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27 June 2022

Dr Bradley Armstrong PSM
Commissioner
Anti-Dumping Commission
GPO Box 1632
Melbourne VIC 3001
By email: clientsupport@adcommission.gov.au

Dear Commissioner of the Anti-Dumping Commission

**Application seeking an exemption from anti-dumping and countervailing measures**

DE Engineers seeks an exemption from anti-dumping and countervailing measures that apply to hollow structural sections (HSS) exported from China, Korea, Malaysia and Taiwan.

Our details are as follows:

Applicant:
Kasia Nominees Pty Ltd (T/A DE Engineers)
131 Clayton Street, Bellevue, WA, 6056

Contact person:
[redacted]

Applicant's interest as an affected party:

DE Engineers is a small to medium sized business with a workforce of between 40 to 50 full time staff. The company is one of Western Australia's largest farm machinery manufacturers that sources **air blown hot dipped galvanised (HDG) 200-300g/m$^2$ pipe** (the exemption goods) for use in the production of agricultural products, including grain silo base frames.

DE Engineers has been sourcing these galvanised pipes for many years from BlueScope Steel Limited (BlueScope). It is DE Engineers' understanding that the exemption goods cannot be produced in Australia as there is no longer specific manufacturing equipment in Australia available to produce them.

**Details of other parties likely to have an interest in this exemption application and their interests in this application:**

Austube Mills Pty Ltd (ATM) is an Australian manufacturer of hollow structural sections (HSS).

Austube Mills Pty Ltd
Building 7, Industrial Drive, Mayfield, NSW, 2304

Orrcon Manufacturing Pty Ltd (Orrcon), a wholly owned subsidiary of BlueScope Steel Limited, is an Australian manufacturer of HSS.

Orrcon Manufacturing Pty Ltd
121 Evans Road, Salisbury, QLD, 4107

**Grounds on which we are seeking the exemption:**

Ground One – Like or directly competitive goods are not offered for sale in Australia to all purchasers on equal terms under like conditions having regard to the custom and usage of trade.

**Evidence that all known Australian producers have been contacted in writing:**

Orrcon, BlueScope and ATM have been contacted.

Orrcon confirmed that they are unable to offer a product suitable for our requirements and suggested following up with BlueScope.

The response from BlueScope was that Orrcon does manufacture equivalent product in size, strength, shape and coating pass per DE Engineers requirements for grain silo base frames. As noted above DE Engineers' request for details of said product from Orrcon was that no similar products are available.

ATM advised that they currently produce a minimum coating of 100g/$m^2$.

See attached:

- Confidential Attachment 1a – Orrcon
  - email correspondence – Orrcon to DE Engineers dated 9 February 2022
- Confidential Attachment 1b – BlueScope
  - email correspondence – DE Engineers to Bluescope dated 10 May 2022
- Confidential Attachment 1c – AustubeMills
  - Email correspondence – AustubeMills to DE Engineers dated 19 May 2022

**Details of the anti-dumping and countervailing measures applying to the goods:**

The goods subject to measures are described in Dumping Commodity Register - Hollow Structural Sections as follows:

Certain electric resistance welded pipe and tube made of carbon steel, comprising circular and non-circular hollow sections. Normally referred to as either CHS (circular or oval hollow sections) or RHS (rectangular or square hollow sections) collectively referred to as hollow structural sections (HSS), including CHS with other than plain ends, such as threaded, swaged and shouldered.

Finish Types

- Galvanised (including in-line galvanised (ILG), pre-galvanised or hot-dipped galvanised (HDG)); or
- Non-galvanised (including, but not restricted to, painted, black, lacquered or oiled finishes).

Sizes

- Circular products – outside diameter exceeding 21 mm up to and including 165.1 mm; or
- Oval, square and rectangular products – perimeter up to and including 1277.3 mm; that may also be categorised according to minimum yield strength, the most common classifications being 250 and 350 mega Pascals (MPa).

Tariff classifications of the goods subject to measures:

| Tariff subheading | Statistical code |
|---|---|
| 7306.30.00 | 31, 32, 33, 34, 35, 36, 37 |
| 7306.61.00 | 21, 22, 25 |
| 7306.69.00 | 10 |
| 7306.50.00* | 45* |
| 7306.61.00* | 90* |

* Note: The tariff subheadings (7306.61.00 (90) and 7306.50.00 (45)) only apply to the following exporters/suppliers:

- Dalian Steelforce Hi-Tech Co. (China);
- Tianjin Friend Steel Pipe Co. Ltd (China);
- Tianjin Ruitong Iron and Steel Co. Ltd (China);
- Roswell S A R Ltd (China); and
- Alpine Pipe Manufacturing SDN BHD (Malaysia).

For other exporters/suppliers not listed using the tariff subheadings (7306.61.00 (90) and 7306.50.00 (45)) the exemption type 'SUPPLIER' should be used.

Countries subject to measures:

- China, Korea, Malaysia and Taiwan

**Detailed statement setting out reasons for seeking an exemption:**

The exemption goods are hot dipped galvanised pipe described as follows:

Electric resistance welded pipe made of carbon steel, comprising circular and hollow sections normally referred to as CHS (circular hollow sections), RHS (square or rectangular) and trapezoidal hollow sections comprising ALL of the following:

a) an air-blown hot-dipped galvanised finish; and
b) a zinc coating mass of 200-300g/m$^2$.

DE Engineers is dedicated to building innovated products designed to make on-farm storage and products handling easier and safer for its customers. For the last 50 years our vision has never changed: to deliver **the most advanced and reliable** agricultural products to farm.

DE Engineers commenced making grain silo base frames from pipe in 1973 for the poultry industry. At that time we used black steel which was subsequently painted. The black painted steel offered very little corrosion resistance so around 1978 DE Engineers started manufacturing silo bases from air blown HDG pipe, commonly referred to as hot dipped galvanised pipe (HDGP), also referred to as water pipe, that was manufactured in Australia by Australian steel mills.

The advantage of air blown HDGP is that during the molten process excess zinc is blown off resulting in a thickness of zinc coating that is suitable for welding.

DE Engineers have been using air blown HDGP for more than 44 years and those original silo base frames are still standing and in very good condition showing minimal signs of corrosion due to the long lasting protective coating HDG has with between 200-300 grams of zinc per square metre (m$^2$).

In the last 10 years or so the Australian steel mills ceased manufacturing air blown HDGP 200-300g/m$^2$ in Australia. Despite this these Australian steel companies have continued to *supply* the growing market for air blown HDGP 200-300g/m$^2$ with **imported air blown HDGP 200-300g/m$^2$**.

Since the dumping and countervailing measures were imposed on HSS in 2012
DE Engineers continued to source air blown HDGP with a zinc coating mass of 200-300g/m$^2$ mostly from BlueScope. It is DE Engineers' understanding that BlueScope part owns a steel mill in China that exports to Australia and supplies a major percentage of HDGP 200-300g/m$^2$ to Australian steel manufacturers for distribution to the Australian market.
DE Engineers also imports HDGP from China with other Australian suppliers of pipe importing from Pakistan, India, Korea and Vietnam.

DE Engineer's uses the imported air blown HDGP zinc coating 200-300g/m$^2$ because Australian made Duragal® or ALLGAL® tube (also referred to as pre or in-line galvanised tube) has a maximum zinc coating of 100g/m$^2$ or less and consequently does not have the corrosion resistance for agricultural products that are exposed to the elements. Our customers expect our silos and their frames to last at least 50 years.

Our preference is to make silos with Australian made HDGP zinc coating 200-300g/m$^2$. The commercial reality is that for the last 10 years or so we have been manufacturing agricultural products with **imported** HDGP zinc coating 200-300g/m$^2$ because that is what the Australian steel companies are supplying.

It seems absurd that imported inputs to Australian manufacturing attract dumping and countervailing duties when the Australian steel industry made a commercial decision to cease the manufacture of those goods in Australia and invest in a mill in China that manufactures and exports to Australia huge quantities of air blown HDGP zinc coating 200-300g/m$^2$.

In 2014 Kasia Nominees applied to the Anti-Dumping Commission (commission) for an exemption for certain hot-dipped galvanised circular hollow sections (HDG CHS). The commission initiated an inquiry[1].

Following the initiation the definition of the exemption goods was revised to the following

> *electric resistance welded pipe made of carbon steel, comprising circular and hollow sections normally referred to as CHS (circular hollow sections) having a hot-dipped galvanised (HDG) finish, and a nominal size (NB) of either 25, 32, 40 or 50 millimetres exported to Australia from China, Korea, Malaysia and Taiwan comprising ALL of the following:*
>
> > *a) an air-blown hot-dipped galvanised finish;*
> > *b) a zinc coating mass of 200-300g/m$^2$.*

In summary, ATM objected to an exemption being granted because:

- air blown HDG HSS would compete in the same market as pre and in-line galvanised CHS and batch-galvanised HDG CHS
- air blowing is merely an additional process to control the thickness of zinc on the surface of the CHS
- 'air blown" HDG CHS is a direct substitute for Duragal® and Duragal Plus® galvanised CHS that ATM manufactures domestically, as well as the batch-galvanised HDG CHS manufactured by ATM and an external galvaniser
- Duragal® and Duragal Plus® products can and have been used as a substitute for HDG CHS and it is only in the marine environment for medium to long term applications that Duragal® and Duragal Plus® are not substitutable for HDG CHS.

The commission found that:

- there is an Australian industry producing like or directly competitive goods
- those goods are offered for sale in Australia to all purchasers on equal terms under like conditions having regard to the custom and usage of trade
- the conditions for granting an exemption are not satisfied.

DE Engineers is seeking another exemption inquiry on effectively the same goods on the basis that:

- there are **distinct markets** for air blown HDG HSS, pre and in-line galvanised CHS and batch-galvanised HDG CHS
- the finding that air blowing is merely an additional process to control the thickness of zinc on the surface of the CHS is incomplete

[1] Anti-Dumping Notice No. 2014/14

- 'air blown' HDG CHS is **not** a direct substitute for Duragal® and Duragal Plus® galvanised CHS that ATM manufactures domestically, as well as the batch-galvanised HDG CHS manufactured by ATM and an external galvaniser
- typically Duragal® and Duragal Plus® products **are not used** as a substitute for HDG CHS. It is **not correct** that only in the marine environment for medium to long term applications that Duragal® and Duragal Plus® are not substitutable for HDG CHS.

**Australian Market**

The Australian market for HDG CHS products comprises:

- **imported** air blown HDG CHS
- pre or in-line galvanised CHS
  - ALLGAL® manufactured by Orrcon
  - Duragal® and Duragal Plus® manufactured by ATM
- batch-galvanised HDG CHS manufactured by ATM coated by an external galvaniser.

It is DE Engineers' understanding that sales of **imported** air blown HDG CHS are **substantial** indicating there is a significant and distinct market for air blown HDG CHS and it is disingenuous for the Australian industry to claim that imported air blown HDG CHS **competes** in the same market as Australian made pre and in-line galvanised CHS and batch-galvanised HDG CHS. Remarkably the size of the market for air blown HDG CHS and the market demand for this product was not addressed in the Final Report for Exemption Inquiry EX0015[2].

The exempt goods are a significant product often distributed by the Australian industry. At Confidential Attachment 2 is an email showing that [redacted]

The fact that [redacted] which is only part of the Australian industry, imports and distributes significant quantities [redacted] of air blown HDGP pipe compared to their sales of Australian made product of comparable size, contradicts the Commission's 2014 finding that substitutable goods are produced in Australia. The reality is there is a significant and distinct market for air blown HDGP that the Australian made pre and in-line galvanised CHS and batch-galvanised HDG CHS is not fit for purpose.

**Imported air blown HDG versus Australian manufactured HDG**

The following table is a comparison of imported air blown HDG CHS and Australian manufactured pre or in-line galvanised CHS and batch galvanised HDG CHS.

[2] Final Report – Exemption Inquiry EX0015

| Product | Imported air blown HDG CHS | ALLGAL® | Duragal® /Duragal Plus® | **Batch-galvanised HDG CHS manufactured by ATM and an external galvaniser** |
|---|---|---|---|---|
| Manufacturer in Australia | No | Yes (Orrcon) | Yes (ATM) | Yes, Black pipe (ATM), "batch" galvanised by external provider |
| Australian Standard | AS1163 C250 | AS4750-2003 Electrogalvanised (zinc) coatings | AS/NZS 1163 - Cold-formed structural steel hollow sections<br><br>AS/NZS 4792 - Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process | |
| Finish types | Air blown HDG CHS | Pre or in-line galvanised CHS | Pre or in-line galvanised CHS | Batch galvanised HDG CHS |
| Zinc coating mass | 300g/$m^2$ on each side | 50g/$m^2$ on each side | Duragal® 100g/$m^2$ on the outer surface only<br><br>Duragal Plus® 100g/$m^2$ on each side | Minimum 500-600g/$m^2$ on each side |
| Able to be manipulated (bent and shaped) | Yes | Yes | Yes | **Cannot** be readily manipulated |
| Able to be directly welded | Difficult | Yes | Yes | **Cannot** be directly welded |
| End use | Open to weather environments (submerged or water based environments) | Not terrain based applications, cannot be exposed to the weather or the ground | Not terrain based applications, cannot be exposed to the weather or the ground | Open to weather environments |

| | | | | |
|---|---|---|---|---|
| Suitability for production of grain silo base frames | Highly suitable for a water based environment.<br><br>Expect grain silo base frames with such a coating to last 50+ years. | A coating of 50g/m$^2$ is not suitable for a water based environment.<br><br>Expect grain silo base frames with such a coating would require replacing in 8 years. | A coating of 100g/m$^2$ is not suitable for a water based environment.<br><br>Expect grain silo base frames with such a coating would require replacing in 15 years. | Not suitable – unable to weld. |
| Estimated market share galvanised HSS supplied for the manufacture of a **welded** product | Significant | Moderate | Moderate | **Nil** |

DE Engineers is aware that there has been much discussion over the years between the commission and the Australian steel manufacturers regarding the substitutability of Australian manufactured pre or in-line galvanised CHS or batch galvanised HDG CHS for imported HDG.

DE Engineers notes from the commission's record of meeting[3] with the then Onesteel Australian Tube Mills on 15 April 2014 (as part of the exemption inquiry EX0015) that:

- Duragal® is no longer supplied
- HDG CHS is not able to be easily welded.

DE Engineers notes that in the ATM visit report for Investigation 254[4] (HSS from Thailand) ATM presented photos to the ADC purporting to show that pre-galvanised products are used in substitution for HDG products as per the following extract from the visit report.

> ATM also showed a number of photos of fencing applications where pre-galvanised SHS was used for a fence and HDG CHS was used for another fence only a couple of metres apart. ATM argued that these photos prove that pre-galvanised products are used in substitution for HDG products. These photos are at **Attachment GEN 9**.

DE Engineers has reviewed the photos supplied by ATM (see Attachment 3) which is a copy of Attachment GEN 9, ATM Visit Report, INV 254) and disagrees with ATM's claim that these photos prove that pre-galvanised products are used in substitution for HDG products. The picture with pre-galvanised posts (Photo 3) shows a newly constructed fence with no corrosion and this is compared to a picture of and a fence with HDGP (Photo 2) that could be 30 years old with rust stains down the side. On close inspection (Photo 2) you can see

[3] EPR, EX00015, No. 9 Note for File – ADC meeting with Australian Industry
[4] EPR, INV 254, No 19 ATM Visit Report, page 19

that the rust stain on the HDG pipe post is from the wire that is fixed to the poles and the HDGP poles are actually in good condition. It is worth noting that the wire fence has a similar coating to pre and in-line galvanised tube so what the photos are actually showing is that there is a significant difference in corrosion resistance between pre and in-line galvanised and HDGP.

DE Engineers is an SME manufacturer of silo base frames. These silos are dual purpose, storing grain and granulated fertiliser. For our silo frames to meet our standards and reputation we expect them to last at least 50 years. The purchase of a silo is a significant investment for our farmers and **we require a galvanised product with a zinc coating of at least 200-300g/m$^2$**.

Batch-galvanised HDG CHS manufactured by ATM with zinc coating by an external galvaniser is not an option for the following reasons:

- batch galvanised HDG CHS (500-600g/m$^2$) **cannot** be welded and to do so would be poisonous for the operator
- our silo frames are too large to batch dipped post manufacture.

At Attachment 4 is an article published by United Steel, New Zealand that includes a graph showing the linear relationship between the thickness of the zinc coating and the service life of the coated steel. It clearly shows the thicker the zinc coating the longer the service life of the coated steel.

In summary, ALLGAL®, manufactured by Orrcon and Duragal® and Duragal Plus® products manufactured by the ATM, **cannot** be used in the manufacture of agricultural products that are exposed to the elements. A zinc coating up to only 100g/m$^2$ is not thick enough to protect the silo frame without extra painting which is expensive and still does not have the corrosion resistance of hot dipped (cold blown) galvanised pipe.

DE Engineers does use some Australian made in-line galvanised tube trapezoidal in shape, in the production of grain silo frames but has found the coating to be ineffective when exposed to the environment. See Attachment 5, Picture 2 which shows significant corrosion on a Duragal® section that has been exposed to the environment for less than 15 years. The issue with such corrosion is that once the zinc coating is gone the steel structure will corrode compromising the structural integrity of the silo.

In 2016 DE Engineers trialled making silo base frames from hot dipped Duragal® silo section, dipped in molten zinc with a zinc coating in excess of 500g/m2, but found it nearly impossible and dangerous to weld.

In 2018 DE Engineers re-formed imported 50nb HDGP cold blown into the required trapezoidal shape with excellent results but reforming was expensive and did not have the correct shape (see Attachment 5, Picture 1). DE Engineers continued to use Australian made Duragal® to which we acid wash, wipe clean then paint with a zinc rich paint (see Attachment 5, Picture 3) to provide some extra corrosion resistance but the cost of painting was uneconomical and the finish still not acceptable.

In May 2022 DE Engineers imported HDG trapezoidal hollow section with a hot dipped cold blown finish. This is the imported product, the subject of this application, which is not

manufactured in Australia has a zinc coating of 200-300m$^2$ and is expected to increase the life of our silo by 2-3 times!

Attachment 6, Picture 4 shows images of an Australian made grain silo with the silo frame constructed from Australian made SHS Duragal® approximately 15 years old that has severe corrosion (rust) on the vertical legs and ring beam which is also made from Duragal®. Compare this to the DE Engineers' silos in the same Attachment 6, Picture 1 made from air blown HDGP with 300g/m$^2$ galvanised pipe legs that is nearly 40 years old and Attachment 6, Picture 2 a HDG pipe base silo around 30 years old with little or no sign of corrosion (rust) on the pipe frames.

Storing of fertiliser in silos is promoted on DE Engineers website at: http://www.deengineers.com.au/products/fertiliser-silos/. Grain silos by their very nature are often installed on farms where sheep and cattle often move under silos for shade exposing them to animal waste. All DE Engineers silos are recommended to store granulated fertiliser and have often been installed within one km from the coast and near lakes.

