Quality Technical Bulletin

Galvanic Corrosion-How Metals React On Contact

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At low corrosion rates, galvanic corrosion may be negligible, but usually increases greatly once started.

Combined with schedule 40 pipe and a moderate corrosion rate, galvanic corrosion will often produce premature failures in 6 yrs.

➢ To determine the compatibility of two metals, use the chart to the right by drawing a line from one metal to the other.

Here's a classic example of galvanic corrosion; a stainless screw in contact w/ a cadmium plated washer.

➢ See the fastener compatibility chart at the right — a brass fastener and aluminum base metal shows as **C**, therefore, corrosion will develop (the aluminum will be eaten away), so aluminum should not be fastened using brass screws (use galvanized or stainless steel screws).

Galvanic corrosion is an electrochemical action of two dissimilar metals. It occurs when dissimilar metals are in contact. In order for galvanic corrosion to occur, all three elements are required.

1) Dissimilar metals 2) Metal-to-metal contact 3) Metals in the same solution (such as water or vapor)

If any of these elements is missing, galvanic corrosion cannot occur. If, for example, the direct contact between the two metals is prevented (plastic washer, paint film etc.) there cannot be galvanic corrosion. Galvanic corrosion only causes deterioration of one of the metals, the anodic side (see below chart). If you do not use dielectric fittings, in time (couple years / decades, who knows) the connections will start to fail. Usually at the thinnest point, the threads.

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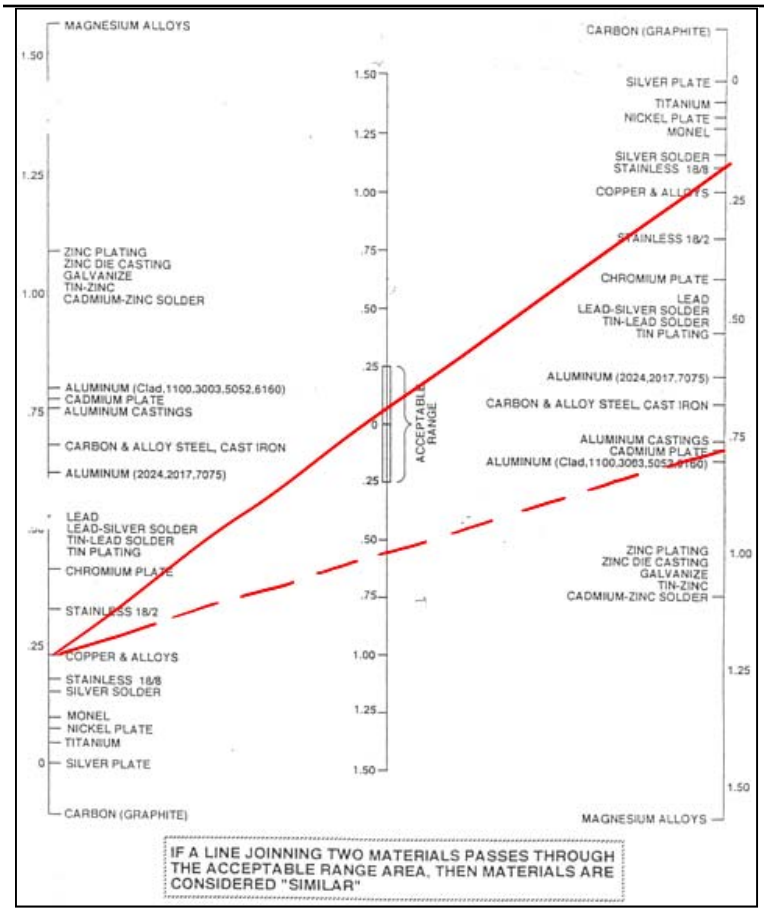

Guideline for Selection of Fasteners based on Galvanic Action

	Fastener Metal					
	Zinc & Galvanized Steel	Aluminum & Aluminum Alloys	Steel and Cast Iron	Brass, Copper, Bronze	Martensitic Stainless (Type 410)	Austentic Stainless (Types 302, 303, 304, 305)
Base Metal						
Zinc & Galvanized Steel	A	B	B	C	C	C
Aluminum & Aluminum Alloys	A	A	B	C	Not Recommended	B
Steel and Cast Iron	AD	A	A	C	C	B
Lead-Tin Plated Sheets	ADE	AE	AE	C	C	B
Brass, Copper, Bronze, Monel	ADE	AE	AE	A	A	B
Ferritic Stainless (Type 430)	ADE	AE	AE	A	A	A
Austentic Stainless (Type 302/304)	ADE	AE	AE	AE	A	A

A - The corrosion of the base metal is not increased by the fastener
B - The corrosion of the base metal is marginally increased by the fastener
C - The corrosion of the base metal may be markedly increased by the fastener material
D - The plating on the fastener is rapidly consumed, leaving the bare fastener metal
E - The corrosion of the fastener is increased by the base metal
Note - Surface treatment and environment can change activity
Source - *"Stainless Steel Fasteners A Systematic Approach To Their Selection" AISI 502-476-18M-CP*

What the Codes Say for Plumbing Pipe:

City of Chicago Code:

18-29-705.14..... Joints between different materials shall be made with a mechanical compression joint.

18-29-705.14.1..... Copper to cast iron hub pipe require a brass ferrule or compression joint.

18-29-705.14.2..... Copper to Galvanized shall be with a brass converter or dielectric fitting.

International Plumbing Code:

705.18 ..... Joints between different materials shall be made with a mechanical compression joint.

705.18.1 ..... Copper to cast iron hub pipe require a brass ferrule or compression joint.

705.18.2 ..... Copper to Galvanized shall be with a brass converter or dielectric fitting.

Uniform Plumbing Code:

316.2.1 ..... Copper pipe to a threaded pipe shall be made with a brass adapter fitting.

Preventing Galvanic Corrosion:

Prevent Direct Contact. Use a non-conducting spacer, gasket, or union. Such as rubber, plastic, or a material that is has better compatibility with both metals, such as copper—brass—cast iron.

Prevent Moisture at Junctions. Ensure that the area remains dry at all times. This requires special attention to drainage, covering, and weather protection. Keep in mind that vapor is also considered a potential wet source.

Use the Area Effect. Provide a larger overall material area of the less noble material, such as cast iron when attached to brass.

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