MONKEYTOE EBOOK 8

THE ULTIMATE DEFENSE: PROTECTING YOUR ZINCALUME & COLOURBOND ROOF

Monkeytoe

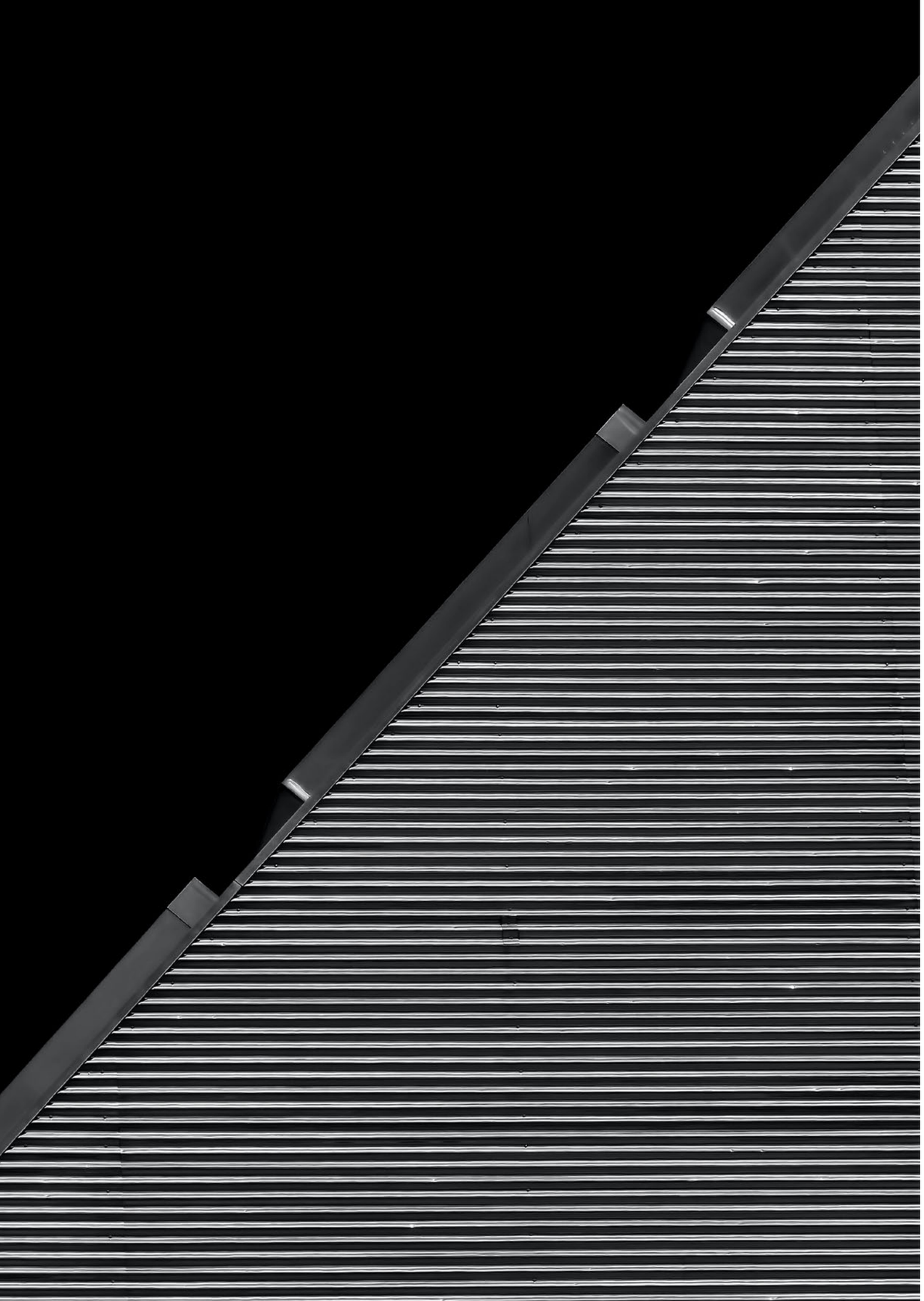
EVERYTHING BETTER

FORWARD

In Australasia, our roofs can take a hammering. As a home's first layer of weather proofing – keeping us dry, cool, and warm – ensuring your roof is installed and maintained correctly is vital.