Attachment 7 is a copy of Orrcon's ALLGAL® Product Catalogue. The following excerpt[5] from page 7 states that:

> Environments susceptible to acid rain, chemical spillage, animal waste, fertilisers and particularly those within one kilometre of coastal areas or other salt laden environments such as inland seas and lakes are considered harshly corrosive and are not suitable for ALLGAL unless further corrosion preventative measures are taken such as painting with an epoxy, polyurethane, oil-based topcoat or powder coating.

This is confirmation in writing by Orrcon that ALLGAL® is **not suitable** for the manufacture of our grain silos.

Also on Page 7 of Orrcon's ALLGAL® Product Catalogue (refer Attachment 7) it states that ALLGAL® must have further coatings, whereas HDGP does not. In terms of the farms where our silos are placed rain water often ponds inside the base ring of a silo when dirt, dust of grain is trapped when bolted to its concrete foundation making ALLGAL® again unsuitable for grain silos as per Orrcon's brochure instructions. See the following excerpt[6]:

[5] Orrcon ALLGAL® Product Catalogue, Page 7 (Refer Attachment 7 to this application)
[6] Orrcon ALLGAL® Product Catalogue, Page 7 (Refer Attachment 7 to this application)

### Additional Precautions when Installing ALLGAL Products in the Ground

As with all galvanized products, the following precautions should be followed to obtain best results when installing ALLGAL in the ground:

- Prior to installation, coat section of steel in contact with concrete or earth with a bitumen-based paint product such as Ormonoid according to the manufacturer's directions for use. Bitumen paint should ideally coat 100mm of the steel above ground so as to ensure that moisture does not remain in contact with the steel.
- In addition, where ALLGAL products are installed into concrete piers, ensure the top of the concrete pier is above ground level providing a barrier between the earth and steel. Ensure the top of the concrete pier slopes away from the ALLGAL product to allow water and moisture to run away from the base of the steel.
- Under no circumstances should water or moisture be allowed to pond around the steel.

The fact is HDGP cold blown does not require further coatings and can sit in water for many years with little risk of corrosion.

In contrast to Orrcon's pictures in Attachment 5 demonstrating HSS used as fence posts and the record of meeting with the commission in April 2014 (Attachment 8) where it is claimed that Duragal Plus CHS is directly competitive with HDG CHS in numerous applications, please see Attachment 9 where an independent engineering firm with more than 20 years of experience specialising in structural engineering for residential commercial and industrial projects has published an article on steel posts Duragal® versus hot dipped galvanised pipe and details how Duragal® should not be used in contact with the ground.

Attachment 10 is the Duragal® Painting and Corrosion Guide. Page 5 notes that salts deposited by animal urine and faeces, farm chemical over spray, aerial fertiliser and crop dusting over spray, other fallout from industrial farm operations. The guide goes on to recommend that special precautions need to be taken to protect steel work that is exposed to salt contamination as well as those sections in contact with soil or concrete. The recommendation is that the Duragal product be painted and a barrier coat applied.

At Attachment 11, which is an article sponsored by Austube Mills from March 2015, the graph on page 3 clearly shows the zinc coating life of Duragal® with a thickness of 100g/m$^2$ lasting less than 10 years compared to HDGP with a thickness of 300g/m$^2$ lasting 20-30 years. Below the graph the article notes Duragal® is popular for use in roofing, flooring, column applications in buildings, posts, caravan chassis, trailers, large and small signage, gym and recreational equipment and many fencing applications.

DE Engineers notes that nearly all these uses are either indoors or undercover while not exposed to the environment. While DE Engineers does not argue that Duragal® can be used

for outdoor fencing or signage, we note that it is not recommended by industry to be used without further corrosion protection and it only has a 10 year lifespan.

As per the recommendations in advertised publications from the Australian steel industry pre-or inline galvanised products made in Australia such as Allgal® and Duragal®/Duragal Plus® are unsuitable for the manufacture of grain silos and other agricultural products being exposed to the environment, fertiliser either stored of airborne particles, used near animals or in contact with the ground or concrete footings.

**Summary**

For this application DE Engineers has applied for an exemption for the following goods:

> Electric resistance welded pipe made of carbon steel, comprising circular and hollow sections normally referred to as CHS (circular hollow sections), RHS (square or rectangular) and trapezoidal hollow sections comprising ALL of the following:
>
> a) an air-blown hot-dipped galvanised finish; and
>
> b) a zinc coating mass of 200-300g/$m^2$.

It is DE Engineers' position that all air blown HDGP (200-300g/$m^2$) hollow sections of any size and shape that are used in the construction of grain silos and other agricultural products should be exempt as they are **not manufactured in Australia** and the pre or in-line galvanised CHS that is manufactured in Australia is **not substitutable.**

Since 2014 DE Engineers has sourced the exemption goods through the distributors linked to Australian HSS manufacturing as well as importing directly from overseas suppliers. DE Engineers' understanding is that the exempt goods supplied by the Australian HSS manufacturers are **not manufactured in Australia**. The supplied goods are sourced from overseas and distributed by the Australian industry. These imported goods service a specific market requirement and do not compete with the Australian made HSS which is **not fit for purpose**.

The imposition of anti-dumping measures on products not manufactured in Australian unnecessarily increases the costs of local manufacturing which flows into unnecessary price increases to our customers.

Should you have queries regarding this application please do not hesitate to contact me.

Yours sincerely

[redacted]

**List of Attachments**

- Confidential Attachment 1a - email correspondence – Orrcon
- Confidential Attachment 1b - email correspondence – BlueScope
- Confidential Attachment 1c - email correspondence – ATM
- Confidential Attachment 2 – Sales quantities of HDGP vs ALLGAL
- Attachment 3 – Copy of Attachment Gen 9 - ATM Visit Report - INV 254, EPR Doc No 19
- Attachment 4 – United Steel article on the different types of galvanising for steel protection
- Attachment 5 – Photos showing Duragal silo section
- Attachment 6 – Photos showing HDGP cold blown silos vs square tube silos
- Attachment 7 – Copy of Orrcon ALLGAL product catalogue
- Attachment 8 – Copy of OneSteel ATM and ADC record of meeting, EX00015, EPR Doc No 9
- Attachment 9 – Cormell Engineers article on Duragal vs hot dipped galv
- Attachment 10 – Duragal Painting and Corrosion Guide
- Attachment 11 – Austube Mills expands production capacity for DuraGal

PUBLIC FILE

Attachment 3

# Attachment GEN 9

**Photographs provided by ATM showing pre-galvanised HSS and HDG HSS products used in fencing side by side.**

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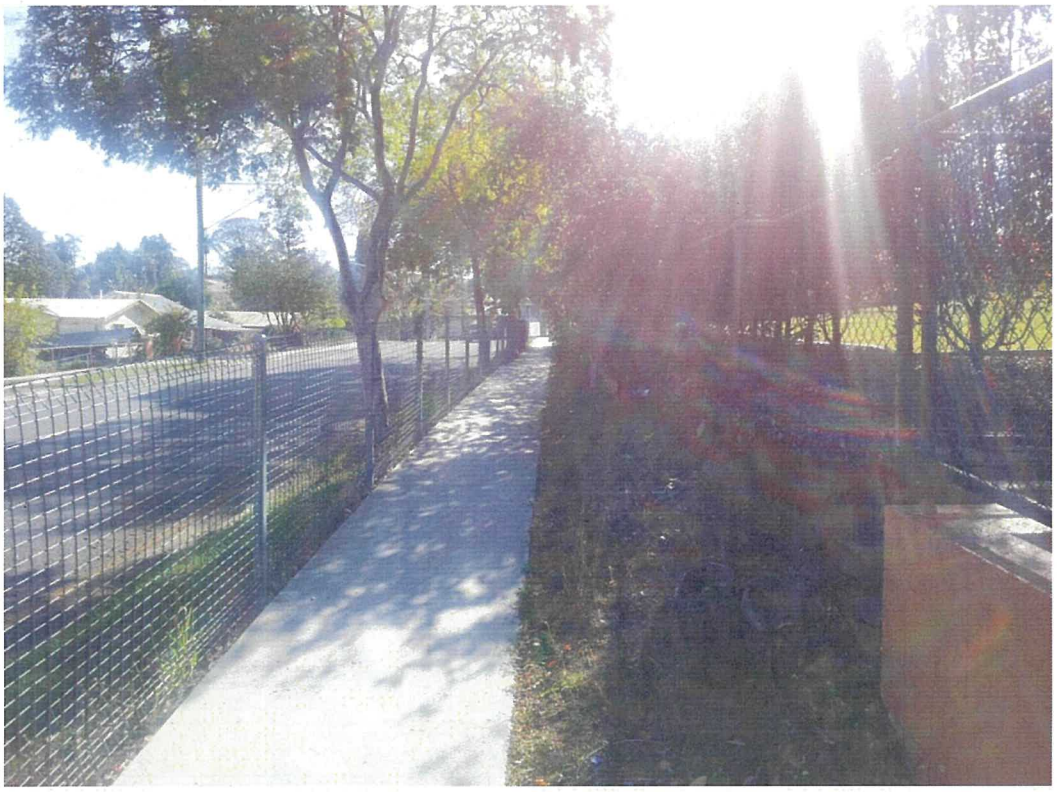


**Photo 1 – Picture showing two fences. The fence to the right of picture has HDG air blown pipe as posts and the fence to the left of picture has pre-galvanised SHS posts**

**Photo 2 – Close up picture of fence with HDG air blown pipe as posts**

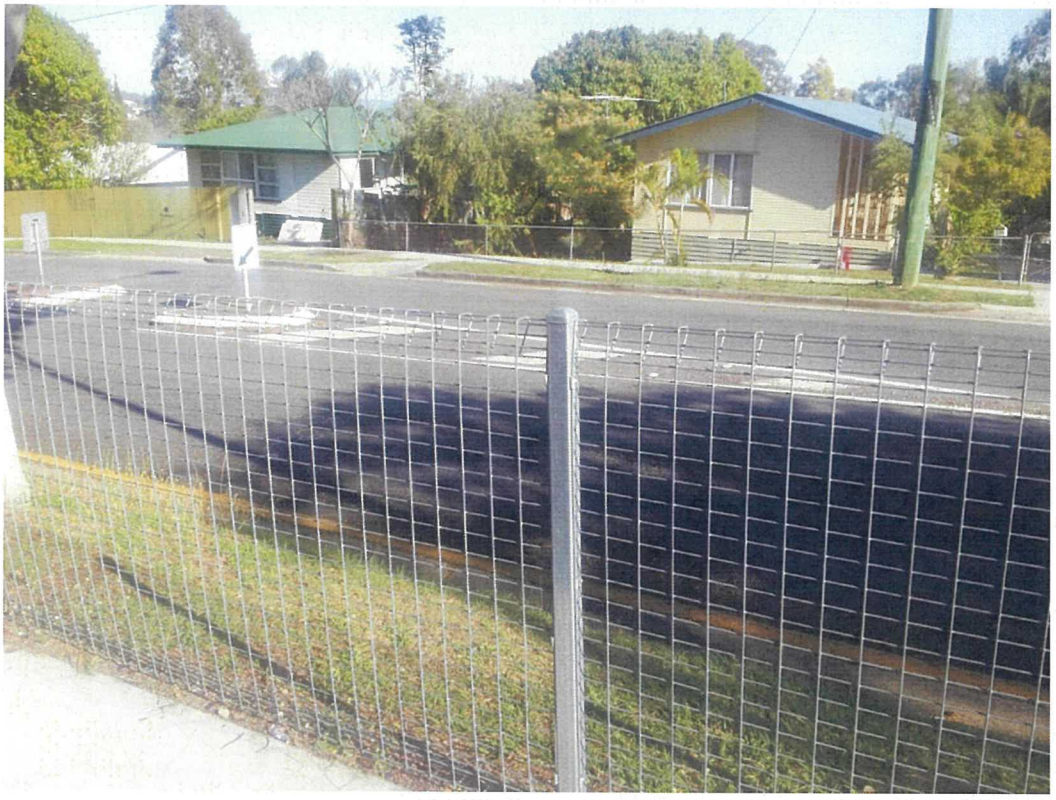
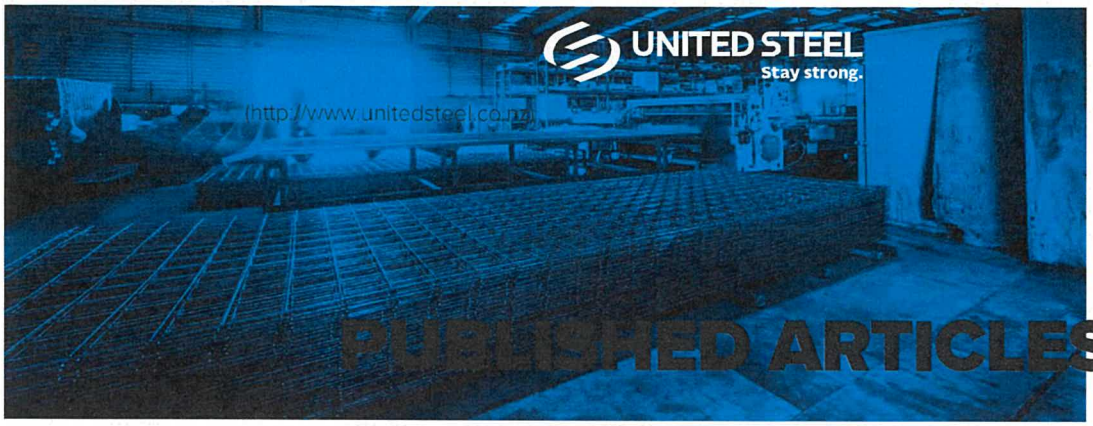


Photo 3 – Picture of fence with pre-galvanised SHS as posts

Photo 4 – Close up picture of pre-galvanised SHS fence showing weld repair strip on left hand side of product






# Galvanised Steel - Hot-dipped, PreGalv, DuraGal or AllGal?

## The different types of Galvanising for steel protection

Feb 16, 2021

A number of different forms of galvaniszing are used to protect steel from rusting (oxidation). Different forms of galvanizing offer different levels of protection and, consequently, make the product protected suitable for differing applications.

We notice some confusion out there with regards to the different types of Galvanising. This is not made any easier with the use of trade names, such a DuraGal & AllGal, to describe similar products.

To clear up some of the confusion the main galvanising types are described here, and we also provide an overview of the level of protection provided by the different forms of galvanising.

In this article we discuss:

- How Galvanising Protects (/articles/typessteelgalvanising/#_GalvProtect)
- Types of Galvanising (/articles/typessteelgalvanising/#_GalvTypes)
- Galvanising Standards (/articles/typessteelgalvanising/#_GalvStd)
- United Steel's Galvanised Product (/articles/typessteelgalvanising/#_GalvProduct)

On reading the full article you should have an improved understanding of the different forms of galvanising, and have some links to useful guidelines & references.

# How Galvanising Protects

Galvanising provides three different types of protection for steel (https://galvanizeit.org/hot-dip-galvanizing/why-specify-galvanizing/corrosion-protection). These include:

- Firstly, physical or barrier protection, by enveloping the steel in a coating of zinc, which oxidises at a slower rate than steel. The rate of oxidisation of zinc is 1/17 (https://www.galvanizing.org.nz/docs/Design-for-Galvanizing.pdf)$^{th}$ to 1/18$^{th}$ (https://www.galvanizing.org.nz/docs/Design-for-Galvanizing.pdf) that of steel (https://www.galvanizing.org.nz/docs/Design-for-Galvanizing.pdf).
- Secondly, chemical protection, by using the principles of "Cathodic Protection" (https://www.galvanizing.org.uk/cathodic-protection/), where even when the physical envelop is compromised exposing the steel, the surrounding zinc will still oxidise in preference to the exposed steel.
- Thirdly, the Zinc Oxide on the surface of the galvanised steel undergoes further reactions with compounds in the atmosphere (i.e. water and carbon dioxide) to form a stable film, which enhances the barrier protection properties. This stable film is known as a Zinc Patina, it takes 6-12 months to develop, has a matt grey colour, is made from Zinc Carbonate, and has a corrosion rate of 1/30$^{th}$ that of steel (https://galvanizeit.org/hot-dip-galvanizing/why-specify-galvanizing/corrosion-protection).


When Galvanising is applied with the batch Hot Dipped (HD) Galvanising (https://www.galvanizing.org.nz/docs/Design-for-Galvanizing.pdf) process a mechanically hard coating is produced that has excellent resistance to abrasion and mechanical damage. Batch processed HD Galvanising creates a four layer metallurgically bounded barrier. The layers consist of a Zinc/Iron alloy, and the iron composition of the alloy is highest in the layers closest to the steel surface. Two of the middle layers have a surface hardness that is greater than the underlying steel.

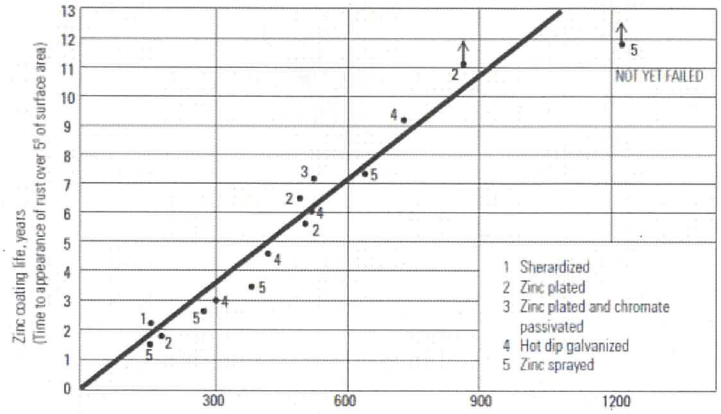
If the physical barrier created by galvanising is damaged, Cathodic Protection has the ability to protect exposed areas of steel up to a width or diameter of 5mm (https://www.galvanizing.org.uk/cathodic-protection/). There is also the possibility of a degree of self-healing. Thus, Cathodic Protection can offer a limited amount of protection when galvanised steel is cut or drilled.

# Types of Galvanising

Galvanising can be applied to the steel using a variety of processes including, for example, Hot-Dipping, Electroplating and In-Line Galvanising. A number of different forms of galvanising are discussed in this section.

The level of protection offered by galvanising is most influenced by the thickness of the zinc coating applied, rather than the method of application. The following graph, from the ***British Iron & Steel Research Association***, demonstrates the linear relationship between the thickness of the zinc coating and the service life of the coated steel. A number of different galvanising processes are plotted, with the thickness of the zinc coating on the horizontal axis and service life on the vertical axis.

