37 - GALVANIZED COATINGS AND BUSHFIRE

Unlike most other applied organic coatings used to protect steel, galvanized coatings are zinc-based metallic coatings applied to steel using a variety of technologies.

The performance of these zinc-based coatings when subjected to bushfire depends on a number of factors, not the least of which is the characteristics of the galvanized coating arising from the technology with which it is applied.

Pure zinc has a melting point of about 420°C, this a coating consisting mainly of pure zinc can be expected to start melting once this temperature is reached on the metal surface.

Many galvanized products produced by a continuous galvanizing process (sheet, coil and some tube) have a coating that is largely pure zinc and is typically 15-25 microns in thickness.

Hot dip galvanized coatings, applied by immersing batches of fabricated steel in a bath of molten zinc, are made up of zinc-iron alloy crystals with a thin coating of zinc on the surface. These zinc-iron alloys constitute 80-100% of the coating, depending on steel chemistry and some processing techniques.

These zinc-iron alloys are not only much harder than pure zinc (about 4-5X) but have a much higher melting point of around 650oC.

Typical bushfire conditions may expose steel structures to air temperature of 800°C for periods of up to 120 seconds. Depending on section thickness of the steel, the actual steel surface temperatures do not exceed 350°C for a Level II bushfire event, according to recent tests done on behalf of BlueScope Steel by the CSIRO Manufacturing and Infrastructure Technology Bushfire CRC

At the temperature of molten zinc (420°C), proof stress of the steel is reduced to 70% of its original value. At a temperature of 650°C, the steel will suffer a significant reduction in proof stress. Unlike most other metals, zinc-based coatings will vaporize at relatively low (about 950°C) temperatures and re-condense as zinc oxide fume below that temperature. This phenomenon is commonly seen when galvanized coatings are flame-cut or welded.

In addition, zinc coatings are generally reflective and being metallic, have high emissivity characteristics. For this reason, a galvanized surface will not absorb heat at the same rate as an organically coated or uncoated steel surface.

Another interesting metallurgical phenomenon takes place with galvanized coatings in that if there is any free zinc in the galvanized coating and the steel temperature approaches

CSIRO Bushfire CRC – Mogo NSW. Sureline galvanized steel poles undergoing Level 2 bushfire testing. This test simulates actual bushfire conditions and flame duration. Galvanized coating unaffected.

CSIRO Bushfire CRC – Mogo NSW. Sureline galvanized steel poles undergoing Level 3 bushfire testing. This test substantially exceeds actual bushfire conditions. Galvanized coating unaffected

but does not exceed the melting point of zinc, a `solid state' reaction takes place and the free zinc will be converted into zinc-iron alloy.

In summary, the bushfire flame duration and intensity are not high enough to compromise the structural strength of the steel. The hot dip galvanized coating will thus remain largely unaffected through a bushfire event. This has been verified in the testing of the hot dip galvanized BlueScope Sureline™ hot dip galvanized steel power poles in the CSIRO Bushfire CRC testing done in the Spring of 2005.

Timber poles following grass fire in ACT in 2003 – burnt off at base

Burning timber pole – Canberra fires – 2003.


INDUSTRIAL GALVANIZERS
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SPECIFIERS MANUAL

01 - SPECIFIERS MANUAL — THIRD EDITION

Industrial Galvanizers Australian Galvanizing Division (IGAG) operates nine galvanizing plants around Australia, ranging in size from large structural galvanizing facilities to specialised small plants designed to process small parts.

The Australian Galvanizing Division has galvanized in excess of 2 million tonnes of steel products in Australia since its first plant was commissioned in 1965 and is recognized for its ability to handle complex and difficult projects, as well as routine contracts.

This experience has been collated in the Specifiers Design Manual, to assist those involved in the design of steel products and projects to better understanding the galvanizing process and allow the most durable and cost-effective solutions to be delivered to these products and projects. All sections of this Third Edition have been completely updated and additional sections have been included to provide additional technical information related to the use of hot dip galvanized steel.

In addition to its Australian Galvanizing operations, Industrial Galvanizers Corporation has a network of manufacturing operations in Australia, as well as galvanizing and manufacturing businesses throughout Asia and in the USA.

The company's staff in all these locations will be pleased to assist with advice on design and performance of hot dip galvanized coatings and products. Contact details for each of these locations are located elsewhere in this manual.

This edition of the Industrial Galvanizers Specifiers Manual has been produced in both html and .pdf formats for ease of access and distribution and all documents in the Manual are in .pdf format and can be printed if paper documents are required.

The Specifiers Manual is also accessible in its entirety on the company's web site at www.ingal.com.au.

Additional copies of the Specifiers Manual are available on CD on request.

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