With constant innovation in building materials, mechanical systems and building regulations, roofing systems are often compromised by poor installation practices. Almost all commercial buildings now have HVAC and ventilation equipment mounted on the roofs, increasing the chances of corrosion, if installed incorrectly. These mounting structures, the penetrations created by the installation process, and the installation work on the roof, has increased the incidence of compromised roof surfaces leading to leaky buildings and rejected roof warranties.

Monkeytoe was born from the desire to protect roofs with well-designed mounting systems that integrate with the roof without causing damage or voiding the warranty. This guide describes how metal roofing can be damaged and how you can prevent it.



THE ULTIMATE DEFENSE: PROTECTING YOUR ZINCALUME & COLOURBOND ROOF

TABLE OF CONTENTS

Monkeytoe

PROTECTING YOUR ZUNCALUME & COLOURBOND ROOF

WHAT IS ZINCALUME AND COLOURBOND?

Introduced the 1960's and 70's, Zincalume and Colourbond are now the most common roofing materials in Australia. Colourbond is a pre-painted Zincalume sheet that has a highly durable surface to withstand UV rays. Zincalume has proved to be far more durable than galvanized roofing sheets, with roofs lasting from two to four times longer. A 2014 study of older Zincalume roofs, established that the minimum service life for a well installed Zincalume roof is at least 60 years.[1]

The Zincalume coating is a mixture of aluminium, zinc and trace elements of other metals. The aluminium particles in the coating form a weak protective oxide layer on the surface of the coating, stopping corrosion in the same way as marine-grade aluminium. The zinc allows for slow corrosion and protects small superficial scratches and cut ends.

To maintain the integrity of the roofing iron surface and the lifespan, it requires a good installation, being in contact with compatible materials, and rain-washing.

While far more durable when installed correctly, Zincalume products will deteriorate more rapidly than galvanized /Galvbond if subjected to bad water runoff or if combined with the incorrect material, so correct installation is vital.[2]

[1] 2014 MCA Service life report

[2] Metal Roof Manufacturers Association NZ

WHAT CAN AFFECT YOUR ROOF?

BAD WATER RUNOFF

When rainwater runs over surfaces it can collect particles or electrical charge which can then cause accelerated corrosion. These particles include metals that are different to the roof's surface (such as stainless, brass copper, or lead runoff) or in some cases even plastics. Condensation from air-conditioning units can also cause rapid deterioration of Zincalume roofing, if draining directly onto the roof surface

DISSIMILAR METALS IN CONTACT (GALVANIC CORROSION)

When two different types of metals connect by water, physical fastening, or if a metal is close while a small amount of corrosion takes place, it will form a conductive salt that will connect the two metals, even in relatively dry weather.[3]

Of common materials found on roofs the order is from least active (more noble) to more active (less noble)

