



Technical

BULLETIN

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Durability

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In many practical construction applications the contact of dissimilar materials is sometimes unavoidable. When dissimilar metals are in contact with one another in the right medium the condition is called Galvanic Coupling. The effects of galvanic coupling depend on how different the electrochemical properties of the metals are. The following Technical Bulletin describes the compatibility of Galvanized steel and Aluminum, two materials commonly found together in the construction of lightgauge steel framed homes. Dr. X.G. Zhang is a Corrosion Scientist for Cominco Ltd., and is author of Corrosion and Electrochemistry of Zinc.

Galvanic Compatibility of Galvanized Steel and Aluminum

By X.G. Zhang, Cominco Ltd.



Zinc and aluminum are galvanically compatible materials in atmospheric environments. That is, when these two metals are in direct contact there will be very little galvanic corrosion of either metal resulting from the coupling.

As shown in the Table 1 below, the amount of corrosion of both zinc and aluminum when coupled to each other is close to that of the controls, indicating that there is very little galvanic corrosion. This is in contrast to the coupling with copper for which the amounts of corrosion on both zinc and aluminum are greatly increased due to the galvanic action. The reason for the low galvanic action between zinc and aluminum is primarily due to a lower position in the electromotive force series of aluminum relative to zinc and the formation of an inert passive film on the surface of aluminum.

Table 1

Galvanic corrosion rates of zinc and aluminum tested for one year in an urban atmospheric environment, in m/y [1].

<u>Aluminum</u>	
control	0.2
coupled to zinc	0.0
coupled to copper	5.3
<u>Zinc</u>	
control	1.2
coupled to aluminum	1.1
coupled to copper	2.0

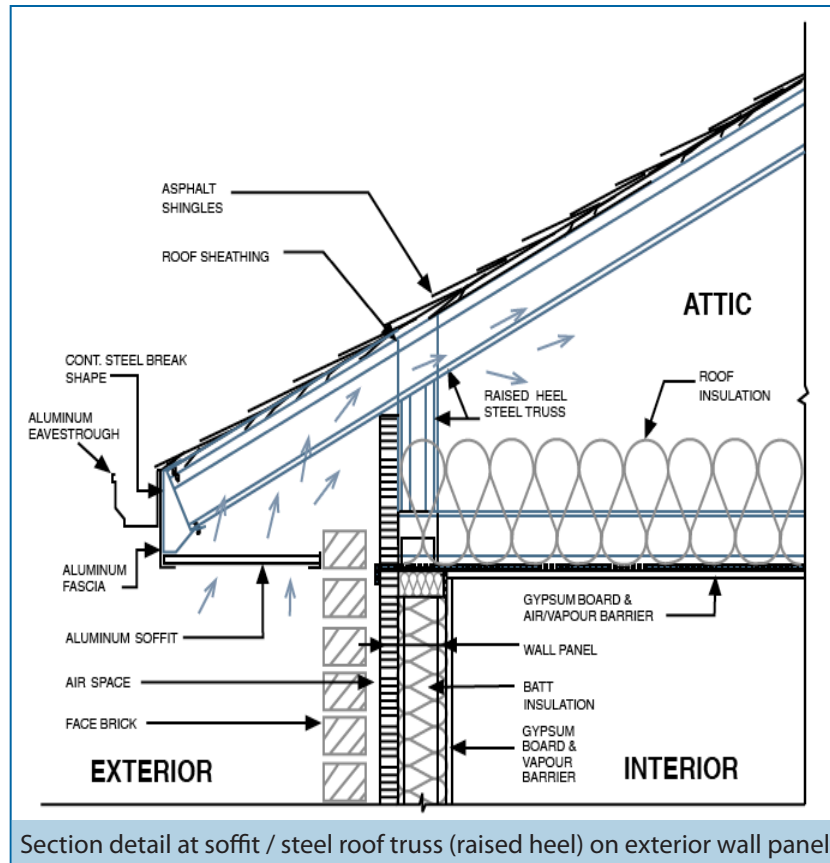
Test in a wire-on-bolt assembly



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Because of their galvanic compatibility, zinc and aluminum can be used together in atmospheric environments without significant galvanic corrosion problems. The situation is even better when the metals are painted. Since paint is generally not conductive, it prevents the electrical and/or electrolytic contact between the two metals which is required for galvanic action. Therefore, painted aluminum and galvanized steel can be used in direct contact without causing galvanic corrosion problems as, for example, shown by the sketch above in the case of a galvanized steel fascia in contact with a painted aluminum eavestrough. Some galvanic action may occur at places where the two painted metal products are joined by metallic screw fasteners or nuts and bolts. At these places the amount of galvanic corrosion should be close to the values indicated in the table and the extent of galvanic action is limited to within a few millimetres of the contact line [2].

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References:

1. V. Kucera and E. Mattsson, "Atmospheric Corrosion of Bimetallic Structures", in Atmospheric Corrosion, W.H. Ailor (ed.), pp.561-574, John Wiley & Sons, New York, 1982.
2. X.G. Zhang, "Galvanic Protection Distance of Zinc Coated Steels Under Various Environmental Conditions", Corrosion'98, Paper No. 747, NACE, 1998.