## Service life test results, various zinc coatings




There are three primary processes used to Galvanise bar, hollows & plate, of which the greatest percentage is hot-dipped galvanised. There are two types of hot-dipped galvanising – batch & continuous. The three types of galvanising and their characteristics are:

- **Hot-Dip Galvanising (https://www.galvanizing.org.nz/docs/Design-for-Galvanizing.pdf):** This is the most familiar form of galvanising, where steel items are galvanised in batches, by dipping them in a bath of molten zinc or zinc alloy (https://www.galvanizing.org.nz/docs/20016GANZBrochureHR.pdf). When the steel surface comes into contact with the molten zinc a chemical reaction takes place to form the zinc-iron alloy layers described in the previous section. With this process the galvanising thickness is determined by the mass of the steel being galvanised (https://gaa.com.au/types-of-galvanizing-and-other-zinc-coatings/), and as a consequence an operator independent standard minimum coating is applied. This process allows objects that are a variety of complex shapes to be galvanised inside and outside in one operation. The molten zinc is able to cover corners, seams & rivets, seal edges & penetrate recesses unlike some other forms of galvanising. The galvanising is also slightly thicker on corners and narrow edges, giving greater protection than organic anti-corrosion treatments.
- **Continuous Galvanising Processes:** Is also known as pre-gal, in-line or mill galvanising. In this galvanising process, continuous ribbons of steel & steel plate are run through a molten zinc bath at speeds of around 180m/sec, molten zinc on the surface is cleaned off using a gas knife to provide a tightly controlled coating thickness & surface finish. The length of time in the zinc bath is much shorter than in the batch process (2-4s vs 4-8mins) and as a consequence the metallurgy is different, with the surface coating being almost pure zinc. The softer surface coating means steel galvanised in this manner can be worked without cracking the coating, but it is less abrasion resistant. These thinner coatings may require supplementary protection for outdoor exposure.
- **Electro-Galvanising: (https://galvanizeit.org/corrosion/corrosion-protection/zinc-coatings/electroplating)** Is a form of galvanising where steel is placed in a zinc salt solution, and an electric current is passed through the solution to deposit a layer of zinc on the surface of the steel. The terminals used to introduce the electric current into the steel, are the steel itself (cathode) & an inert anode or sacrificial zinc anode. The positively charged zinc particles (ions) are attracted to the negatively charged steel. The zinc layer deposited using electro-galvanising is thinner, has a more aesthetic appearance (i.e. bright & uniform), is softer and is more ductile than with other methods. Electro-galvanised sheet is often used in the manufacture of car & truck bodies.

Continuously Galvanised products are often sold under a variety of trade-names, such as AllGal, DuraGal, GalForce, and Flo-coat to describe the coating. These products can have differences in terms of the galvanising process, galvanising thickness, interior treatment for hollows (e.g. paint or galvanising), and supplementary exterior coatings that are applied to further protect the product.


**Continuous Galvanising Line**

Other types of Galvanising (https://www.galvanizing.org.uk/metal-finishes/) that are used for protecting steel from corrosion include:

- **Thermal Spray or Metallising**, where semi-molten zinc is sprayed onto the surface of the steel. This process has the advantages that thick coatings can be applied and coatings can be applied in the field, but obtaining internal & sharp edge/corner coverage is difficult.
- **Sheradising**, where the part to be coated is heated while being placed in a rotating steel drum with zinc powder. The zinc evaporates and bonds to the steel surface. The coating thickness is related to the time in the drum. This method is often used to coat fasteners (e.g. screws) & has a hard dull grey finish.
- **Mechanical Plating (Peen plating)**, where the part to be coated is rotated in a drum with zinc powder and glass-beads. The glass beads press the zinc powder into surface of the part to be coated. This method is also often used to coat fasteners, and in particular threaded components or those requiring close tolerances.
- **Zinc Rich Paints**, where zinc dust is suspended in a paint solution. These paints are used for repair of damaged galvanised coatings or on-site protection of large structures

# Galvanising Standards

There are a number of standards (https://gaa.com.au/hot-dip-galvanizing-standards/)covering the different types of galvanising applied to "off-the-shelf" and fabricated product. These standards provide guidance on the types & thicknesses of galvanising to be applied in different environments, the galvanising manufacturing processes & tolerances, and the design of items to be galvanised. Specifically:

- AS/NZS2312 (https://www.galvanizing.org.nz/docs/An_Introduction_to_New_Standards.pdf) - "Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings" provides guidelines on the design of steel parts to minimise corrosion and to ensure effective application of galvanised coatings. It also provides guidance on the influence of different environments on corrosion, corrosion maps for different locations in NZ, and the life to first maintenance of different galvanising processes, with specified minimum coating thicknesses in the different environments. This standard comes in three parts, Part 1 covers paints, Part 2 covers HD, and Part 3 covers Thermal Sprays
- NZS 3404.1 - Steel Structures Standard, has an appendix covering the corrosion protection of steel structures.
- AS/NZS 4680 - Hot-dip galvanised (zinc) coatings on ferrous fabricated sections. Describes the composition of the molten zinc in the galvanising bath, information to be supplied by the purchaser of the hot-dipping service, draining & venting requirements, testing and inspection of hot-dipped galvanised items, acceptable renovation of uncoated areas, & provision of a certificate of compliance when required. The testing & inspection includes the surface finish and the thickness of the coating. The purchaser needs to provide the standard to which the HD process is to conform (i.e. NZS 4680), and may include information such as the composition of the base metal, special pre-treatments, and required finish
- AS/NZS 4792 - Hot-dip galvanised (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialised process. This includes hollow sections galvanised on both surfaces in a specialised plant, made by welding pre-galvanised steel strip; and galvanised on external surfaces only, within a continuous (in-line) process.
- AS 4750 - Electro-galvanised Coatings on Ferrous Hollow and Open Sections
- AS 1397 - Hot dipped zinc coated and aluminium/zinc coated sheet & strip covers the requirements for the composition & properties of the base steel, and coating mass requirements for different steel thicknesses.
- Other standards exist for galvanising tube & pipe, and fasteners. Examples include, AS/NZS 4534 for continuously galvanised wire, AS/NZS 1559 for hot-dip galvanised steel bolts and AS/NZS 1214 for hot-dip galvanised coatings on threaded fasteners

In test certificates you may see reference to coating designations that are of the form, for example, Z100. Coating designations of this form are from International Standards such as ISO 3575 and ASTM A653 (http://www.unitedmetalproducts.info/sites/default/files/downloads/ASTM_A_653_REDLINE.pdf) (ASTM is the American Society of

Testing & Materials (https://www.astm.org/Standards/A653.htm)). The letter relates to the composition of the coating (i.e. Z for Zinc & ZF for Zinc Iron Alloy) and the number relates to the thickness of the coating in g/m2. A Z100 coating is typically 7 micro m thick (https://www.ssab.com/products/steel-categories/metal-coated-steels/coatings/zinc-coating) on both sides.

# United Steel Galvanised Product Overview

United Steel stocks various galvanised steel products, which includes:

- Square (categories/40/galvanised-shs/) & Rectangular Hollow Sections (categories/41/galvanised-rhs/) (SHS & RHS), which are predominately continuous or electro- galvanised product, with HD available in a few sizes. The continuous & electro- galvanised product has coatings described by a variety of tradenames and an overview of these is provided later in this section.
- Pipe (categories/28/pipe-galvanised/), which is HD galvanised to NZS1074
- Tube (categories/209/galvanised-round-tube/)
- Sheet is available in both continuous (categories/24/galvanised-sheet/) & electro galvanised (categories/23/electro-galv-sheet/). Both types of sheet are available in a range of thicknesses from approximately 0.6mm to 3mm.
- Angles are HD galvanised, with Equal Angle (categories/187/galvanised-equal-angle/) available in a range of sizes from 20x3 up to 125x10, and Unequal Angle (categories/188/galvanised-unequal-angle/) available from 100x75x6 up to 125x75x10.
- Flats (categories/226/galvanised-flat-steel/)are HD galvanised and available in a range of sizes from 25x3 to 100x10.
- Reinforcing Bar is HD galvanised
- Reid Bar (categories/63/reid-bar/) is HD galvanised

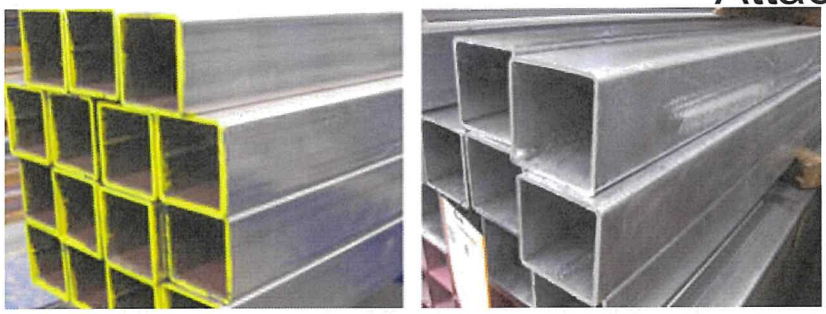
United Steel is able to supply Brick & Block Lintels, by cutting and drilling Hot-Dipped Galvanised Angle to the customer's requirements.

**Hot-Dipped Brick and Block Lintels**

The different tradenames, for the galvanising coatings applied to product such as SHS, include:

- ALLGAL (https://www.orrconsteel.com.au/products/coatings-finishes-available/allgal), which has an electro-galvanised high purity zinc coating applied to both sides of the sheet feedstock, before it is cold formed into hollow section. The weld is then restored with zinc alloy applied by thermal spray and the hollow is coated in a Clear-Tec clear polymer protective coating. Thus, all ALLGAL products are protected from corrosion on the inside and out. The minimum average zinc coating weight is 50 g/m2 on the inside and outside (https://www.orrconsteel.com.au/sites/default/files/2020-06/2020-OR-ALLGAL-Data-Sheet-Final_0.pdf). The galvanising complies with NZS 4750
- DuraGal (https://www.infrabuild.com/en-au/products-services/products/duragal-galvanized-steel-rhs-and-shs-structural-tu/) are cold formed hollow sections that are hot dip galvanised to AS/NZS 4792 and have a minimum average coating mass of 100 grams per square metre applied to the exterior of the section. DuraGal is made from hot rolled coil that is in-line galvanised.
- DuraGal Plus - 100 grams per square metre minimum average coating mass (internally and externally). DuraGal is made from pre-galvanised Hot Rolled Coal. The galvanising complies with NZS 4792
- GalForce™ (http://www.steelforce.com.au/rs/7/sites/647/user_uploads/File/3922-SFC-GalforceBrochure-web.pdf), which is manufactured from HD galvanised steel strip, and so is galvanised on both the inside and outside. The galvanising complies with NZS 4792

The different mills in Australasia and Asia tend to use feedstock with one of the above coatings, or are licenced to produce feedstock coated with one of the above coatings. Thus, the coatings will differ from steel producer to steel producer.



**Continuous Galvanised and HD Galvanised SHS**

As can be seen United Steel stocks a variety of galvanised products, coated using a variety of different processes, including the more durable Hot-Dipped galvanised product (https://cornellengineers.com.au/steel-posts-duragal-vs-hdgalv/). United Steel is happy to discuss your galvanised product requirements with you, and advise the product options best aligned to your needs.

For more information about how we can bring added value to your project, contact our specialists on **0800 800 649 (tel:00640800800649)**

## FIND US

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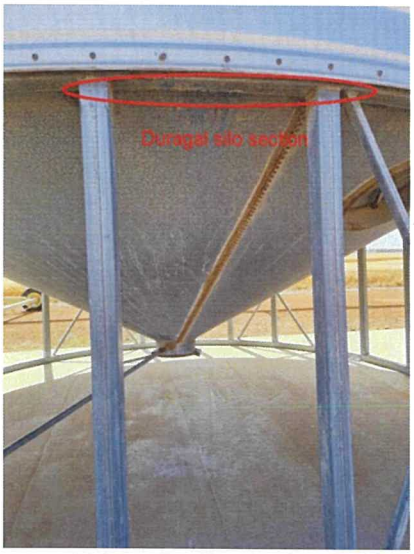
New Zealand manufacturers of reinforcing mesh and suppliers of reinforcing rod, steel plates, structural steel, and wide range of other steel and wire product

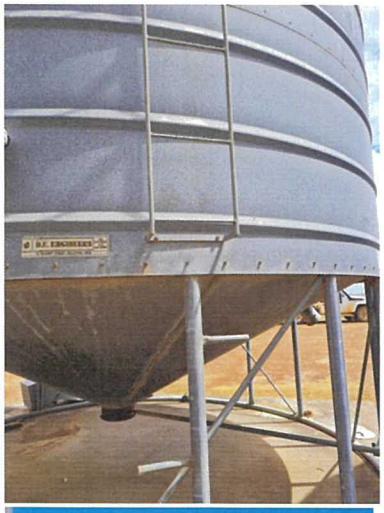
Picture 1. Silo section Hot Dipped with zinc coating of 300-700g/m2.




Picture 2. Duragal® Silo section with significant corrosion.

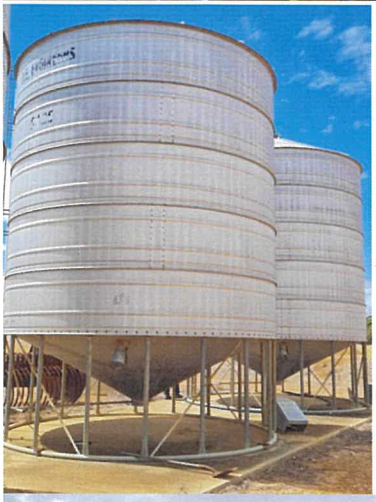
Picture 3. Duragal® silo section being painted to increase corrosion resistance. The cost of painting was not economical and the finish was not acceptable in terms of the level of corrosion resistance required.

# Attachment 6 - HDGP cold blown silos vs ALLGAL® square tube silos

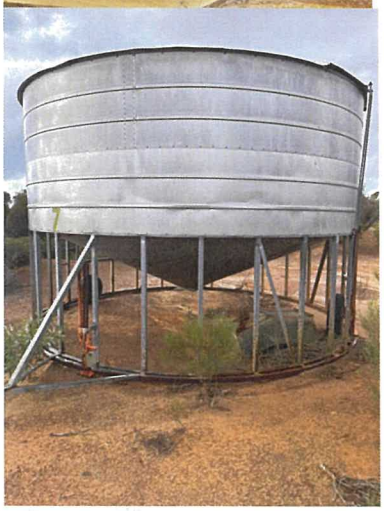


Picture 1. This picture shows a HDGP (200-300 g/m$^2$) silo around 40 years old with a little bit of zinc oxidisation and no rusting of steel underneath.

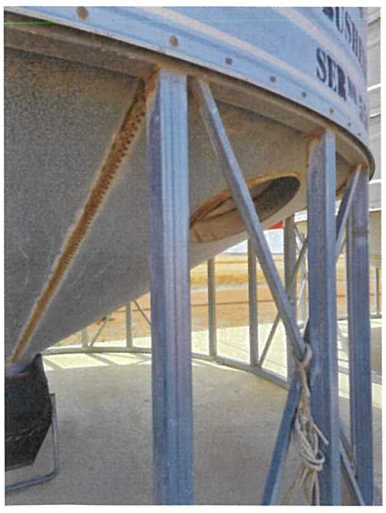
Note there is staining from the ALLGAL® square tube above it at the top.



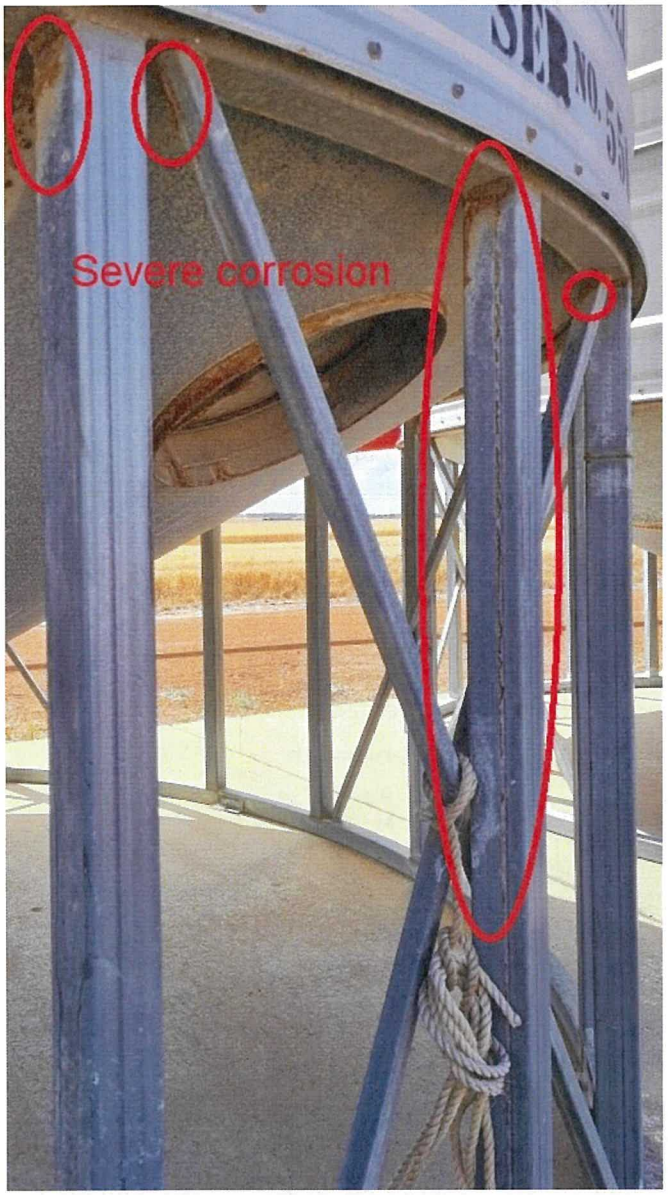
Picture 2. This picture shows a HDG pipe (300 g/m$^2$ zinc coating) silo around 30 years old with no sign of corrosion on the silo frame.



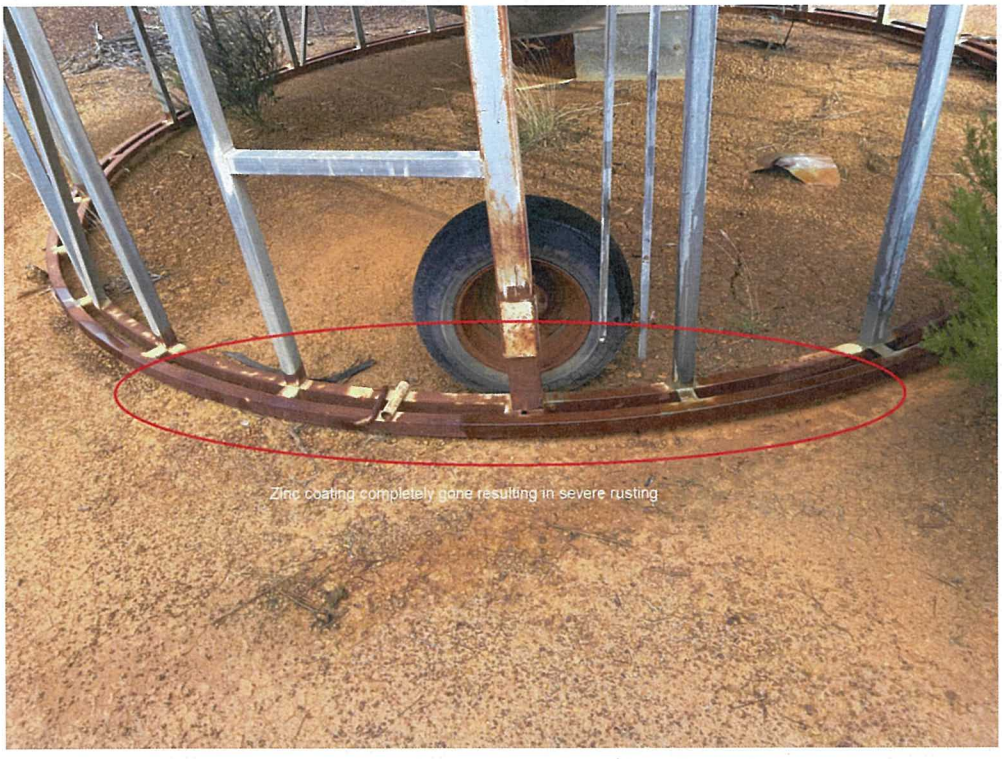
Picture 3. This picture shows an older silo made from ALLGAL® square tube with the zinc coating completely gone on the base ring and substantial corrosion on the legs compared to pipe frame silos.