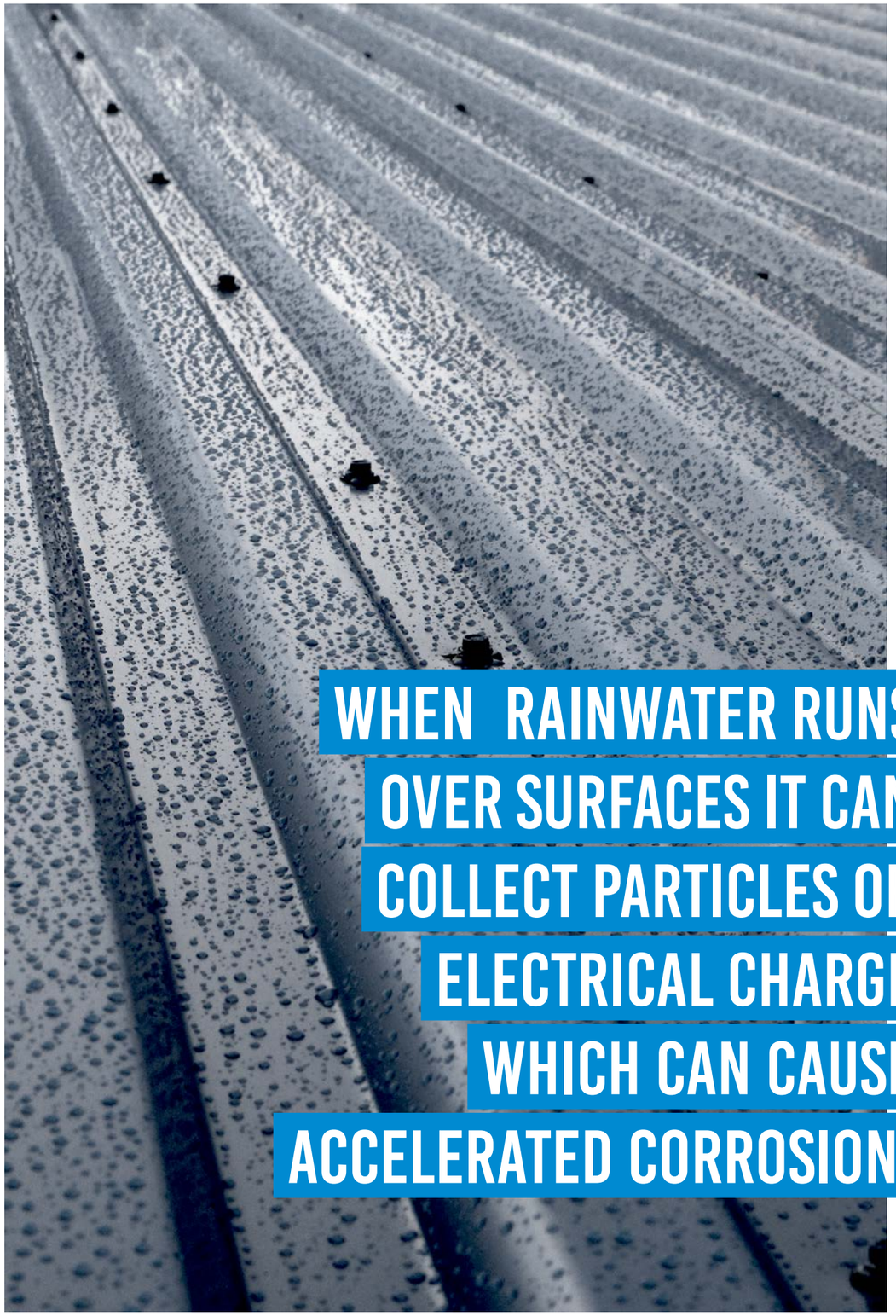
ROOFING MATERIALS GALVANIC SERIES[4]

