinc alloy, the aluminum in the coating is extremely sensitive to chemical compounds containing strong alkalis – such as what is found in highly alkaline cleansers often used to clean HVAC components. Also, cementitious materials, such as stucco mix and mortar mix, when still wet and not yet cured, contain highly alkaline chemistry that pose a severe threat to DECRA roof system components. This is apparent by a conspicuous black and/or white stain on the roof metal surface, which will be then followed by red rust. When fully cured and freely draining, cement mortars do not seem to be a chemical problem, but should be allowed to cure and dry out completely to avoid any electrolytic reaction. Any masonry work near the roof area should be completed and well dried before roof materials are installed. Alkali spills should be immediately flushed with water to prevent damage.

Even if two dissimilar metals are not in direct physical contact, dissimilar metal corrosion can still occur. Water runoff from the cathodic metal (like copper) onto the anodic metal (like a DECRA roof system component), can cause staining and eventual corrosion on the roof metal