Picture 4. This picture shows a relatively new silo around 15 years old made from ALLGAL® with significant corrosion of the silo legs.




Picture 5. This picture is a close up of rusted Duragal® 15 year silo stand.




Picture 7. This picture is a close up of rusted Duragal® silo stand.

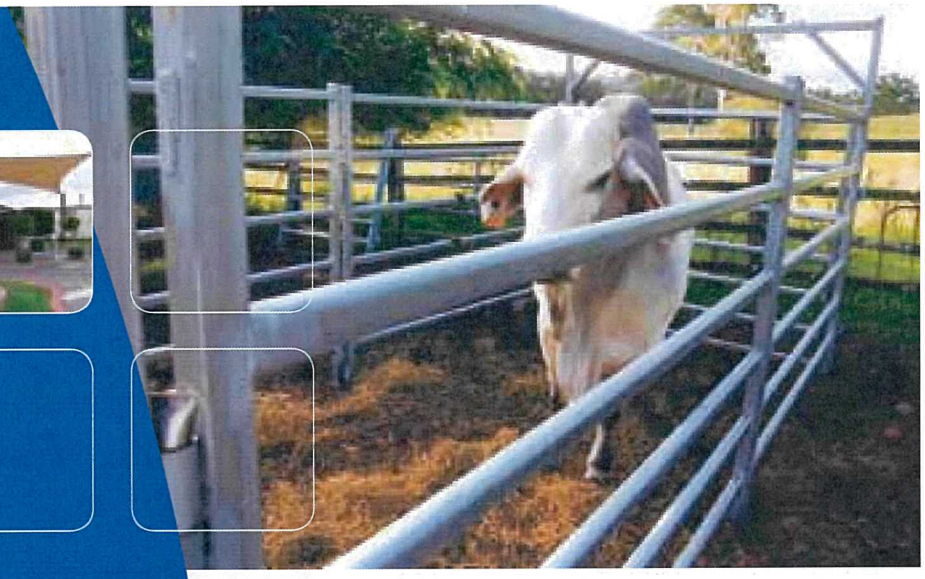
Attachment 7

ALLGAL
PROTECTION INSIDE AND OUT

# Product Catalogue

Orrcon Steel

we'll see it through



ALLGAL
PROTECTION INSIDE AND OUT

# A Leading Australian Manufacturer of Structural Steel Hollow Section

Orrcon's ALLGAL steel hollow sections offer fabricators, builders and manufacturers so many benefits that it is now one of the leading range of zinc coated tubulars available on the Australian market today.

Whether it be a shade structure, cattle yard, bus shelter, floor framing or fence post, ALLGAL is now specified and used in a myriad of applications across Australia and New Zealand.

ALLGAL combines the strength and durability of structural steel with the corrosive protection properties of our unique duplex coating system which comprises a uniform and consistent electrogalvanized zinc coating and Clear-Tec clear polymer protective coating.

## What makes ALLGAL® a Better Alternative?

ALLGAL is an excellent alternative to other in-line galvanized and hot-dip galvanized steel sections because:

- ALLGAL provides sound corrosion protection in mildly corrosive environments
- ALLGAL is faster, safer and easier to weld
- ALLGAL is easier and faster to laser process
- ALLGAL provides for a superior paint and powdercoat finish
- ALLGAL's zinc coating is easy to repair
- ALLGAL is safer to handle
- ALLGAL is available in Minipak quantities
- ALLGAL is available in a larger size range than other in-line galvanized steel hollow sections

## Sound Corrosion Protection

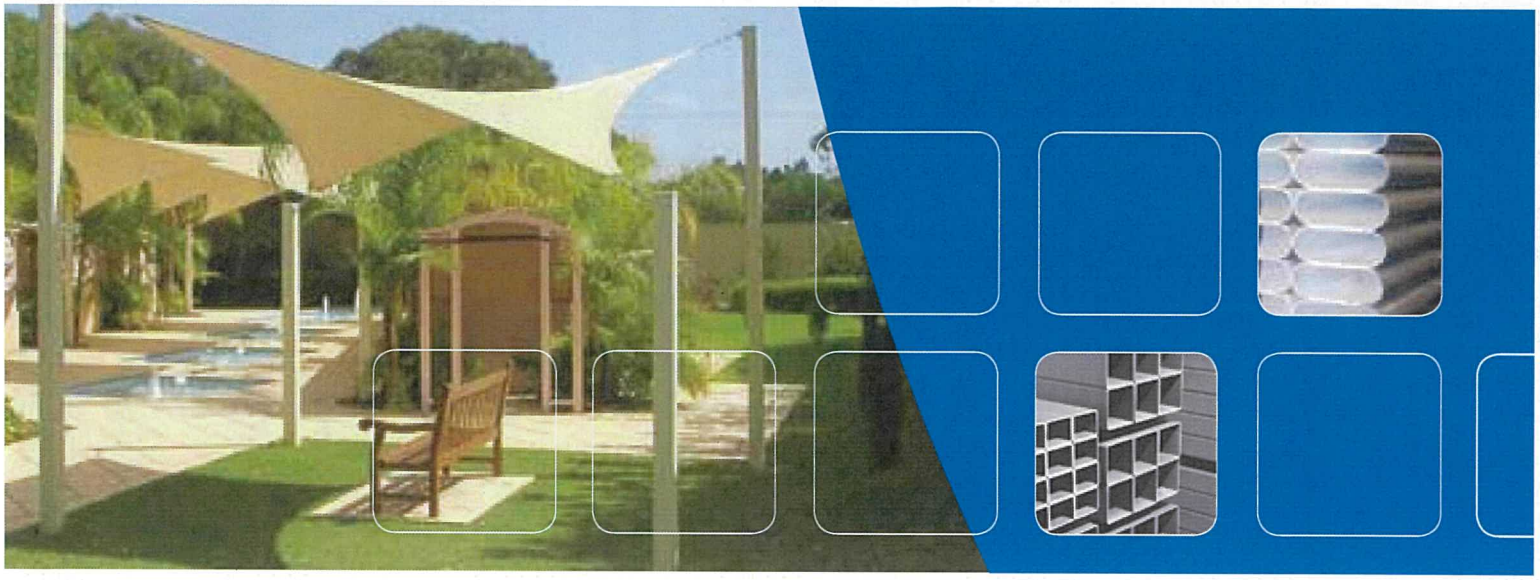
ALLGAL's zinc coating combined with its Clear-Tec polymer coating results in a steel hollow section product which possesses sound corrosion protection properties in mildly corrosive environments.

ALLGAL is suitable for use in moderate to severe environments when top-coated in accordance with the following standard - AS/NZS 2312:2002.

Because ALLGAL is manufactured from steel which is zinc coated with high purity zinc on both sides prior to being cold-formed into hollow section, all ALLGAL products are protected from corrosion on the inside and out.

Although white rust is evidence that the zinc coating is doing its job, ALLGAL's Clear-Tec polymer coating increases the time before white rust commences.

The combination of high purity zinc and Clear-Tec results in ALLGAL products offering corrosion protection properties comparable with other galvanized products containing a higher zinc coating weight.



## Faster, Safer & Easier to Weld

The thickness of ALLGAL's protective zinc coating is uniform and consistent making it easy to weld and causes considerably less weld spatter than hot-dip galvanized products.

ALLGAL's Clear-Tec polymer coating makes welding easier and cleaner as it reduces the potential for weld spatter to adhere to the steel section's surface.

Unlike hot-dip galvanized coated steel products which emit abundant potentially harmful fumes during welding, ALLGAL's protective zinc coating is lead free making welding safer.

ALLGAL is faster to weld than most other in-line galvanized and hot-dip galvanized steel sections as it can be welded at the same speed and setting as standard primed steel hollow sections.

ALLGAL is also easier to weld than most other in-line galvanized and hot-dip galvanized steel sections because arc initiation is similar to that of primed sections.

## Easier and Faster to Laser Process

ALLGAL's smooth and consistent zinc coating thickness results in ALLGAL being up to 20 percent faster in terms of laser cutting compared to in-line galvanised, hot-dip galvanized and painted steel hollow sections.

## Superior Paint and Powdercoat Finish

ALLGAL's unique smooth and consistent zinc coated surface provides an ideal substrate for powder-coating compared to hot-dip galvanized steel products which can be prone to surface unevenness and flaking.

## Safer to Handle

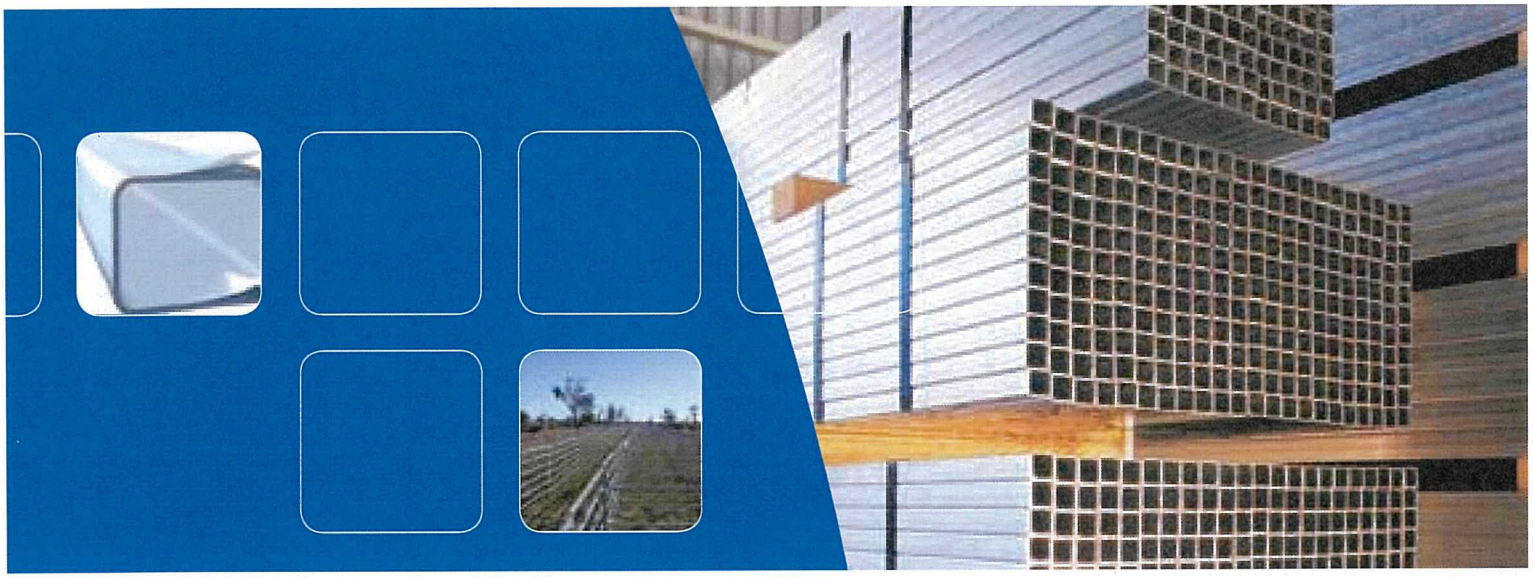
The smooth surface finish of ALLGAL products makes them safer to handle than traditional hot-dip galvanized products which often contain sharp protrusions caused by the galvanizing process.

## Easy to Repair & Apply Additional Zinc-based Paint Coatings

There may be situations where the repair or (re)application of additional protective zinc-based paint coatings to ALLGAL products may be required.

Liquid ALLGAL has been developed by Orrcon to complete the ALLGAL system.

Liquid ALLGAL is Orrcon's high content and high purity zinc-based cold galvanized protective paint coating product specifically designed for use on Orrcon ALLGAL steel hollow sections. When used in accordance with the manufacturer's instructions, Liquid ALLGAL provides an effective method of repair and maintenance of ALLGAL's protective zinc coating and provides an excellent colour match. Liquid ALLGAL is available in 400 gram net aerosols and 20 litre drums.



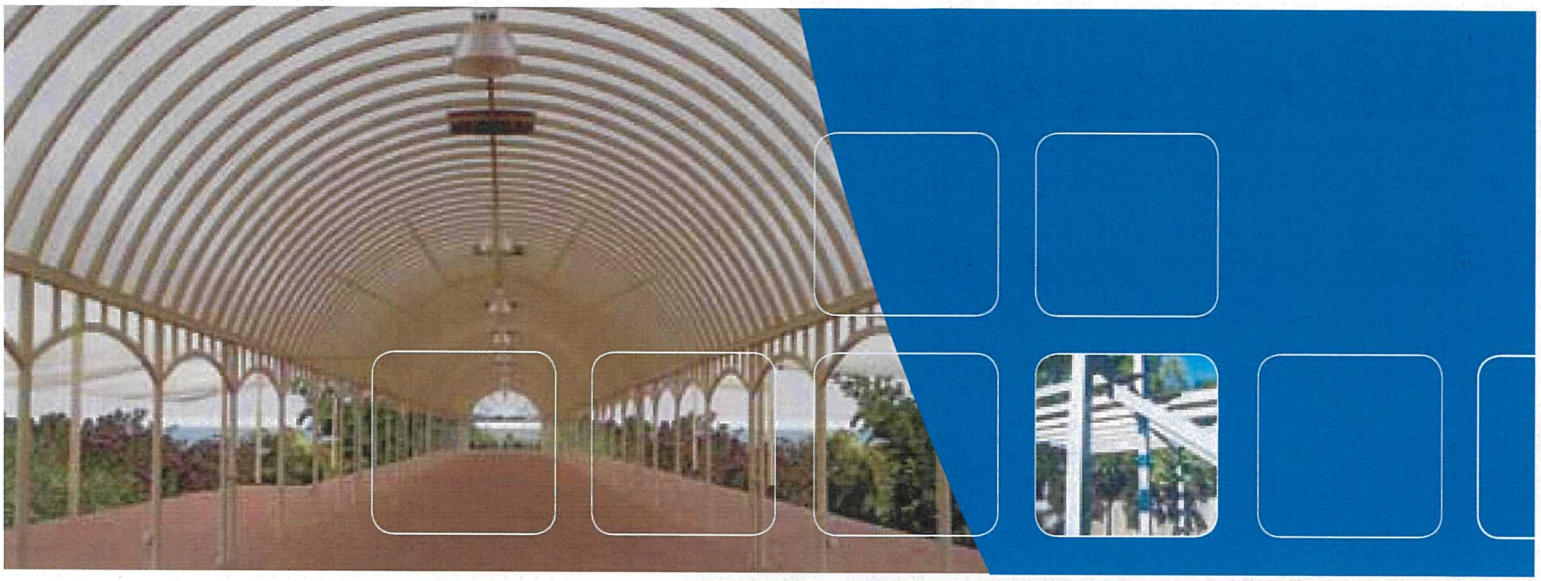
## Product Availability and Size Range

All ALLGAL products are available in MiniPak quantities (approximately half the quantity of full packs) which means customers can hold smaller stock quantities.

ALLGAL is available in a larger range of sizes compared to other in-line galvanized products.

| CIRCULAR HOLLOW SECTION | | | | | |
|---|---|---|---|---|---|
| NB (mm) | OD (mm) | t (mm) | | ALLGAL (Grade C350L0) | ALLGAL (Grade C250L0) |
| 20 | 26.9 | 2.0 | XL | ✓ | |
| 20 | 26.9 | 2.3 | L | ✓ | |
| 20 | 26.9 | 2.6 | M | | ✓ |
| 25 | 33.7 | 2.0 | XL | ✓ | |
| 25 | 33.7 | 2.6 | L | ✓ | |
| 25 | 33.7 | 3.2 | M | | ✓ |
| 32 | 42.4 | 2.0 | XL | ✓ | |
| 32 | 42.4 | 2.6 | L | ✓ | |
| 32 | 42.4 | 3.2 | M | | ✓ |
| 40 | 48.3 | 2.3 | XL | ✓ | |
| 40 | 48.3 | 2.9 | L | ✓ | |
| 40 | 48.3 | 3.2 | M | | ✓ |
| 50 | 60.3 | 2.3 | XL | ✓ | |
| 50 | 60.3 | 2.9 | L | ✓ | |
| 50 | 60.3 | 3.6 | M | | ✓ |
| 65 | 76.1 | 2.3 | XL | ✓ | |
| 65 | 76.1 | 3.2 | L | ✓ | |
| 65 | 76.1 | 3.6 | M | | ✓ |
| 80 | 88.9 | 2.6 | XL | ✓ | |
| 80 | 88.9 | 3.2 | L | ✓ | |
| 80 | 88.9 | 4.0 | M | | ✓ |
| 90 | 101.6 | 3.2 | L | ✓ | |
| 90 | 101.6 | 4.0 | M | ✓ | ✓ |
| 100 | 114.3 | 3.2 | XL | ✓ | |
| 100 | 114.3 | 3.6 | L | ✓ | |
| 100 | 114.3 | 4.5 | M | ✓ | ✓ |
| 125 | 139.7 | 3.0 | XL | ✓ | |
| 125 | 139.7 | 3.5 | L | ✓ | |
| 125 | 139.7 | 5.0 | M | ✓ | ✓ |
| 150 | 165.1 | 3.0 | XL | ✓ | |
| 150 | 165.1 | 3.5 | L | ✓ | |
| 150 | 165.1 | 5.0 | M | ✓ | ✓ |

Note: Available in standard lengths of 6.5 metres



## SQUARE HOLLOW SECTION

| Grade C350L0 | |
|---|---|
| dxb (mm) | t (mm) |
| 20x20 | 1.6 |
| 25x25 | 1.6 |
| 25x25 | 2.0 |
| 25x25 | 2.5 |
| 25x25 | 3.0 |
| 30x30 | 1.6 |
| 30x30 | 2.0 |
| 30x30 | 2.5 |
| 30x30 | 3.0 |
| 35x35 | 1.6 |
| 35x35 | 2.0 |
| 35x35 | 2.5 |
| 35x35 | 3.0 |
| 40x40 | 1.6 |
| 40x40 | 2.0 |
| 40x40 | 2.5 |
| 40x40 | 3.0 |
| 40x40 | 4.0 |
| 50x50 | 1.6 |
| 50x50 | 2.0 |
| 50x50 | 2.5 |
| 50x50 | 3.0 |
| 50x50 | 4.0 |
| 50x50 | 5.0 |
| 65x65 | 1.6 |
| 65x65 | 2.0 |
| 65x65 | 2.5 |
| 65x65 | 3.0 |
| 65x65 | 4.0 |
| 65x65 | 5.0 |
| 75x75 | 2.0 |
| 75x75 | 2.5 |
| 75x75 | 3.0 |
| 75x75 | 3.5 |
| 75x75 | 4.0 |
| 75x75 | 5.0 |
| 89x89 | 2.0 |
| 89x89 | 3.5 |
| 89x89 | 5.0 |
| 100x100 | 2.0 |
| 100x100 | 2.5 |
| 100x100 | 3.0 |
| 100x100 | 4.0 |
| 100x100 | 5.0 |
| 125x125 | 4.0 |
| 125x125 | 5.0 |

Note: 20x20 to 25x25mm available in standard lengths of 6.5 metres.
30x30mm and greater available in standard lengths of 8.0 metres.