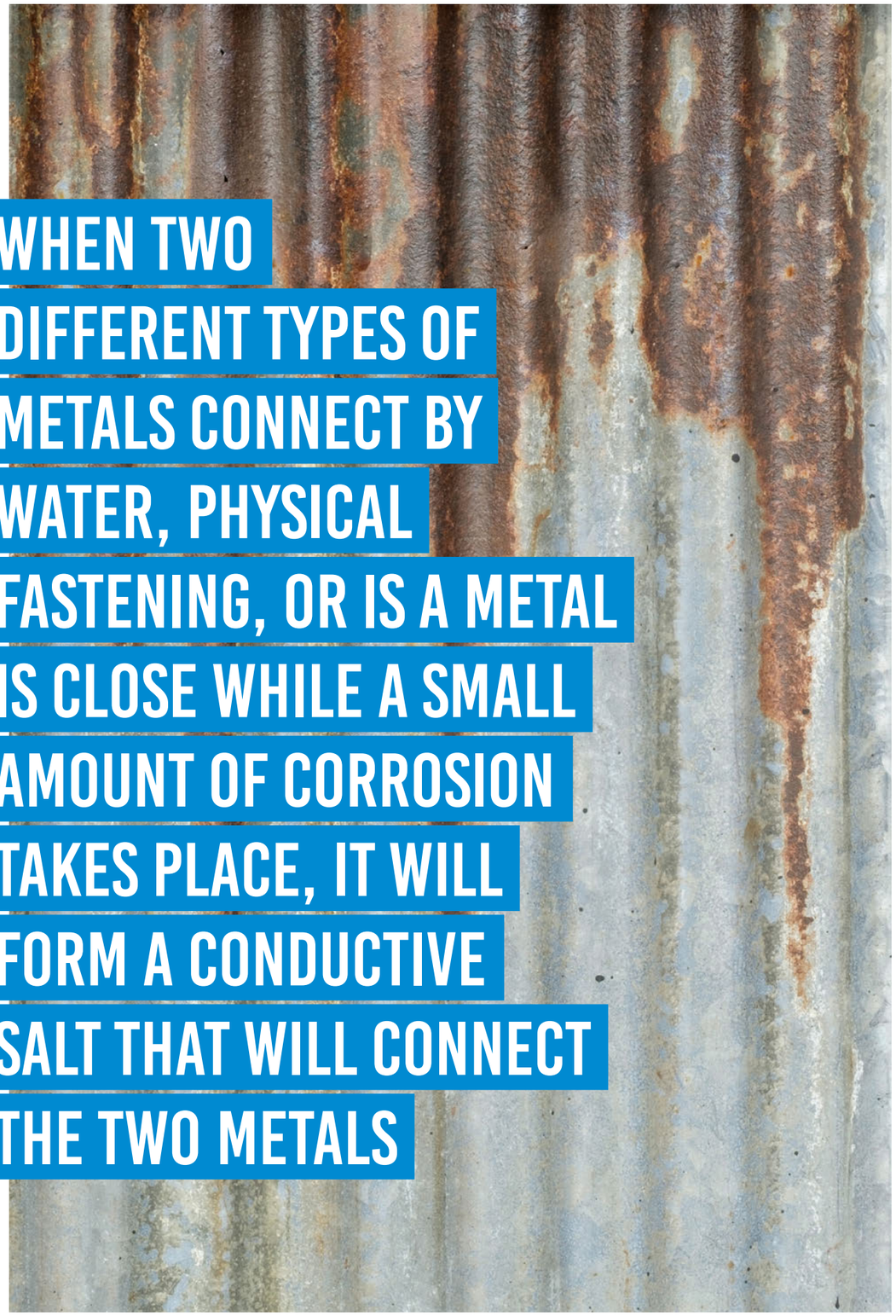
1. Zinc
2. Zincalume
3. Aluminium
4. Steel
5. Stainless Steel

LESS NOBLE METALS
MORE ACTIVE

MORE NOBLE METALS
LESS ACTIVE

[3] Iron and steel in art: corrosion, colorants, conservation. David A. Scott and Gerhard Eggert
[4] BlueScope TB25, Metal Roof Manufacturers Association NZ





WHAT CAN AFFECT YOUR ROOF?

