

Information Update

PMP67 Issue 1 Oct 2023

Aluminium and Bimetallic Corrosion

Aluminium and Ali Alloys when placed in direct contact with dissimilar metals maybe subject to corrosion additional to the acceptable levels of corrosion when dissimilar metals are not involved. This additional corrosion is commonly referred to as 'Bimetallic Corrosion'. Bimetallic Corrosion can be eliminated by isolating the dissimilar metal from the aluminium.

Proprietary methods of isolation are available off the shelf and include:

- Barrier Tapes – Thin tapes normally applied to flat surfaces.
- Sleeves and Washers – Usually moulded nylon and used on bolt diameters and under nut and bolt heads.
- Neoprene Rubber – Generally made to order as washers and gaskets.

Contacting aluminium to aluminium surfaces can suffer crevice corrosion, particularly under marine or industrial exposure conditions. This can be countered by a coat of zinc chromate primer on the contacting surfaces.

Metal in Contact with Aluminium	Atmospheric Environment		
	Rural	Industrial/ Urban	Marine
Grades A2, A4, 304 and 316 Stainless Steel	0	1	2
Zinc and Zinc Based Alloys (Galvanising)	0	0	0

Table 1: Compatibility levels of aluminium and dissimilar metals of most relevance.

Table Key

- 0 Aluminium and aluminium alloys will suffer either no additional corrosion, or at the very most only very slight additional corrosion, usually tolerable in service.
- 1 Aluminium and aluminium alloys will suffer slight or moderate corrosion which may be tolerable in some circumstances.
- 2 Aluminium and aluminium alloys may suffer severe additional corrosion and protective measures will usually be necessary.

Table 1 and Table Key are extracts from BSI PD6484:1979 – Commentary on Corrosion at Bimetallic Contacts and its Alleviation.

The data shown refers to corrosion on bare aluminium surfaces. Treated aluminium surfaces such as polyester powder coated or anodised will be less affected. Unless otherwise specified the following guidelines (Table 2) regarding isolation should be used.

Environment	Guidelines
Rural Industrial/Urban	Stainless steel and galvanised steel do not require isolation when used with treated aluminium. If mill finish aluminium is used consideration should be given to using isolation at key structural support points.
Marine	Isolation is not required where stainless or galvanised steel is used with polyester powder coated or anodised aluminium. In the unlikely event that mill finish is used the isolation methods must be applied.
Rural Industrial/Urban Marine	If there is any possibility that mill finish or treated aluminium can come into contact with non-galvanised steel isolation should be used.

Table 2: Aluminium Isolation Guidelines

General Note

Holes drilled in aluminium or steel exposes bare metal which should, where possible, be treated with touch up paint. This applies more to steel than aluminium except in a marine environment where holes in aluminium should be treated and isolation used on bolts. A thin wrapping or barrier tape will provide isolation on bolt diameters.

The bimetallic corrosion risk from the combination of aluminium and stainless steel is to some degree affected by the relative contact areas of the two materials whereby the risk is increased where a large area of cathode is in contact with a relatively smaller area of anode. In the galvanic series, aluminium is a less noble metal than stainless steel and therefore, in this situation aluminium would be the anode and stainless steel the cathode.



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As a result, an increased risk of corrosion would exist where aluminium fixings are used for stainless steel sections but, the use of stainless-steel fixings on aluminium sections would normally be acceptable. However, in corrosive conditions such as marine environments the contact areas of even the latter combination should be protected by using a separating barrier.