## RECTANGULAR HOLLOW SECTION

| Grade C350L0 | |
|---|---|
| dxb (mm) | t (mm) |
| 38x25 | 1.6 |
| 38x25 | 2.0 |
| 50x25 | 1.6 |
| 50x25 | 2.0 |
| 50x25 | 2.5 |
| 50x25 | 3.0 |
| 65x35 | 1.6 |
| 65x35 | 2.0 |
| 65x35 | 2.5 |
| 65x35 | 3.0 |
| 75x25 | 1.6 |
| 75x25 | 2.0 |
| 75x25 | 2.5 |
| 75x50 | 1.6 |
| 75x50 | 2.0 |
| 75x50 | 2.5 |
| 75x50 | 3.0 |
| 75x50 | 4.0 |
| 75x50 | 5.0 |
| 76x38 | 1.6 |
| 100x50 | 1.6 |
| 100x50 | 2.0 |
| 100x50 | 2.5 |
| 100x50 | 3.0 |
| 100x50 | 3.5 |
| 100x50 | 4.0 |
| 100x50 | 5.0 |
| 125x75 | 2.0 |
| 125x75 | 3.0 |
| 125x75 | 4.0 |
| 125x75 | 5.0 |
| 150x50 | 2.0 |
| 150x50 | 2.5 |
| 150x50 | 3.0 |
| 150x50 | 4.0 |
| 150x50 | 5.0 |
| 150x100 | 4.0 |
| 150x100 | 5.0 |

Note: 38x25mm available in standard lengths of 6.5 metres.
50x25mm and greater available in standard lengths of 8.0 metres.

## DESIGN RAIL (FLAT SIDED ROUND)

| Grade C350L0 | |
|---|---|
| dxb (mm) | t (mm) |
| 62x50 | 2.0 |
| 62x50 | 2.5 |
| 62x50 | 4.0 |

## YARD RAIL (FLAT SIDED OVAL)

| Grade C350L0 | |
|---|---|
| dxb (mm) | t (mm) |
| 59x30 | 1.6 |
| 59x30 | 2.0 |
| 97x42 | 2.0 |
| 97x42 | 2.5 |
| 115x42 | 2.0 |
| 115x42 | 2.5 |

Note: Design Rail & Yard Rail are available in standard lengths of 6.1 metres.
They are also available in 8.0 metre lengths on request.
Note: MOQ may apply.



# ALLGAL Specifications

ALLGAL is manufactured to the following Australian Standards:

AS 1163 – 1991 Structural Steel Hollow Sections.
AS 4750 – 2003 Electrogalvanized (zinc) coatings on ferrous hollow and open sections.

Orrcon's manufacturing process results in ALLGAL steel hollow sections containing an average zinc coating mass of 50 grams/m² on each side (total average coating mass of 100 grams/m²). The external surface is sealed with a Clear-Tec polymer coating.

## Applications

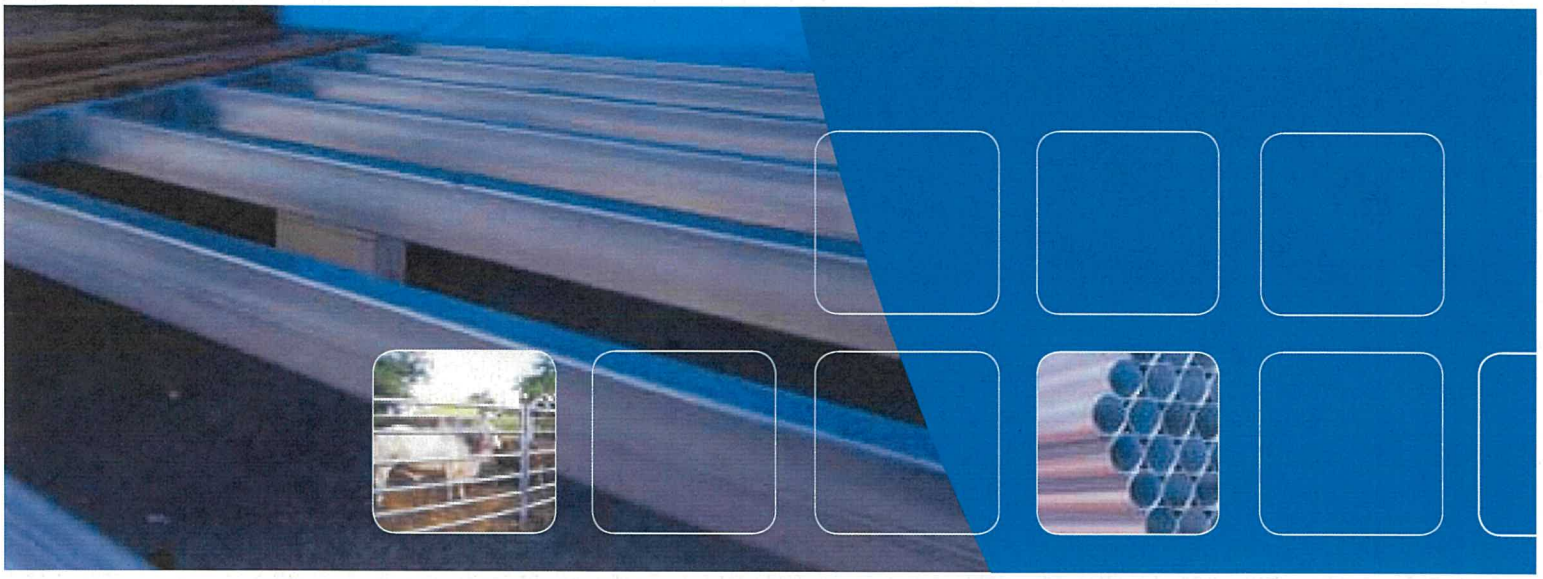
ALLGAL structural steel hollow sections are suitable for a multitude of applications including:

### Agricultural / Manufacturing:

- Stock Yards
- Fence Posts & Rails
- Agricultural Implements
- Sheds and Silos
- Trailers
- Truck, Bus & Caravan Chassis
- Truck bodies
- Racking Systems
- Shelving Systems
- Conveyors
- Material Handling Equipment
- Rolling Garage Door Axles
- Roller Shutter Axles
- Sectional Garage Door Axles
- Machinery & Equipment
- Cattle Crushes
- Playground Equipment
- Pool & Garden Fencing
- Gates
- Bus Shelters
- Shade Structure Framework (including sails, blinds, awnings, gazebos, shade houses, umbrellas)

### Construction:

- Architectural & Structural Columns
- Roof Framing
- Wall Framing
- Floor Framing
- Deck and Verandah Framing
- Pergola Framing
- Balustrade & Handrail
- Space Frames, Trusses



## Notes:

### General Information Regarding Installation, Storage & Handling of ALLGAL Products

ALLGAL steel hollow section products are only recommended for use in mildly corrosive environments and should not be used in environments exposing the product to soluble salts containing chlorides, nitrates and sulphates. When combined with moisture, these chemicals can attack the zinc coating and steel substrate causing accelerated corrosion.

Environments susceptible to acid rain, chemical spillage, animal waste, fertilisers and particularly those within one kilometre of coastal areas or other salt laden environments such as inland seas and lakes are considered harshly corrosive and are not suitable for ALLGAL unless further corrosion preventative measures are taken such as painting with an epoxy, polyurethane, oil-based topcoat or powder coating.

Where ALLGAL products must be used in corrosive environments, thicker high purity zinc coatings such as liquid ALLGAL should be applied prior to original installation and on an ongoing basis post installation. Where installed in salt-laden environments, ALLGAL products should be regularly washed down with clean water to remove salt deposits.

The life and performance of ALLGAL steel hollow sections will be prolonged where the products are applied, installed or used in an upright position or at such an angle which facilitates run-off of water and moisture due to gravity. Water or moisture which ponds on ALLGAL surfaces can cause white rust and may eventually lead to red rust. Where water and moisture does not run-off due to gravity or allowed to sufficiently dry, ALLGAL steel products must be inspected from time to time and wiped down to prevent the possibility of corrosion. Any indication of corrosion should be treated immediately by applying an appropriate corrosive protection product according to manufacturer's directions for use. Liquid ALLGAL is ideal in these cases. Note that whilst products such as Liquid ALLGAL assist in maintaining corrosive protection properties, they will not remedy any impact on the structural integrity of ALLGAL products caused by corrosion.

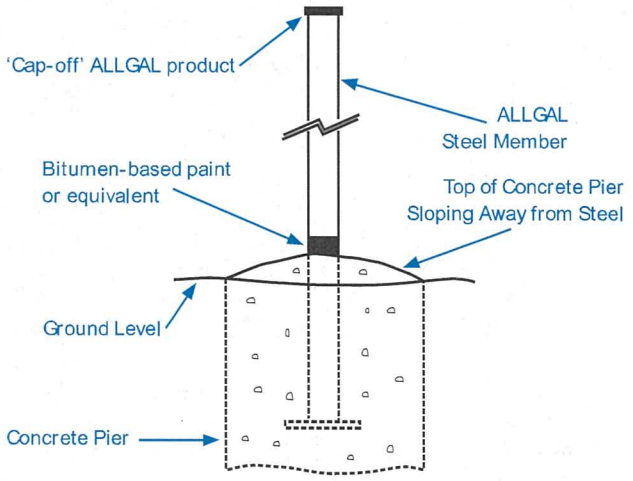
Cap ends of ALLGAL products where used in applications which can potentially allow water or moisture to enter the hollow area of the product.

### Additional Precautions when Installing ALLGAL Products in the Ground

As with all galvanized products, the following precautions should be followed to obtain best results when installing ALLGAL in the ground:

- Prior to installation, coat section of steel in contact with concrete or earth with a bitumen-based paint product such as Ormonoid according to the manufacturer's directions for use. Bitumen paint should ideally coat 100mm of the steel above ground so as to ensure that moisture does not remain in contact with the steel.
- In addition, where ALLGAL products are installed into concrete piers, ensure the top of the concrete pier is above ground level providing a barrier between the earth and steel. Ensure the top of the concrete pier slopes away from the ALLGAL product to allow water and moisture to run away from the base of the steel.
- Under no circumstances should water or moisture be allowed to pond around the steel.

### Installation of ALLGAL Steel Hollow Sections in Concrete Piers




### Repair and Maintenance of ALLGAL's Protective Electrogalvanized Zinc Coating

Depending on the product's application, method of transportation, storage and handling, ALLGAL's protective zinc coating may encounter damage which can adversely affect the product's life. The coating should be repaired immediately with an appropriate product such as Liquid ALLGAL in accordance with the manufacturer's directions for use.

Exposed edges resulting from cutting, sawing or other work should be repaired immediately using an appropriate product such as Liquid ALLGAL according to the manufacturer's directions for use.

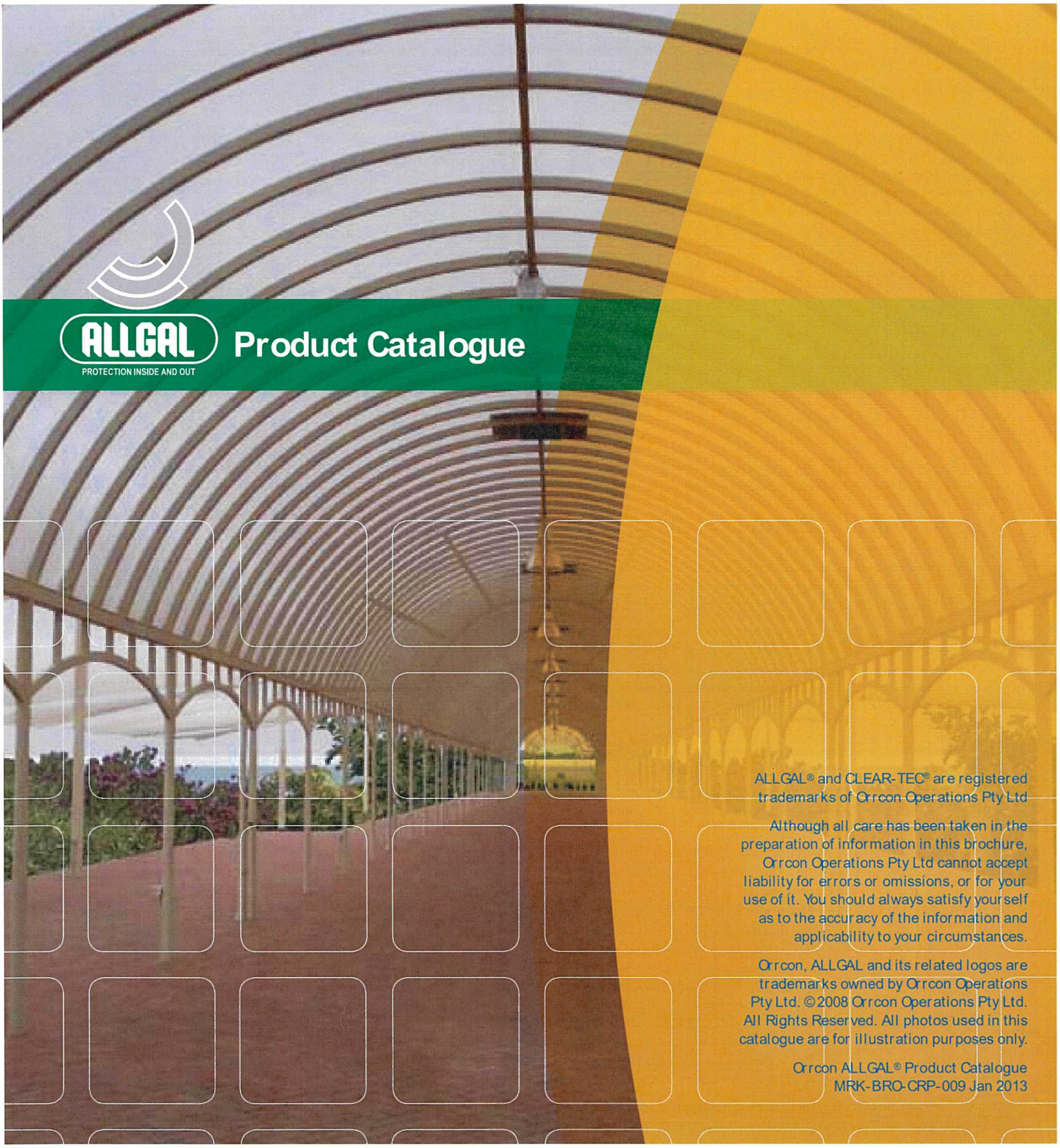
### Storage Instructions

Avoid pack storage in external conditions or those susceptible to moisture. If storing ALLGAL in wet or moist conditions, separate individual lengths storing them off the ground so they can adequately dry. No galvanized steel products should remain in surface contact with each other under continually damp conditions as they will eventually develop white rust.

### Powder-coating

Where users of ALLGAL are considering the application of powder-coating, some surface preparation of ALLGAL products may be required as powder-coating pre-treatment processes vary.

Contact Orrcon for more in-depth information regarding all technical aspects of ALLGAL accessible from www.orrcon.com.au



# ALLGAL Product Catalogue

PROTECTION INSIDE AND OUT



Orrcon ALLGAL® Product Catalogue
MRK-BRO-CRP-009 Jan 2013

FPA AUSTRALIA Code of Practice Compliant

Member of AUSTRALIAN STEEL INSTITUTE

Certified System Quality ISO9001 SAI GLOBAL

ACASPA AUSTRALIAN CANVAS AND SYNTHETIC PRODUCTS ASSOCIATION

Orrcon Steel

**Orrcon Operations Pty Ltd** ABN 92 094 103 090
Head Office: 121 Evans Road, Salisbury, QLD 4107
**Telephone** (07) 3274 0500 **Facsimile** (07) 3274 0517
**For your nearest stockist: 1300 650 303**
**Orrcon Steel & Tube Direct: 1300 665 757**
**Email** info@orrcon.com.au **Website** www.orrcon.com.au

**Distributed by:**

PUBLIC RECORD

Attachment 8

Australian Government
Anti-Dumping Commission

# APPLICATION FOR EXEMPTION FROM DUTY UNDER *THE CUSTOMS TARIFF (ANTI-DUMPING) ACT 1975*

## CERTAIN HOT-DIP GALVANISED (HDG) CIRCULAR HOLLOW SECTIONS (CHS)

## RECORD OF MEETING WITH ONESTEEL AUSTRALIAN TUBE MILLS (ATM)

*Note: the matters outlined in this document do not reflect the Anti-Dumping Commission's findings or opinion in relation to this inquiry, but rather reflect matters discussed at the concerned meeting.*

**Date:** 15 April 2014

**Location:** Anti-Dumping Commission
1010 La Trobe St
Docklands
VIC

**Attendees:**

| Anti-Dumping Commission | ATM |
|---|---|
| Kerry Taylor<br>Director, operations 4 | Matt Condon<br>Manager Trade Development |
| Andrea Stone<br>Manager, Operations 2 | Arun Syam<br>Tubular Development Manager |
| Bora Akdeniz<br>Investigator, Operations 4 | John O'Connor<br>Director, John O'Connor and Associates |

**Discussed:**

Galvanised CHS in general

- ATM classified the types of galvanised CHS into three categories:

1. Pre or in-line galvanised
   - zinc coating mass of approximately 100g/$m^2$
   - able to be manipulated (bent and shaped)
   - able to be directly welded

2. Semi-automatic galvanised HDG CHS (air-blown as part of the galvanising process)
   - zinc coating mass of approximately 300g/$m^2$
   - able to be manipulated
   - difficult to directly weld

3. Batch-galvanised HDG CHS
   - zinc coating mass between 500 and 600 g/$m^2$ or possibly more (based on steel thickness)
   - cannot be readily manipulated
   - cannot be directly welded

- Pre or in-line galvanised CHS may not be suitable for coastal locations where there is a high level of steel corrosion – such as being exposed within 1 km of breaking surf, etc.

- Where the coating of zinc is too thick on CHS, it becomes difficult to manipulate (brittle coating) and unsuitable for certain applications.

ATM's galvanised CHS product offering

*HDG CHS*

- ATM currently supplies HDG CHS to the Australian market. This is Australian-manufactured (made from black pipe that is outsourced 'batch' galvanised by a local external provider).
  [redacted] [Confidential: previous source of sales]

- The Australian batch-galvanised product that is supplied by ATM is [redacted] [Confidential: product characteristics] as part of the galvanising process.

- The external galvaniser may be considered to be part of the Australian industry for HDG CHS.