SURFACE AREA OF OPPOSING METALS

When two different types of opposing metals join together on a roof, the corrosion process is accelerated. The amount of surface area that each metal takes up on a roof is also a factor in how quickly corrosion occurs.
For instance, a small piece of aluminium or zinc on a stainless-steel structure will corrode rapidly due to it acting as a sacrificial anode for the whole structure. In contrast stainless steel fasteners on a large aluminium structure pose no problem due to the difference in surface area that will be acting as an anode.[5]

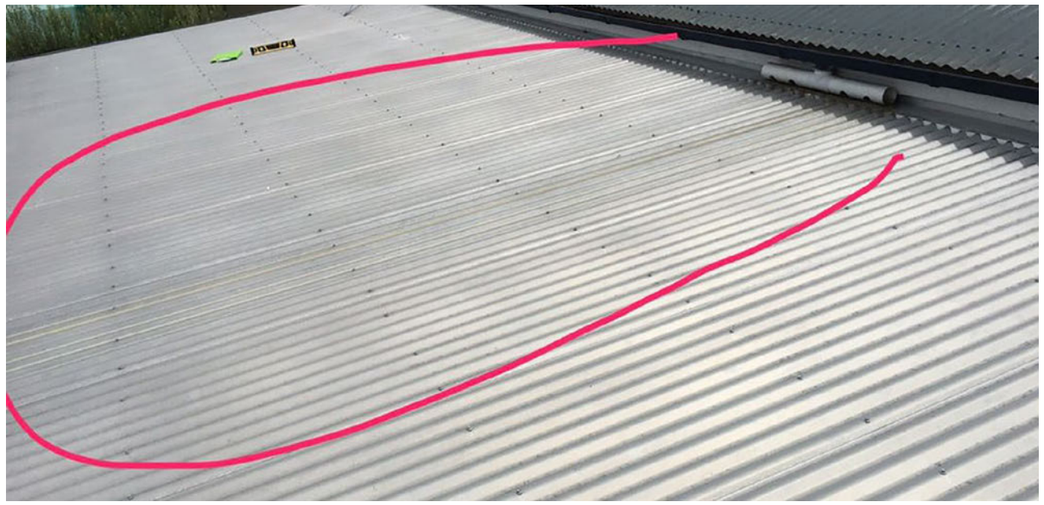


Figure 1. Runoff from the galvanized roof above is causing corrosion to start on this new Zincalume roof[8]

GALVANIZED PRODUCTS WITH ZINCALUME

Although noted by Bluescope Steel as being acceptable to use with Zincalume[6], galvanised steel will often have a detrimental effect on Zincalume. For this reason many manufacturers prohibit the use of Galvbond/ galvanized flashings with Zincalume roofs[7]. As shown in Figure 1, the galvanised iron roof above has caused rapid deterioration on a newer Zincalume roof.

[5] Australian Stainless-Steel Development Association
[6] BlueScope Technical Bulleting CTB12, NZ Steel Roofing Installers Guide
[7] Lysaght Flashing Guide
[8] Courtesy of Ambrose Building

WHAT CAN AFFECT YOUR ROOF?

UNWASHED AREAS

Areas that are not washed by rainwater, including parts covered by plant and ancillary equipment, and overhangs such as eaves and fascia linings, are more susceptible to corrosion as the unwashed areas build up dirt and corrosion salts which are not removed by rain.

Mounted equipment that is close to the roof surface such as solar panels or closed top walkways can also promote the build-up of debris resulting in leaks and accelerated corrosion[9].

CERTIFIED MOUNTING METHODS

Due to the relatively weak bond in the material protecting the surface of the Zincalume roof, this means it is more susceptible to runoff from corroded metals. Old roofing materials that are not Zincalume and that are corroding at a different rate, can cause rapid corrosion on relatively new roofing as shown in **Figure 1**.

Other items such as corroding air-conditioning units and poorly treated steel mounting systems will also have the same effect. As noted on BlueScope CTB-8, “contact with rusted or bare steel will cause rapid deterioration of the ZINCALUME® steel sheets.”

Figure 3. Insufficient corrosion protection on the mounting frame and condensate have damaged this Zincalume roof.

Figure 4. Insufficient corrosion protection on this bracket is beginning to cause roof damage.

Figure 5. Metal swarf damage due to improper work practices

SWARF DAMAGE

A significant factor that can cause corrosion is swarf staining, which is caused by metal particles accumulating during the installation of the roof. These small particles typically come from holes drilled by fasteners or penetrations in the roof surface. If left, these corrode and etch into the roof surface forming a bad rust colored stain and shorten the overall lifespan of the roof[10].

