

# Immersion

## Introduction

BlueScope are world renowned leaders in technical excellence when it comes to corrosion resistant coatings on steel. This excellence is demonstrated by BlueScope products such as ZINCALUME® aluminium/zinc/magnesium alloy-coated steel, COLORBOND® prepainted steel and the wide range of zinc-coated steel strip products.

However, there are special considerations the user should be aware of to ensure optimum performance from these products. These considerations, which are generic in nature, are not confined to BlueScope products.

Immersion, in the context of this bulletin, occurs when the steel is covered or buried by liquid, soils, vegetable matter or any material which will inhibit normal exposure of the coating to the atmosphere. The major factors influencing corrosion are the continual retention of moisture and the differential concentration of oxygen at the material surface.

Moisture or moisture retaining materials should not be permitted to remain in intimate contact with ZINCALUME® steel, COLORBOND® steel or zinc-coated steel. Such contact will ultimately result in accelerated corrosion.

In roofing applications, immersion problems are usually associated with bad design with low to negative pitch contributing to ponding of water and consequent perforation of the roof sheeting. Gutters are frequent victims of insufficient fall leading to ponding of water. Some fascia style gutters are designed to be installed with absolute minimal fall and lead to rapid failure of the gutter at ponded areas. The accumulation of debris (leaf matter, dirt etc.) which results in continual immersion, is the most common reason for unsatisfactory performance of guttering.

Parapet and soffit panels are often retained by a sill type trim. The trim should be shaped to provide clearance at the bottom of the sheet to allow drainage and to create fall away from the panel to ensure that the cladding is not sitting in retained water.

Coolroom panels, in food processing applications, are subject to very aggressive conditions due to the frequency of high-pressure cleaning, often with hot water and strong detergent solutions. This treatment can force water into crevices within the panels and surrounding trims which, being retained by capillary action, constitutes immersion with detrimental results. Not only does the water remain at the point of contact but it is drawn up into the panel, saturating the panel insulation material.

Many of these problems can be avoided at the design stage by detailing the base retaining channel to allow for free drainage of water prior to contact with the foam insulation and using suitable sealants which will resist the force of the water cleaning jets.

In typical garden applications such as fence panels, garden sheds and walling, the buildup of grass cuttings, leaves, soil from gardens, mulch, compost, sand and ashes must be avoided. Failure to prevent this build up will cause premature corrosion of COLORBOND® steel, ZINCALUME® steel or zinc-coated steels as a direct result of mechanisms associated with the wet poultice held against the coated steel surface.

## Concrete

Uncured concrete (cement), mortar and plaster cause some initial attack of galvanised (zinc coated) steels. This etching or attack ceases rapidly and the slight amount of attack is just sufficient to achieve a good bond. Because zinc, unlike aluminium, is very resistant to mild alkaline conditions such as those that exist with uncured concrete, mortar and plaster, it is the preferred material for contact situations such as fence posts.

ZINCALUME® steel (and COLORBOND® steel manufactured with an aluminium/zinc/magnesium alloy-coated steel substrate), is NOT recommended for immersion in wet cement as rapid corrosion and degradation of the alloy structure will occur.

Mortar splashes arising from adjacent bricklaying operations are rarely a direct cause for concern when considering ZINCALUME® steel building frames. This appears to be associated with the low volume of the mortar splash. However, it is imperative to prevent the inundation of framing components from large quantities of uncured mortar arising from substandard bricklaying procedures.

Therefore, the recommended BlueScope product for use with uncured concrete and highly alkaline bonding materials is galvanised steel. In composite structures there is often a requirement to mix substrate types to achieve a suitable performance life. Steel fencing typically uses COLORBOND® steel infill panels because of their superior atmospheric corrosion resistance and prepainted zinc-coated steel posts to take advantage of superior performance in contact with wet concrete.

BlueScope therefore regards any construction practice which intentionally utilises aluminium/zinc/magnesium alloy-coated steel-based product for concrete formwork as sub-standard building practice.

## Soil

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The construction of gardens adjacent to buildings or fencing by placing soil directly against ZINCALUME® steel or COLORBOND® steel is specifically not recommended as corrosion and perforation of the steel will rapidly occur about the point of immersion.

Where poor detailing or subsequent low standards of maintenance lead to soil or dirt remaining in contact with bare or prepainted galvanised steel fence posts above the concrete footing, corrosion will occur. This will lead to mechanical failure.

**Figure 1: Immersed Shed Wall**



## Water

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Water storage tanks are particularly prone to aggressive immersion conditions which arise from a wide range of catchment and water quality mechanisms, resulting in variable performance when either bare zinc-coated or ZINCALUME® steel is used. BlueScope only recommends AQUAPLATE® polymer-coated steel, a polymer-laminated galvanised steel, for the purpose of water storage.

## Ponding

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Ponding occurs when water is allowed to pool on the surface of low-pitched roofing, rainwater goods and other surfaces. Accelerated corrosion of metallic coated products and prepainted products will occur as a result of ponding.

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