- ATM used to fully produce HDG CHS itself (galvanising performed internally) at its Acacia Ridge and Newcastle facilities. The last galvanising plant was at Acacia Ridge and was initially 'mothballed', but has since been fully decommissioned. The HDG CHS produced at Acacia Ridge was air-blown.

*Other galvanised finishes*

- ATM also supplies the following other galvanised finishes of CHS (not HDG) that it manufactures:
  - DuraGal – the first generation of in-line galvanised product that is galvanised only on the outer surface – this is no longer supplied;
  - DuraGal$^{Plus}$ - pre-galvanised product that is galvanised both internally and externally.

- While ATM could still supply the DuraGal product, it has moved towards the supply of DuraGal$^{Plus}$.

Imported HDG CHS

- ATM understands that a reasonable amount of imported HDG HSS from the countries subject to anti-dumping measures may be batch-galvanised and not air-blown.

Supply of like or directly competitive goods

- Australian made batch-galvanised HDG CHS is like to, and directly competitive with, imported HDG CHS.

- If requested by its customers (distributors of steel products), ATM is able to supply Australian-manufactured batch galvanised HDG CHS.

- Consequently, ATM submits that the Australian industry manufactures and supplies like or directly competitive goods to those subject to the exemption application, and an exemption from anti-dumping measures is not warranted.

- Additionally, DuraGal$^{Plus}$ CHS is directly competitive with HDG CHS in numerous applications, specifically those that require the product to be manipulated. In addition, it is able to be easily welded, which HDG CHS is not.

- The Galvanizers Association of Australia (GAA) members advise they batch dip galvanise HDG CHS for customers other than OneSteel ATM.

Terms of supply

- ATM supplies CHS to its customers, which are at the distributor level. These customers then on-sell CHS to their own customers.

- Whether a distributor offers imported or Australian-produced HDG CHS to its customers will be a purchasing decision by the distributor, taking into account numerous factors.

- HDG CHS is listed in ATM's product availability guide as part of its standard product offering. Currently only Australian-made CHS is offered by ATM.

- All of ATM's customers (steel distributors) are able to access Australian-made HDG CHS, subject to minimum order requirements and customer-specific established terms of trade (e.g. credit terms, delivery terms, etc.).

Other matters

*Orrcon Steel product*

- Orrcon Steel has recently released its new Australian-manufactured MAXI-TUBE® range of galvanised pipe and tube (including CHS).

- This is a pre-galvanised product, and its coating consists of zinc, magnesium and aluminium.

- Orrcon Steel is marketing MAXI-TUBE® as a direct competitor to batch-galvanised HDG CHS, suitable for numerous end uses, including coastal applications.

*Issues with batch galvanising*

- The Commission raised provisional findings in its investigations that stated that Australian batch galvanised HDG CHS supplied by ATM is inferior to imports as it has not been hydrostatically tested and may be insufficiently straight.

- ATM explained that hydrostatic testing is only necessary for pressure pipe, which is generally larger in size than that covered by the anti-dumping measures.

- ATM advised that batch-galvanising of products may result in some straightness issues, but this is more common in asymmetrical goods (such as some structural beams and angles) than in pipe which is multi-symmetrical. Australian hot-dip galvanising contractors also report minimal straightness issues as the dipped CHS are restrained in jigs.

Attachment 9

# Steel Posts – Duragal vs H.D. Galv

December 8, 2014 < https://cornellengineers.com.au/steel-posts-duragal-vs-hdgalv/>

The Duragal steel post vs the Hot Dipped Galvanised steel post battle is a long-standing grudge match between two steely contenders.

Which steel post is better for your house project? Get the full blow-by-blow battle breakdown here.

## The Battleground

Whether your project is a new house or an extension, if you are building a timber floor above ground, there's a chance you'll encounter the Duragal vs H.D. Galvanised steel stump battleground.

It's not an easy battleground either. At stake are cost, longetivity, durability, corrosivity, availability and a whole host of other "itties" that cloud the decision process.

< https://i0.wp.com/www.cornellengineers.com.au/wp-content/uploads/2014/12/Steel-Stump-under-house.jpg?ssl=1>

Steel stumps under a house

Quite often steel stumps are open to the environment, easily seen but often ignored. The steel stump battleground is a forest of columns stretching from concrete footings to the underside of timber floor frame

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Steel column lengths can vary from less than 300mm to more than 5 metres. The columns support floors, walls, roofs, belongings and families. They are the critical support structure for our buildings. That's why it is crucial you and your construction team make the right decision.

## The Villain!

The villain of the battleground is corrosion. Rust. Steel cancer. Iron oxide. Fe2O3 (thanks John!).

Corrosion in a steel post

Steel's affinity for water and oxygen is like red wine to a musketeer. Corrosion is the downfall of shiny steel stumps and the kryptonite of steel's super strength. How can you protect yourself and your property?

## The Hero!

Fortunately, there is a hero: Standing between steel and evil corrosion steel's shiny coat of armour: Zinc.

When applied as a molten coating onto steel, zinc becomes the hero – bonding onto the steel surface and forming an impenetrable surface that staves off steel's weakness to water and oxygen.

But steel has a choice that it must make before the battle: It must choose from a range of armours – It must choose an armour that is light enough to be inexpensive yet strong enough to outlast the battle.

**Behold the contenders!**

Weighing in at 100g of zinc coating per square meter is DuraGal, marketed and sold by **Austube Mills <** **https://www.austubemills.com.au/en-au/>** . The lightest (and cheapest) of the galvanised coatings, the zinc armour is only applied to the external surface of square (SHS), round (CHS) and rectangular (RHS) column sections.

The internal surface of DuraGal is a painted finish measuring only 35 micrometres (that's 35 thousandths of a millimetre) thick.

Our next contender: Weighing in at 100g of zinc per square metre on inside and outside faces of box and round column sections is DuraGal Plus. It's a better option than Duragal because the inside surface has a zinc coating too but it is slightly more expensive. If needed you can screw into DuragGal Plus or leave end caps off – but only in some environments. Check with your engineer.

**<**
**https://i0.wp.com/www.cornellengineers.com.au/wp-content/uploads/2014/12/images.jpg?ssl=1>**

Finally, our superhero: Hot Dip Galvanising. Weighing in at a hefty 500 grams of zinc per square metre inside and out, H.D. Galvanised steel has the heaviest, strongest coat but is also the most expensive. Steel has to be fabricated and then sent to the

galvanisers to be dipped into a bath of molten zinc. It takes longer to arrive on-site, makes on-site alterations harder but is super tough.

## The Steel Stump Battle

It's a fierce battle. What is the best thickness of galvanising for your project?

That's a decision for you, your structural engineer and the builder to make.

## The Provisos

There's a couple of issues you should be aware of:

It is well known in the construction industry that DuraGal steel and the chemicals in concrete react and fail the thin galvanised coating on DuraGal steel prematurely.

<

https://i0.wp.com/www.cornellengineers.com.au/wp-content/uploads/2014/12/Duragal-column-with-premature-corrosion.jpg?ssl=1>

Duragal steel in contact with the ground

If you are casting DuraGal steel into a concrete footing, ask your structural engineer to document the precaution you need to take specific to your situation.

Yes, we're talking about keeping your galvanised steel posts out of contact with the ground, uric acid and some other chemicals. Check with your structural engineer for your project.

Also, for the structural engineers and builders, don't forget the requirements of National Construction Code NCC2019 Clause 3.4.4.4. Duragal has to be painted if it is in an external location (ie under a house). Check out the NCC for more information.

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will corrode

## References

We used the following websites to compile this article.


- Galvanisers Association of Australia < http://www.gaa.com.au/index.php?page=coating-thickness-and-factors-influencing-thickness>
- Austube Mills DuraGal Page < http://www.austubemills.com.au/our-range/coating/duragal>
- Austube Mills DuraGal Plus Page < http://www.austubemills.com.au/our-range/coating/duragalplus>
- Structural Pipe and Tube < https://www.libertygfg.com/metalcentre/products-services/structural-tube/>
- A House Raiser's Guide to Steel Stumps < http://www.palframanhouserestumpingbrisbane.com/info-tips/steel-columns/>
- Scott Metals Pricelist for Steel Stumps < http://www.scottmetals.com.au/column.php>
- NCC 2019 Volume 2 < https://ncc.abcb.gov.au/editions/2019-a1/ncc-2019-volume-two-amendment-1>





Up ↑




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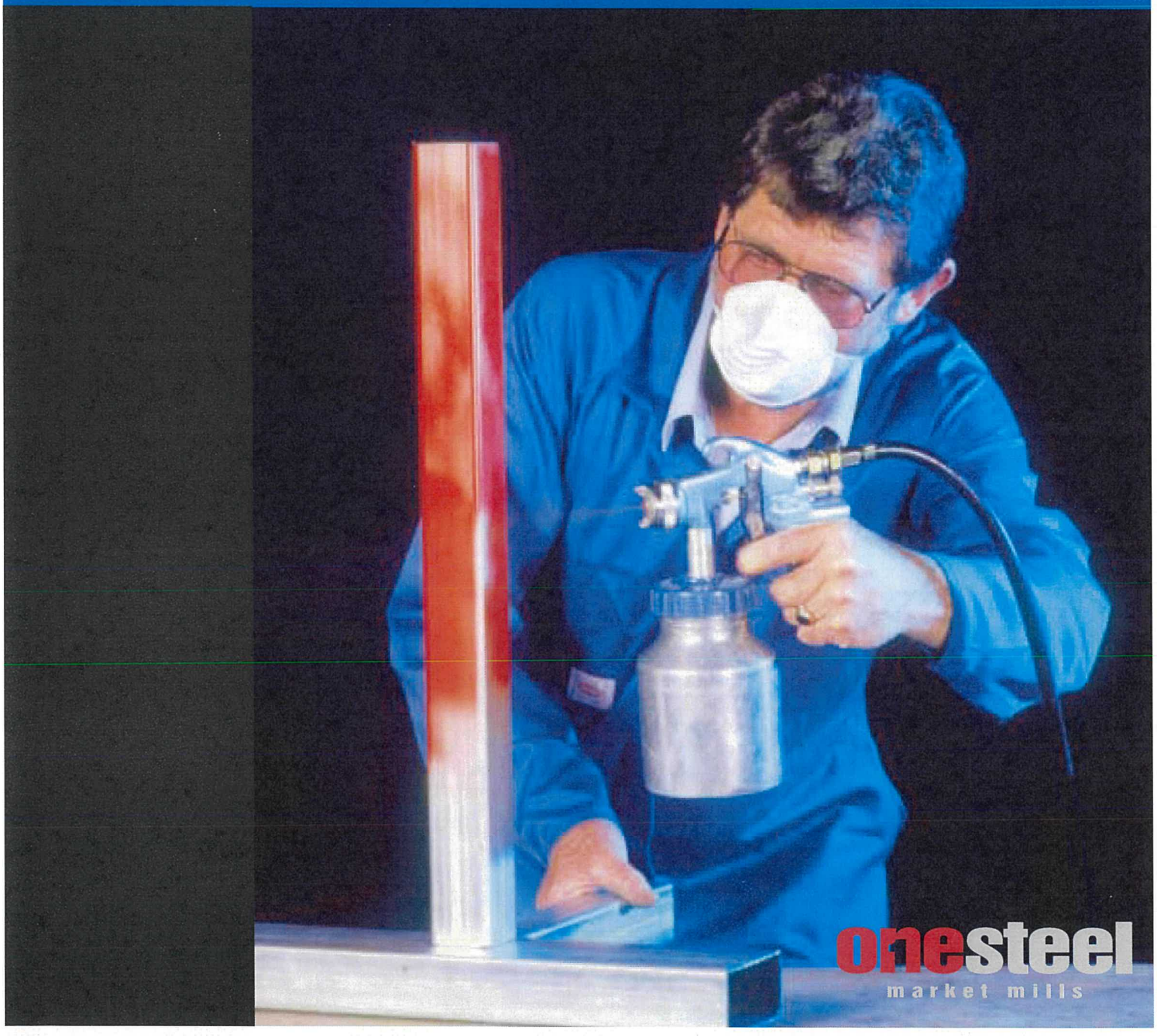
Attachment 10

TECHNICAL INFORMATION

# DURAGAL EASY PAINTING & CORROSION PROTECTION GUIDE



onesteel
market mills

# *DuraGal*®

# Easy Painting & Corrosion Protection Guide

## INDEX

# INTRODUCTION

## Cost Effective High Tensile Steel Products with a Fully Prepared Surface

DuraGal steel hollow sections have been developed to provide cost effective corrosion resistance, as well as a smooth, easy to use surface finish.

The advantages of the DuraGal prepared surface are now available in a full range of DuraGal cold-formed open profiles - angles, channels and flats. Extending the DuraGal Family of Products®.

### *Architecturally Decorative Finish which is Kind to the Environment*

The steel surface, prepared in a closely controlled factory environment, eliminates or significantly reduces the need for messy open air blasting, chemical, hand or power tool cleaning and its effect on the environment.

DuraGal sections are mechanically cleaned to AS1627.4 Class 3 and then chemically cleaned prior to hot dip galvanising. A zinc coating weight of 100gms/m$^2$ (14.3 microns) is applied. A surface conversion coating is then applied to help prepare the surface for later painting and to assist prevent white rust during transport and storage. Then, in the case of equal angles (greater than 50 x 50), channels and flats, a clear barrier polymer coat is applied.

### *Cost Effective*

The most cost effective way to use DuraGal products is unpainted, touching up any welds.

The Table on page 7, called "Corrosion life of Unpainted DuraGal in AS/NZS 2312 Atmospheric Environments", indicates which combinations of environment and expected life to first maintenance that unpainted DuraGal can cover. However, if painting is required the result is an even better surface protection.

By teaming the hot dip zinc coating with paint a synergistic effect occurs, ie the corrosion life of the duplex coating system is higher than the sum of the corrosion lives of the zinc and the paint coatings used separately. Research has shown that the increase can be from 1.5 to 2.3 times the sum of the lives of the zinc coating and the paint system, used separately.

When superior corrosion life before first maintenance is required, the DuraGal hot dip galvanized coating will eliminate or considerably reduce the cost of surface preparation and may allow a more cost effective paint coating system to be used, reducing the cost of your project.

The total cost of a product fabricated from a DuraGal profile or hollow section can be considerably less than that of other steel shapes. There can be savings in both the cost of steel and the cost of applying the corrosion resistant coatings. The high tensile DuraGal shapes and hollow sections and their structural advantages can save steel and often dollars.

### *About This Guide*

This guide is designed to cover, in a practical and concise form, paint systems for a wide range of environments, performance levels, pre-treatments and application methods.

On pages 22 to 27 of this guide you will find the recommended coating systems from several leading coatings manufacturers. These coatings manufacturers have carried out their own evaluation for the DuraGal Family of Products® and the exposure categories listed within AS/NZS 2312:1994.

For further information on the coatings listed, OneSteel recommends you contact the coatings manufacturer directly to discuss the details of your application, and obtain detailed data sheets on surface preparation, application and safe use of their products.

OneSteel Direct can assist you by providing the nearest location and contact details for the nominated coatings manufacturers listed in this guide.

Freecall: 1800 065 415
Freefax: 1800 800 744
e-mail: onesteeldirect@onesteel.com

# ENVIRONMENTS

## Atmospheric Environments

### *General*

The following classifies atmospheric zones in Australia and New Zealand, which affect the corrosion of steel and the life of a coating system.

This information was taken from Section 2 of AS/NZS 2312:1994 (with some additions) and is included in this publication with the permission of Standards Australia.

When selecting an appropriate protective coating system, the overall atmospheric conditions in the location of the intended structure require consideration. A structure situated in an aggressive environment will require a much higher standard of corrosion protection than one in a benign environment. The environment can affect both the steel and the paint system. Of prime importance is the effect the environment has on the corrosion of steel.

The effect the environment has on the life of the paint system is also important. It should be appreciated that corrosive environments described do not necessarily affect coatings in the same way as they affect bare steel. Environments that would not be considered to be particularly corrosive to steel, such as hot dry climates with a high amount of ultraviolet (UV) radiation, can cause early breakdown of some coatings. Tropical environments, with high humidity, rainfall, and which promote mould and fungal growth, are far more aggressive to organic coatings than the corrosion rate would suggest. Furthermore, the colour of the paint may influence its performance in some environments.

In addition to climatic effects, the local environment effects (or microclimate) produced by the erection of a structure or installation of equipment need to be taken into account. Such on-site factors require additional consideration because a mildly corrosive atmosphere can be converted into an aggressive environment by microclimatic effects. A significant acceleration of corrosion rate can occur in the following circumstances:-

**(a)** At locations where the metal surface remains damp for an extended period, such as where surfaces are not freely drained or are shaded from sunlight.

**(b)** On unwashed surfaces, ie surfaces exposed to atmospheric contaminants, notably coastal salts, but protected from cleansing rain.

**(c)** Where the surface is in contact with animal urine or faeces, prolonged intimate contact with very slightly contaminated hay or straw will rapidly remove the zinc coating and initiate rusting.

Other microclimatic effects which may accelerate the corrosion of the substrate or the deterioration of its protective coating include acidic or alkaline fallout, industrial chemicals and solvents, airborne fertilisers and chemicals, prevailing winds which transport contamination, hot or cold surfaces and surfaces exposed to abrasion and impact. These effects can outweigh those of the macroclimatic zones described below.

Microclimatic effects can make it very difficult, if not impossible, to predict accurately the aggressiveness of a given environment and a certain amount of educated judgement is required to assess its influence on the coating life.

### *Atmospheric Classifications*

**(a) Mild**

A mild environment will corrode mild steel at a rate of up to 10 microns per year and includes all areas remote from the coast, industrial activity and the tropics. Sparsely settled regions such as outback Australia are typical examples, but the category also includes rural communities other than those on the coast. The only areas in New Zealand in this category are sheltered inland areas. Corrosion protection required for this category is minimal.

**(b) Moderate**

A moderate environment will cause a first year corrosion rate of mild steel of 10 microns to 25 microns and includes areas with light industrial pollution or very light marine influence, or both. Typical areas are suburbs of cities on sheltered bays such as Melbourne, Adelaide and Hobart (except those areas near the coast) and most inland cities. Most of New Zealand, other than sheltered inland areas and areas near the coast, is in this zone.

Corrosion protection requirements are moderate and do not call for special measures.

**(c) Tropical**

A tropical environment includes coastal areas of north Queensland, Northern Territory, north-west Western Australia, Papua New Guinea and the Pacific Islands, except where directly affected by salt spray. This is the only category that cannot be delineated by the corrosion rate. Although corrosivity is generally low in tropical regions, the aggressiveness of the environment to organic coatings means special protection is required.

**(d) Industrial**

Industrial environments will cause a first year corrosion rate of mild steel to be greater than 25 microns and can be greater than 50 microns per year. The only areas within this category are around major industrial complexes. There are only a few such regions in Australia and New Zealand, examples of which occur around Port Pirie, Newcastle and the geothermal areas of New Zealand. The pollution in these areas requires that coating systems be resistant to mild acid.