To prevent this, roofing installers always blow and rinse the roof surface as they complete each part and at the end of each day. Swarf damage is often created when other trades people work above the roof surface such as HVAC, plumbing and structural engineering. Often these trades people may not be as aware of roof damage implications and sometimes perform ‘hot work’ above the roof surface.

When hot metal particles from cutting or welding fall onto the roof surface they melt and remove the Zincalume coating exposing the unprotected steel. For this reason, Bluescope recommends all hot work be done off the roof. If it must be done, the surfaces should be fully protected with full masking that will not melt (standard plastic protective coatings film will not suffice).[11]

[9] ABlueScope Technical Bulletin TB36, NZ Steel Roofing Installers Guide
[10] Swarf and Corrosion Build AU
[11] BlueScope TB5

WHAT CAN AFFECT YOUR ROOF?

DURAGAL

Duragal was introduced to the Australian market in the 1980's by what is now Austube mills. Duragal is a zinc-based coating, pre-applied to both hollow, flat bar and angle sections. It is line applied during the manufacturing process before shipment. Duragal has revolutionized the smaller structures market and is able to be used with just touch ups at joins in low corrosive environments such as outback cattle yards and internal mechanical building services supports.

Although Duragal is a tough corrosion-resistant coating, it is not usually suitable for permanent outdoor structures, without further treatment. The manufacturer recommends, when used outdoors in metro areas of most major cities, all cut edges and fastener holes must be primed and sealed with an epoxy or urethane after cutting. All cut edges should be cleaned with power or hand tools before priming. The recommended coating is a high-grade epoxy and urethane primer, and enamel with a minimum coating thickness of over 2 mm.[12]

OUTDOOR STRUCTURES & THE BCA

The Australian Building Codes Board (ABCB) stipulate a design life for components such as roofing systems to have a design life of 15 years.[13] Using uncoated Duragal for roof mounting systems clearly results in a non-conforming building product or system.

Due to the fact it can corrode if used incorrectly, the Northern Territory Department of Infrastructure, Planning and Logistics recommends not using Duragal as a building material[14]. Fundamental Building Materials published by the Australian Institute of Architects mentions the following: "Duragal products are steel with a light galvanized coating which is not intended for long life in external building situations, but excellent for interiors and temporary work."

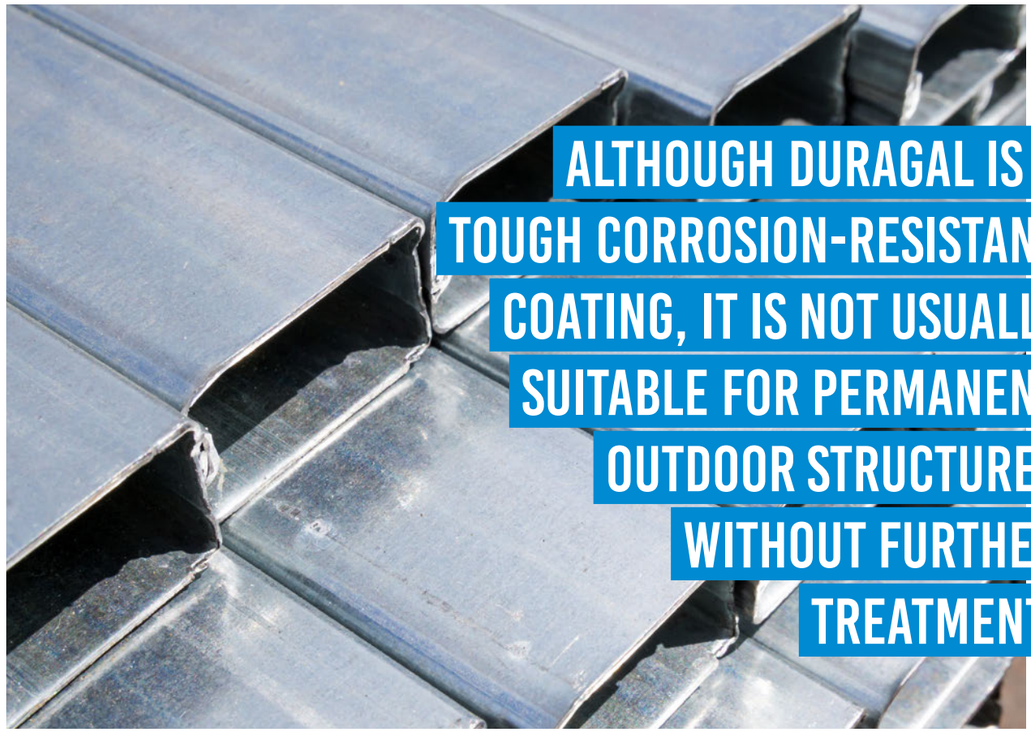
[12] Duragal Easy Painting and Corrosion Protection Guide - Marine environments as specified in the Duragal product guide states it has a design life without extra protection of just 2-5 years. Marine environments or corrosion Class C4 as defined by Duragal and AS 2312 includes the metropolitan areas of Sydney, Wollongong, Gold Coast, Perth, and New Zealand cities of Auckland and Wellington.