**(e) Marine**

Marine environments will cause a first year corrosion rate of 25 microns to 50 microns and include areas influenced to a moderate extent by coastal salts. The extent of the area varies considerably depending on factors such as winds, topography and vegetation. For sheltered areas, such as occur around Port Phillip Bay, it extends from about 100m from the beach to about 1km inland, but for most ocean front areas, such as occur along the south-western corner of Western Australia, the south-eastern coast of South Australia, the New South Wales and New Zealand coasts and the surf beach regions of Queensland, it generally extends from about 1km from the coast to about 10km inland and to about 50km inland in exceptional circumstances, depending on the conditions.

Much of Auckland, Wellington, Perth, the Gold Coast, Wollongong, Sydney and Newcastle are in this zone. Significant protection is essential, requiring a high performance coating system to give a long life.

**(f) Severe Marine**

Severe marine environments have high to very high corrosivity and will cause a one year corrosion rate of steel to be in excess of 50 microns. In Australia and New Zealand, such regions are found off-shore and on the coast. The extent to which such conditions extend inland depends on prevailing winds, extent of wave action and marine surf and land topography, but is generally from the beachfront to about 1km inland along the ocean coast. Around sheltered bays, the region extends inland about 100m. In high wind areas, this region may extend further inland. Special high performance coating systems are required in this region, and it should be recognised that salt deposition during surface preparation or coating applications will cause significant reduction in coating life. As far as possible, structures for these regions should be coated off-site.

Atmospheric classifications (c) and (d) should be considered as additive to the other classifications. Coatings selected for an industrial site in a severe marine environment in the tropics, for example, should be those which are recommended in each classification (c), (d) and (f), as far as possible. Industrial or tropical environments will dominate a moderate or mild environment however, and can be considered by themselves in such cases.

Areas of special corrosivity with high to very high corrosion rates occur underground, underwater, in splash zones and in chemical plants. For these areas, specific protection from the aggressive conditions is essential. The selection of a coating system for any of these conditions is outside the scope of this Guide. Consult your paint company or other expert.

# WARNINGS ABOUT ESPECIALLY HARSH CORROSION CONDITIONS

### *General Warnings*

Zinc is very susceptible to acid attack. Even very weak acid solutions will remove the zinc coating from steel very quickly resulting in rust forming after a very short time, often in much less than one year.

Soluble salts such as chlorides, nitrates and sulphates can form acidic salts when wet. The moisture can come from any moisture in the air, ie rain, dew, humidity, etc. In these circumstances suitable painting of the zinc coated product will dramatically increase the length of time before rust appears.

All paints will let small amounts of liquids through to the steel and after time corrosion will result. Generally the more coats and thus the thicker the paint, the longer it takes for rust to appear.

Some paints are better than others at resisting liquid penetration. Advice should be sought from your paint supplier or this company as to which is the best paint for any application that falls outside the cases listed elsewhere in this paint guide or discussed in this section.

## Salt, Acid Rain, Farming, Animal Husbandry and Other Corrosion Causes

Soluble salts, such as chlorides, sulphates and nitrates deposited on steel surfaces in combination with moisture, cause accelerated corrosion of steel and zinc coated steel products. These salts are deposited by marine spray, acid rain, chemical spillage, animal urine and faeces, farm chemical over spay, aerial fertiliser and crop dusting over spray, other fallout from industrial and farm operations.

***SPECIAL PRECAUTIONS*** need to be taken to protect steelwork that is exposed to salt contamination and is not frequently washed by rain (or regularly washed clean). Generally using paint systems suitable for protection in severe marine environments will be sufficient (see table 2).

Soluble salts deposited in protected areas combine with moisture, commonly condensation in high humidity environments, to increase corrosion rates through ionic transfer or to form acids that attack the zinc. As mentioned above, accelerated corrosion can occur even if the sections are painted or powder coated.

Corrosion rates in these circumstances can be up to 4 times greater than expected. The failure mechanism requires the salts to be frequently replaced with fresh material and the soluble salt contaminated structural members to be regularly moistened. This includes areas around frequently open doors (and sometimes windows, ie any openings) in generally enclosed structures.

Some specific cases of general and accelerated corrosion contamination are:-

### *Salt Spray Contamination*

- The most commonly known salt contaminant is salt spray from the sea, harbours, estuaries and coastal and inland salt water lakes. Advice on whether the surface being painted will be exposed to a marine or severe marine environment can be found in the "*ATMOSPHERIC CLASSIFICATIONS*" section earlier in this guide.

Steel components that are not regularly washed by rain or hosed down manually, in marine environments, can have an accelerated corrosion rate 4 times greater than normally exposed components. Rain or hosing washes off the soluble salts. For components in these severely corrosive areas always use paint systems recommended in this guide as suitable for severe marine environments (see Table 2).

Some typical areas of buildings that are attacked in this way are: -
- under the eaves.
- the under side of an elevated floor or verandah.
- under awnings, particularly fixed awnings.
- the underside of purlins or framework of verandahs or covered pergolas.
- the inside of open fronted farm machinery sheds.
- any steelwork close to frequently open doors and windows, or other openings.

### Accelerated Corrosion of Steelwork in Contact with Animal or Bird Urine and Faeces

Any zinc coated steelwork in contact with animal or bird urine or faeces will need painting. The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

Even being in contact with straw or wood chip that is used to protect animals from hard floors can result in rapid corrosion. Common practice is to remove soiled and wet straw or woodchips every day, pushing the remaining old litter to the outside of stalls possibly up against galvanized steel framing, and replenishing the litter bed with fresh materials. Failure of the zinc coating can occur in as little as 12 months due to contact with contaminated litter, even though the contamination is not visible.

The need for painting can be eliminated by ensuring that any sections in direct contact with animal waste products are made from corrosion resistant materials. A common way of achieving this is to mount steel sections on concrete nib walls at least 150 mm above direct contact with the urine or faeces.

### Accelerated Corrosion of the Inside of Poorly Ventilated Animal or Bird Shelters

Accelerated corrosion can occur in animal or bird sheds where dust or dirt can collect in or on purlins and girts. It is thought that gases and vapours from urine and faeces can form acids or increase corrosion rates through ionic transfer, in the humid atmosphere of closed animal sheds. The atmosphere in the sheds does not have to be highly corrosive at all times to accelerate corrosion.

The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

### Accelerated Corrosion from the Soot from Burning Sugar Cane

A farm machinery shed in Queensland showed red rust, on lightly galvanized sections (50 grams per square metre zinc coating weight), in one season. The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

### Accelerated Corrosion if the Structure is Being Regularly Dowsed with Highly Mineralised Water from Bores or Springs

Powder coated playground equipment showed red rust, in less that one year, at a north western WA sporting oval that was being irrigated every night.

The paint systems recommended in this guide as suitable for severe marine environments will generally be satisfactory (see Table 2).

### Accelerated Corrosion of DuraGal Sections in contact with soil or concrete

Contact with moist acidic contaminants of any kind will cause accelerated corrosion of zinc. The point where DuraGal sections enter concrete footings or are below the surface of soil which gets wet at any time are common problem areas.

The moisture that wets the soil might be from animal urine, condensation in humid areas, wind blown spray near the sea or lakes, etc.

***This problem is common enough for OneSteel to recommend that all DuraGal product/concrete junctions be painted and a barrier coat be applied to DuraGal Products that will be in contact with soil.***

In frequently moist or marine environments use the systems recommended in Table 2 of this guide, for milder areas use those in Table 1.

An alternative to painting is to use epoxy or urethane compounds, tar epoxy substitutes, such as those suggested in the section on the "Protection of Bolts and Bolt Holes" in the "Recommended Paint Systems" section of this guide.

The paint should cover the DuraGal for at least 100 mm above and below the concrete junction. The concrete at the DuraGal/concrete junction should be sloped to encourage any moisture to drain away from the steel member.

To avoid contact with soil, ensure that any footings are at least 50 mm above the soil. In acid soil conditions, If there is any chance that the acid soil can splash up onto the DuraGal, the DuraGal should be painted, as above, anyway.

### *Chemical Attack*

Contact your paint manufacturer for suitable paint systems for these applications.

The paint system needs to be tailored for the precise combination of chemicals and the concentrations used. Only in this way can an effective, yet economical system be recommended

# THE CORROSION LIFE OF DURAGAL

## Corrosion life of Unpainted DuraGal in AS/NZS 2312 Atmospheric Environments

| | Recommended Corrosion Protection System Options | | |
|---|---|---|---|
| **Atmospheric Classification** | **Short Term 2-5 Years** | **Medium Term 5-10 years** | **Long Term 10 - 20 yrs** |
| Mild | Suitable | Suitable | Suitable |
| Moderate | Suitable | Suitable | Suitable |
| Tropical* | Suitable | Suitable | Suitable |
| Industrial | Unsuitable | Unsuitable | Unsuitable |
| Marine | Suitable | Unsuitable | Unsuitable |
| Severe Marine | Unsuitable | Unsuitable | Unsuitable |

* Not suitable when affected by salt spray

## THE CORROSION LIFE OF DURAGAL

### *Corrosion Life of Unpainted DuraGal*

The most economical way to use DuraGal is unpainted, touching up any welds and black steel attachments.
The corrosion life of unpainted DuraGal products will vary depending upon the exposure conditions. Both general environmental zones and local factors must be considered when evaluating corrosion life.

Some localised factors that can reduce corrosion life are: concentration of industry, fertilisers and insecticides, animal urine and faeces, abrasion or impact, condensation and exposure to wind borne salt (see previous pages for more details).

### *In Dry Interior and Protected Exterior Environments*

These environments are generally less corrosive than the moderate classification in the following tables.

Most environments are only mildly corrosive in the absence of rain, dew, humid conditions or strong liquid chemicals.

Conservatively, an adequate level of corrosion protection will be achieved if DuraGal fabrications are protected to the level set out in the appropriate part of Table 3.

### *In Wet or Damp Interior Environments*

These environments are generally similar to tropical conditions in the following tables. For detailed advice on the coating systems to use see the appropriate part of Table 4.

### *In Exterior Atmospheric Environments*

The table above sets out the corrosion life of unpainted DuraGal when exposed to exterior atmospheric conditions.

### *Typical Zinc Coating Weight on DuraGal Compared with Other Common Products*

To give some guide to the corrosion life that can be expected from DuraGal, it is helpful to compare the typical weight of zinc applied to DuraGal with other common in-line galvanized structural products.

| In-line Galvanized and Production Line Products | |
|---|---|
| DuraGal | 100 to 160 g/m$^2$ |
| Z100 Purlins | 45 to 65 g/m$^2$ |
| Sheeting, etc<br>Z200<br>Z275 | <br>90 to 120 g/m$^2$<br>125 to 165 g/m$^2$ |
| RHS & Pipe | 300 to 600 g/m$^2$ |

| Batch Galvanized Products (From AS/NZS 4680 Table 1) | | |
|---|---|---|
| | Section Thickness | Minimum Average Coating Mass |
| Hot Rolled Steel Structurals, RHS and Pipe | ≤ 1.5mm | 320 g/m$^2$ |
| | > 1.5mm ≤ 3 mm | 390 g/m$^2$ |
| | > 3 ≤ 6 | 500 g/m$^2$ |
| | ≥ 6mm | 600 g/m$^2$ |

The thin, even hot dip zinc coating on DuraGal makes it an entirely different product to weld than batch hot dip galvanized steel. Normal welding rates are readily achievable. Advice on welding the product is available in the "DuraGal Easy Welding Guide".

## Protection of the Bore of DuraGal Hollow Sections

A CIDECT investigation has shown that internal corrosion in hollow sections is not significant when they are sealed at both ends.

CIDECT is a world wide group of tube manufacturers carrying out research into the engineering performance of hollow sections and publishing the results. A series of design guides are available from the AISC.

Good fabrication techniques generally ensure the sealing of the bore of structural hollow sections. If, however, the bore is open to corrosion the bore may need protection and we offer the following suggestions: -

- Flat trapping the ends of the sections to seal off the inside.
- Seal with plugs, and if necessary, a sealing compound.
- Use internally painted DuraGal. Typically 30 microns of Zinc Phosphate primer on an AS 1627.4 class 3 blast. This product is not normally stocked and should be ordered from a mill rolling.
- Coat the bore with a corrosion protectant eg : an anti-corrosive paint; a petroleum based wax; fish oil, etc.

**Note ! The above suggestions do not eliminate the need to get "proper design advice" to meet the needs of your particular corrosion environment.**

# WHITE RUST OR ZINC STORAGE STAIN

## Avoiding White Rust or Zinc Storage Stain

DuraGal products, as well as Galtube and Tubeline Hot Dip Galvanized (HDG) are given a protective finish in the form of a zinc conversion coating and/or polymer coatings. One purpose of these coatings is to prevent the formation of white rust during packing, storage and transport.

### *Avoiding White Rust on DuraGal Channels, Flats and some Angles*

DuraGal Profiles, (except for angles up to and including 50mm x 50mm), have been specifically treated to resist white rust by the application of a clear polymer barrier coating, typically 8 microns thick.

This coating is designed to provide packs of DuraGal Profiles with protection from white rust and atmospheric corrosion, in non-marine environments, for a period of 3 months.

If clear coated packs of DuraGal Profiles are to be stored outside for a total of more than 3 months, or if white rust has formed, the advice given below, for DuraGal hollow sections, can generally be followed with just one major modification -

> **Methylated spirits is the only solvent that should be used to clean clear coated DuraGal open Profiles.**

Failure to follow this advice could reduce the adhesion, and thus the corrosion protection, of any additional paint coatings applied to the DuraGal sections.

Any clear coated DuraGal Profile product that has been stored out in the elements, and is going to exceed 3 months open air storage before being used, should be inspected for white rust. If white rust has formed it should be treated, dried and then stored as described in "Preventative Actions".

OneSteel cannot be held responsible for deterioration to galvanized DuraGal Profile products caused by unsuitable storage practices after the product has arrived at the customer's warehouse.

### *Avoiding White Rust on All DuraGal Hollow Sections and Angles 50mm x 50mm & Smaller*

The packed product must be stored under clean, dry and ventilated conditions. This is especially important for smaller size hollow sections, as their physical size and pack configuration restricts natural ventilation.

Storage of packs of galvanized products under covers which restrict ventilation (eg tarps) is not recommended. Changes of temperature from day to night may cause condensation inside the bundles. This condensate will promote the forming of white rust.

Packs of product stored in the open or wet product stored anywhere will develop white rust. OneSteel's quality assurance program ensures that dry first grade product is delivered to Steel Distributors.

OneSteel cannot be held responsible for deterioration to galvanized hollow section products caused by poor transport or storage practices after the product has arrived at the customer's warehouse.

### *Preventative Actions*

If it is necessary to store galvanized sections where they will get wet, either outside or undercover where wind driven rain or spray can enter through a leak, or an opening like a door or window, the product should be arranged so that water will easily run off and all surfaces of the sections are well ventilated. The most common way of achieving this is to stack on non-staining timbers, one end of the stack higher than the other. Each row of galvanized product must be separated by timbers, each item in each row separated by at least 5mm from the next item and open sections stored so that water cannot pool, ie for DuraGal angles, stack with the toes of the profile facing down.

A suitable non-staining timber is seasoned dressed pine. Galvanized sections should never be stored in contact with cardboard or other paper products, cinders, clinkers, unseasoned timbers, treated pine, anything even slightly acidic (pH less than 7) or very strong alkalis (pH greater than 12).

### *Remedial Treatment*

DuraGal RHS packs, and packs of angles 50mm x 50mm and smaller, that become wet should immediately be separated. Each length should have the bulk of any water wiped off, and then be allowed to dry before being stored in a dry place or being stored as recommended in the previous section.

Very light wet storage stains (ie the surface is smooth without significant growth of oxide layer) do not reduce the protective properties of the coating and can be removed by rubbing with a rag soaked in methylated spirits.

Light white rust deposits may be removed by blasting with clean high pressure water, or careful abrasion with soft plastic scouring pads, followed by rinsing with clean water or rubbing with a kerosene or consumer grade rubbing alcohol soaked rag. Only if these methods do not work should steel wool or other harsh metallic scourers be used, as they can significantly reduce the thickness of the zinc coating and thus the corrosion protection provided.

White rust deposits that do not respond to the above methods may be removed by brush blasting, wire brushing or abrasion with a metallic scourer. The dust left on the section should be cleaned off with water or methylated spirits. The original bright, metallic galvanized surface cannot be restored by these treatments and the zinc thickness will probably be significantly reduced.

If the sections are to be painted the white rust can be partially removed by the appropriate method above and then completely removed by chemical treatment. Suggested solutions are 10% acetic acid or proprietary solutions such as Deoxidine 624 by Henkel Australia Pty. Ltd. Henkel recommends a dilute solution of 1 part Deoxidine 624 to 4 parts water.

**WARNING !!!** The above chemically treated surfaces must be chemically neutralised or rinsed to remove any traces of acid, and then painted immediately, certainly within 4 hours. In particular acetic acid treated surfaces must be carefully rinsed and dried to ensure no soluble salts are left on the surface. Soluble salts reduce paint adhesion.

If removing the white rust reduces the zinc thickness below the specified minimum, the coating can be repaired by application of two coats of zinc rich paint complying with AS2204 to a total thickness of 100 microns. When colour matching is required, Galmet DuraGal Silver paint may be applied over the zinc rich paint.

### *Warning to Powder Coaters*

Bubbling of the coating may occur when trying to powder coat galvanized sections that have had heavy white rust removed.

This can occur at any spot where you can feel surface roughness after the white rust has been removed. There may be a black spot in the bottom of these holes.

This problem can often be overcome by wiping with a weak phosphoric acid solution and then rinsing in clean water and drying before coating.

# PAINTING HINTS

## SURFACE PREPARATION

A clean, dry surface is essential for satisfactory paint performance.

### *Degreasing*

The preferred method of degreasing is to use aqueous mild alkaline detergent cleaners with high pressure water cleaners, water jetting or scrubbing equipment, followed by water rinsing.

The most common method of degreasing is by solvent washing, followed by wiping dry with clean rags.

**Warning ! - Most solvents are not suitable for clear coated profiles. The recommended solvent for all DuraGal products, open profiles and hollow sections, is methylated spirits.**

Wiping the tube or profile clean, after solvent washing, is critical. If this is not carried out thoroughly, solvent washing will simply spread any contamination over a wider area. This method is not seen as suitable for large areas (see clause 5.2 of AS/NZS 2312 and AS 1627.1).

### *Etching The Zinc Surface*

If cold phosphating solutions are used, they can damage the zinc coating if left on too long. They should be thoroughly rinsed off with clean water to remove all acidic residues. These preparations are generally not recommended for use on DuraGal.

**Note**: Clear coated DuraGal Profiles should not be etch primed as this may affect the polymer coat, reducing resistance to corrosion and adhesion of the clear coat to the zinc coating. See table 3 (page 16) for basic primers.

### *Paint Preparation*

Carefully read the Paint Manufacturer's "Instructions for Use" usually found on the paint can label or product data sheet.

Paint should be thoroughly mixed before use; either by paddle stirring or by "boxing" from one can to another. Manual shaking of the can is inadequate.

If thinning is necessary, use no more than the maximum recommended quantity of the Paint Manufacturer's approved solvent. Over thinning is to be avoided as it lowers the solids content of the paint, reduces coating thickness and may produce runs and sags. The above applies particularly to spray application.