[13] Handbook-Durability-in-Buildings-Plumbing-Products. ABCB

[14] NT Standard Specification for Small Building works.

[15] BlueScope TB5

[16] The grinding spark temperatures are above the melting point of the zincalume coating

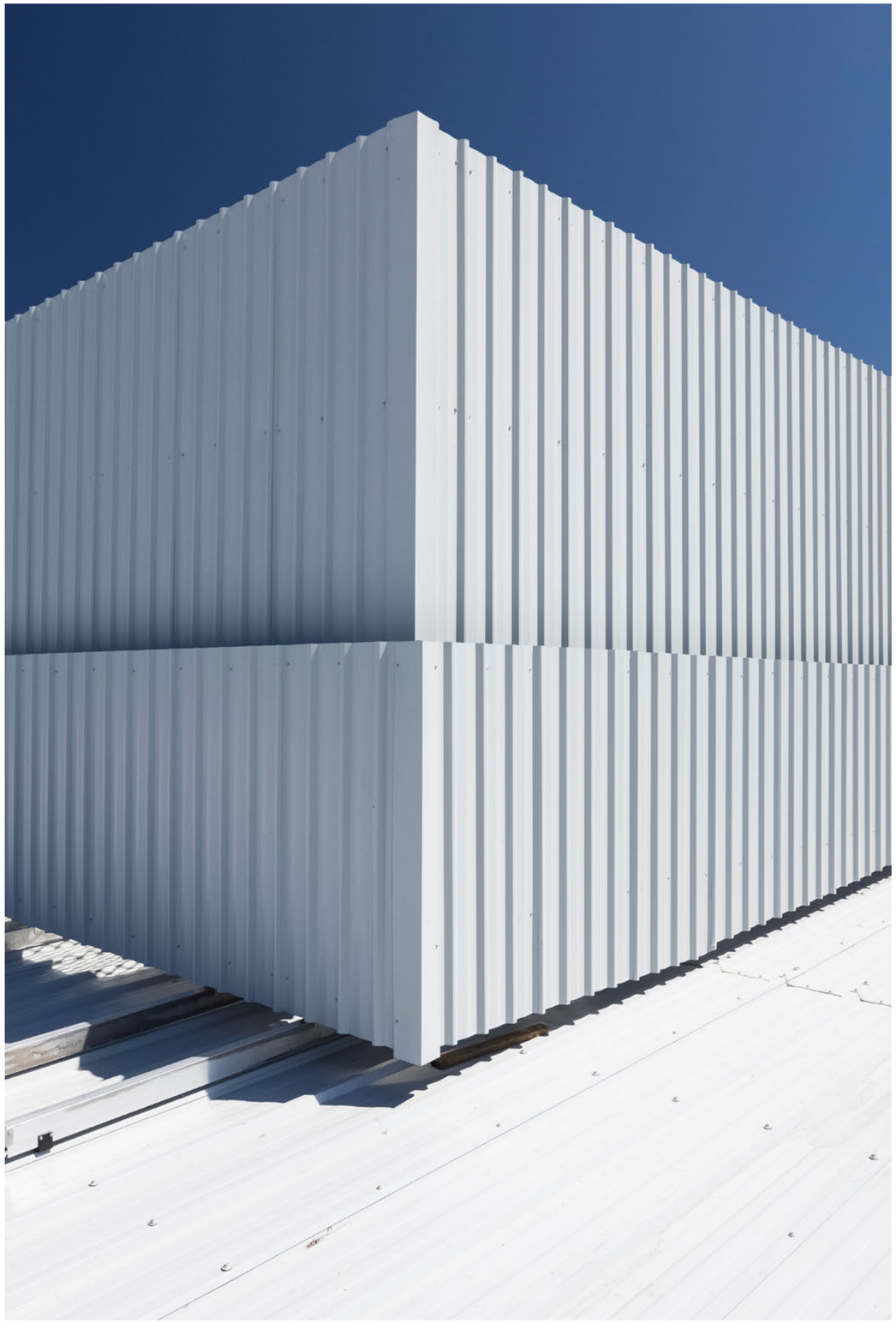


DURAGAL ROOFTOP INSTALLATIONS

When Duragal is installed above roofing surfaces, the cutting, drilling, and trimming of the product produces a large amount of hot metal swarf which ends up on the roof surface. When cut with abrasives, this is a hot work procedure which means the roof surface must be fully masked in the vicinity [15]. Red hot particles of metal falling on the roof surface, causes a complete removal of the Zincalume coating where it lands causing irreversible damage.[16]

Drilling fastener holes typically produces large shavings that can be difficult to remove without damage, producing a large amount of swarf. Even if removed from the roof, it can sometimes end up accumulating in the gutter system causing damage and premature failure.

The risks associated with lightweight Duragal structures above Zincalume roofing, far outweigh those associated with structural steel galvanized structures. The requirement for extensive drilling, cutting, and handling of many small components leads to a vast spread of small corrosive particles. Effective removal of these particles post installation is inconsistent and unreliable. As the Duragal coating is zinc, which is a less noble (more active) coating, when it's installed on a Zincalume roof a Duragal structure has the potential to become a sacrificial anode for the whole roof surface and rapidly losing its protective coating.



PROTECTING YOUR ZUNCALUME & COLOURBOND ROOF

WHAT CAN AFFECT YOUR ROOF?

ALUMINIUM STRUCTURES ON ROOFS

First introduced by Monkeytoe more than 10 years ago, lightweight aluminium mounting systems offer a reliable mounting solution that has no detrimental effect to the roofing system. Monkeytoe platforms are well isolated from the roofing sheet with insulating acyclic tape and well-regarded, structurally rated, polymer roof clips.

As it has a highly stable oxide protective coating, the marine-grade alloy we used requires no treatment when cut or drilled during the installation. Any swarf produced (which is minimal) is easily removed and does not promote staining or corrosion of the roofing sheet.

Even when cutting with an abrasive, the temperature of the swarf produced is below the melting point of the Zincalume coating, in contrast to Duragal steel sparks which can be up to 1000°C.[17]

The fact that the cutting process produces no sparks and negligible heat, negates fire risks and hot work permit requirements. Due to both its inherent corrosion resistance and the position in the galvanic series, aluminium mounting systems have no detrimental effect on the service life of Zincalume roofing.

[17] Radiance of grinding sparks J.E.Kelley

Monkeytoe

EVERYTHING BETTER