Two pack paint systems must be carefully mixed in the ratio specified by the Paint Manufacturer. Minor variations from the recommended component ratio can destroy the effectiveness of the coating.

### *Painting Conditions*

Ideally, painting should be carried out on warm, dry days without frost or heavy dews.
As a general rule paints should not be applied when the temperature of the surface to be painted is below 10°C or above 50°C.

In hot weather painting on the surfaces exposed directly to the sun may result in patchiness or blistering because of rapid loss of solvent.
Painting, particularly of latex paints, should not be carried out in very cold conditions as poor film formation may result.
Conditions of very high humidity (above 85%) can cause "blooming" (whitening) of solvent based paints and poor adhesion of etch primers.

### *Paint Application*

Film thickness for each coat of paint should be as recommended by the Paint Manufacturer.

Excessively thick or thin coats can lead to poor paint performance.

Paint Manufacturers' recommendations regarding drying times between coats should be adhered to.

The heavy zinc powder in zinc rich paints will rapidly settle out and frequent stirring is necessary.

Two pack materials should not be used past the recommended pot life. Also, mixed paint that has exceeded its pot life should not be added to freshly mixed material.

## Quick Drying Finishes

The fabricator of steel products often has the need for a quick "dry to handle", one coat paint finish to decorate his product. The following list of Industrial Paints is offered as a basis for discussion with the Paint Manufacturer who can advise on the suitability of particular products.

### *Very Quick Drying Spraying Enamels*

Dry to Handle 20-30 minutes.

### *Solvent Based Acrylic Clear Coatings*

Prevent dulling of the bright DuraGal finish. Quick drying.

### *Hammer and Textured Finishes*

One coat Quick Drying. Camouflage surface imperfections and minor damage.

### *Very Quick Dry Lacquers*

Rapidly develop hard dry surface.

# Recommended Paint Systems

The following tables (pages 15 to 22) are Design and substitution tables for painting DuraGal fabrications.

The design tables set out OneSteel's recommended treatment of the DuraGal surface, welds, cut ends, drilled holes.

The substitution tables should be used if you are already painting black steel, the design tables if the substitution tables do not show a substitute for your system, if you are using a paint system over jobbing hot-dip galvanized steel or if you need to select a system for a new project.

If you think your existing system is over specified, using the design tables might be cost effective.

The tables attempt to set out water borne and solvent based systems for both brush and spray application. Economical and effective systems could not be suggested using all water borne and solvent based systems. The recommended systems contained mixed systems where necessary. In particular it was not possible to recommend a water borne system for medium and long term protection of the weld areas of DuraGal fabrications and black attachments.

## Corrosion Protection For DuraGal - Powder Coating

DuraGal is a prepared surface suitable for powder coating. See the "DuraGal Powder Coating Manual" for further information.

## Painting Fabrications Welded from DuraGal with Black Steel Attachments

### *Painting the Black Steel Attachments and welds*

Black steel has a surface layer of black mill scale (a form of oxide) which promotes rusting of the steel under normal exterior conditions. Painting over mill scale gives only medium term protection at best.

For long term protection it is necessary to shot or grit blast the steel down to a clean bright metal surface free from mill scale before applying the selected paint system.

It is of interest to note that an essential part of the DuraGal zinc coating process is that the steel surface is shot blasted and chemically cleaned to a surface equivalent to AS 1627.4 class 3, before the zinc coating is applied. DuraGal, as received by the user, is therefore a zinc protected, mill scale free steel surface immediately suitable for coating up to the level of Long Term Protection to AS/NZS 2312.

In considering the painting of a DuraGal/Black Steel composite fabrication, the decision regarding the performance required of the black steel component is therefore important.

Where the Black Steel component is a small part of the surface area of the total fabrication, say less than 5%, it may be treated the same as the weld area in a DuraGal to DuraGal fabrication.

If the black steel component is 5% of the total surface area or larger it should shot blast to AS 1627.4 Class $2^1/_2$ and then painted with a system from AS/NZS 2312 suitable for the design level of protection required and, If the DuraGal component of the fabrication is to be painted as well, compatible with the DuraGal paint system selected.

Only if it is not necessary, from a corrosion protection stand point, to paint the DuraGal component of the fabrication should consideration be given to not blasting the black steel to AS 1627.4 class $2^1/_2$, and then only if the fabrication is to be exposed to the lower end of the "corrosion environment / design life to first maintenance" spectrum.

It could be more cost effective to use attachments that have been hot dip galvanized, zinc plated or blasted and zinc rich primed, rather than black steel attachments.

## *Protection of Bolts and Bolt Holes*

It is preferred that all bolts, nuts and washers used with DuraGal Profiles and hollow Sections should be hot dip Galvanized. Electroplated bolts, nuts and washers are available but AS 2312 says that they are rarely appropriate for exterior exposure conditions.

OneSteel recommends that the bolt holes be treated to stop rusting of the walls of the holes in the assembled joints. In all cases it is preferable that the bare walls of the holes be protected by a system appropriate for the exposure conditions to be experienced.

The following are the recommended protection for: -

**a) *Corrosion Environments Similar to Atmospheric Corrosion Classifications up to and Including AS/NZS 2312;1994 Tropical***

It is preferable to prime the surface of the hole, but at the very least, assemble the joint with silicone sealant, in the hole, on the bolt and under both washers.

**b) *Corrosion Environments Similar to Atmospheric Corrosion Classifications up to and Including AS/NZS 2312;1994 Severe Marine***

It is preferable to prime the surface of the hole using epoxy primers, but at the very least, assemble the joint with a corrosion resistant epoxy or urethane sealant, in the hole, on the bolt, under both washers and over the outside of the exposed fasteners.

The sealant used must be suitable to replace a tar epoxy system and last 25 years in a severe marine environment. Its features should include , but not be limited to the following :-

- Must provide excellent corrosion resistance.
- Provide long lasting flexibility with elasticity and impact resistance.
- Provide excellent adhesion.
- Enable exceptional hold up on edges, corners, welds, bolts, rivets, etc.

# TABLE 1
# CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE
## Architectural Domestic and Factory Manufactured Items

| For Atmospheric Classifications up to & Including **Tropical** | Part to be Painted | Recommended Corrosion Protection Options Suitable for Atmospheric Classifications up to and Including AS/NZS 2312:1994 Tropical | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Short Term Exterior Protection** (from 2 to 5 years) | PRN * | **Medium Term Exterior Protection** (from 5 to 10 years) | PRN * | **Long Term Exterior Protection** (from 10 to 20 years) | PRN * |
| Using **Water-Borne** Coatings Where Suitable | **Finish** Body & Weld | Unpainted DuraGal | | Unpainted DuraGal | | Unpainted DuraGal | |
| | **Weld** Pre- Prep | Hand or power tool clean to class 1 or abrasive blast to class1. [1]<br>Water borne Acrylic latex zinc phosphate primer (35 to 50 microns DFT).<br>2 coats of acrylic latex gloss (each coat 35 to 50 microns DFT). [5] | 11<br><br>21 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT). [5]<br>or<br>Power tool clean to class 2, or abrasive blast to class $2^1/_2$ [1]<br>Chlorinated rubber zinc phos. primer (65 to 85 microns DFT).<br>2 coats of chlorinated rubber gloss (each coat 35 to 50 microns DFT). [5] | 32<br><br>?<br>25 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (200 to 250 micron DFT). [4,5] | 32 |
| Using Mainly **Solvent Based** Coatings | **Finish** Body & Weld | Unpainted DuraGal | | Unpainted DuraGal | | Unpainted DuraGal | |
| | **Weld** Pre- Prep | Hand or power tool clean to class 1 or abrasive blast to class1. [1]<br>Galvanized iron primer (30microns DFT).<br>2 coats of alkyd gloss (each coat 35 to 50 microns DFT). [5]<br>or<br>Epoxy zinc phosphate primer ( 35 to 50 microns DFT).<br>2 coats of Galmet DuraGal Silver Paint (each 35 to 50 Microns DFT). | 5<br><br>20<br><br>6 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT). [5]<br>or<br>Power tool clean to class 2, or abrasive blast to class $2^1/_2$ [1]<br>Chlorinated rubber zinc phos. primer (35 to 50 microns DFT).<br>2 coats of chlorinated rubber gloss (each coat 35 to 50 microns DFT). [5] | 32<br><br>?<br>25 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (200 to 250 micron DFT). [4,5] | 32 |

**Notes!! Additional protection is required for DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)
? There is no PRN number in AS/NZS 2312 for a chlorinated rubber primer.
1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation
4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.
5 To colur match the DuraGal finish overcoat with an aluminium pigmented paint. Galmet DuraGal Silver is generally suitable.

## TABLE 2

# CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE

### Architectural Domestic and Factory Manufactured Items

| For Atmospheric Classifications up to & Including **Marine** (Some suitable for severe marine) | Part to be Painted | Recommended Corrosion Protection Options Suitable for Atmospheric Classifications up to and Including AS/NZS 2312:1994 Marine (Those suitable for Severe Marine denoted [2]) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Short Term Exterior Protection** (from 2 to 5 years) | PRN * | **Medium Term Exterior Protection** (from 5 to 10 years) | PRN * | **Long Term Exterior Protection** (from 10 to 20 years) | PRN * |
| **Using Water-Borne Coatings Where Suitable** | **Finish** Body & Weld | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>2 coats of flat, satin or gloss acrylic self priming emulsion (each 30 to 40 microns DFT). [3]<br>2nd coat optional depending on location and colour | 21 | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>Water bourne 2-pack epoxy ZP primer (35 to 50 microns DFT).<br>MIO water bourne epoxy (100 To 125 microns DFT).<br>If a finish colour is required, 1or 2 coats of a water based self priming acrylic (each 30 to 40 microns DFT). [2] | 21 | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>Water bourne 2-pack epoxy ZP primer (35 to 50 microns DFT).<br>MIO water bourne epoxy (100 To 125 microns DFT).<br>If a finish colour is required, 1or 2 coats of a water based self priming acrylic (each 30 to 40 microns DFT). | 6<br>13<br>21 |
| | **Weld** Pre- Prep | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT). [2] | 32 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT). [2] | 32 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic. (150 to 200 micron DFT) | 32 |
| **Using Mainly Solvent Based Coatings** | **Finish** Body & Weld | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>Galvanized iron primer (30 microns DFT).<br>2 coats of alkyd enamel (each 35 to 50 microns DFT). [2]<br>2nd coat optional depending on location and colour | 10<br>20 | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>2-pack epoxy system (35 to 50 microns DFT).<br>2 coats of a 2-pack acrylic or polyurethane gloss (each 40 to 50 microns DFT). [2] | 6<br>33 or 26 | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>2-pack epoxy system (125 to 150 microns DFT).<br>2 coats of a 2-pack acrylic or polyurethane gloss (each 40 to 50 microns DFT). [2]<br>(check with your paint supplier for suitability of their system over DuraGal & DuraGal Profile surfaces.) | 6<br>33 or 26 |
| | **Weld** Pre- Prep | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT). [2] | 32 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT). [2] | 32 | Hand or power tool clean to class 1 or abrasive blast to class 1. [1]<br>Epoxy mastic (150 to 200 micron DFT).<br>or<br>Abrasive blast to class 2½ [1]<br>Epoxy mastic (225 to 300 microns DFT). [2,4] | 32<br><br>32 |

**Notes !!** **Additional protection is required for DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)
? There is no PRN number in AS/NZS 2312 for a chlorinated rubber primer.
1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.
2 These systems suitable for use in AS/NZS 2312:1994 Severe Marine atmospheric classisifications (see table 3.1 AS/ NZS 2312)
3 Not suitable for severe marine exposure to AS/NZS 2312. To be acceptable for this exposure level a water based acrylic latex (galvanized iron) primer should be applied prior to the finish coats.
4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

## TABLE 3
# CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE

| | Part to be Painted | Point of Sale Decoration for Factory Manufactured Items | PRN * | Protection for Dry Mild Internal Environments in Buildings | PRN * |
|---|---|---|---|---|---|
| Using **Water-Borne** Coatings Where Suitable | **Finish** Body & Weld | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>2 coats of acrylic latex gloss. (each coat 35 to 50 microns DFT) | 21 | Unpainted DuraGal | |
| | **Weld** Pre- Prep | Nothing or dress to improve appearance.<br>or<br>Hand or power tool clean to class 1 or abrasive blast to class1. [1]<br>Water borne Acrylic latex zinc phos. primer . (35 to 50 microns DFT) | 11 | Hand or power tool clean to class 1 or abrasive blast to class1. [1]<br>Water borne Acrylic latex zinc phosphate primer . (35 to 50 microns DFT)<br>2 coats of acrylic latex gloss. (each coat 35 to 50 microns DFT) [5] | 11<br>21 |
| Using Mainly **Solvent Based** Coatings | **Finish** Body & Weld | Clean & degrease with mild alkaline degreaser or methylated spirits.<br>Galvanized iron primer (30 microns DFT)<br>2 coats of alkyd enamel gloss. (each coat 35 to 50 microns DFT) | 20 | Unpainted DuraGal | |
| | **Weld** Pre- Prep | Nothing or dress to improve appearance.<br>or<br>Hand or power tool clean to class 1 or abrasive blast to class 1. [1] | | Hand or power tool clean to class 1 or abrasive blast to class1. [1]<br>Galvanized iron primer (30 microns DFT)<br>2 coats of alkyd enamel gloss. (each coat 35 to 50 microns DFT) [5] | 5<br>20 |

## TABLE 4
# CORROSION PROTECTION FOR DURAGAL - DESIGN GUIDE

| | Part to be Painted | Protection for Wet Internal Environments in Buildings (no salt, chlorine or other acidic chemicals) | | | Protection for Harsh Wet Internal Environments in Buildings (Atmosphere includes salt, chlorine &/or other acidic chemicals) | | |
|---|---|---|---|---|---|---|---|
| | | **Short Term Protection** (2 to 5 years) | **Medium Term Protection** (5 to 10 years) | **Long Term Protection** (10 to 15 years) | **Short Term Protection** (2 to 5 years) | **Medium Term Protection** (5 to 10 years) | **Long Term Protection** (10 to 15 years) |
| Using **Water-Borne** Coatings Where Suitable | **Finish** Body & Weld | To achieve suitable protection for this environment, Use the AS/NZS 2312 recommended corrosion systems suitable for atmospheric classifications up to Tropical - see Table 1 | | | To achieve suitable protection for this environment, Use the AS/NZS 2312 recommended corrosion systems suitable for atmospheric classifications up to Severe Marine - see Table 2 | | |
| | **Weld** Pre- Prep | | | | | | |
| Using Mainly **Solvent Based** Coatings | **Finish** Body & Weld | | | | | | |
| | **Weld** Pre- Prep | | | | | | |

Notes!! **Additional protection is required for DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)
? There is no PRN number in AS/NZS 2312 for a chlorinated rubber primer.
1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation
4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.
5 To colur match the DuraGal finish overcoat with an aluminium pigmented paint. Galmet DuraGal Silver is generally suitable.

# CORROSION PROTECTION FOR DURAGAL - SUBSTITUTION TABLE

| Selected Paint System for Black Steel | PRN * | AS 2312 System Ref. No. | Part to be Painted | Recommended Equivalent Corrosion Protection System for DuraGal | PRN * |
|---|---|---|---|---|---|
| Hand or Power Tool Clean, Class 1.[1]<br>Alkyd Primer (35 to 50 microns DFT) | 5 | SP1 - A | Body | Unpainted DuraGal [4] | |
| | | | Weld | Hand or power tool clean, class 1.[1]<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)[3,4] | ?,7 |
| Hand or Power Tool Clean, Class 1.[1]<br>Epoxy Mastic (100 to 125 microns DFT) | 32 | SP3 - A | Body | Unpainted DuraGal [4] | |
| | | | Weld | Hand or Power Tool Clean, Class 1.[1]<br>Epoxy Mastic (150 to 200 microns DFT)[3,4] | 32 |
| Hand or Power Tool Clean, Class 1.[1]<br>Alkyd Primer (35 to 50 microns DFT)<br>Alkyd U/coat (35 to 50 microns DFT)<br>Alkyd Gloss (35 to 50 microns DFT) | 5<br>18<br>20 | SP4 - A | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)<br>Alkyd Gloss (35 to 50 microns DFT) | ?,7<br>20 |
| | | | Weld | Hand or Power Tool Clean, Class 1.[1]<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)<br>Alkyd Undercoat (35 to 50 microns DFT)<br>Alkyd Gloss (35 to 50 microns DFT) | ?,7<br>18<br>20 |
| Hand or Power Tool Clean, Class 1.[1]<br>Alkyd Primer (35 to 50 microns DFT)<br>2 coats of Alkyd Gloss (each 35 to 50 microns DFT) | 5<br>20<br>20 | SP5 - A | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)<br>Alkyd Gloss (35 to 50 microns DFT)[3] | ?,7<br>20 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)<br>2 Coats of Alkyd Gloss (Each 35 to 50 microns DFT) | ?,7<br>20 |
| Hand or Power Tool Clean, Class 1.[1]<br>Alkyd Primer (35 to 50 microns DFT)<br>2 Coats of Acrylic Gloss Latex (Each 35 to 50 microns DFT) | 5<br>21 | SP5 - D | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT<br>2 Coats of Acrylic Latex Gloss (Each 35 to 50 microns DFT) | ?,7<br>21 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Chlorinated Rubber or Solvent Based Vinyl Zinc Phosphate Primer (35 to 50 microns DFT)<br>2 Coats of Acrylic Latex Gloss (Each 35 to 50 microns DFT) | ?,7<br>21 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (65 to 75 Microns DFT) | 1 | MP1 - A | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT) | 32 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy Mastic (200 to 250 microns DFT)[5] | 32 |

**Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)

? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems .

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

# CORROSION PROTECTION FOR DURAGAL - SUBSTITUTION TABLE - Continued

| Selected Paint System for Black Steel | PRN * | AS 2312 System Ref. No. | Part to be Painted | Recommended Equivalent Corrosion Protection System for DuraGal | PRN * |
|---|---|---|---|---|---|
| Abrasive Blast, Class 2½. [1]<br>High-Build Epoxy (200 to 250 Microns DFT) | 13 | MP1 - C | Body | DuraGal, Solvent Cleaned with Clean Rag<br>High-Build Epoxy (200 to 250 Microns DFT) | 13 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (200 to 250 Microns DFT) | 32<br>13 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (65 to 75 microns DFT)<br>2 Coats of Acrylic Latex (Each 35 to 50 Microns DFT) | 1<br><br>21 | MP2 - A | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT)<br>2 Coats of Acrylic Latex (Each 35 to 50 Microns DFT) | <br>32<br>21 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy Mastic (200 to 250 microns DFT)[5]<br>2 Coats of Acrylic Latex (Each 35 to 50 Microns DFT) | <br>32<br>21 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (65 to 75 Microns DFT)<br>Vinyl Primer (25 to 35 Microns DFT)<br>Alkyd Gloss (35 to 50 Microns DFT) | 1<br><br>7<br>20 | MP3 - A | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT)<br>Alkyd Gloss (35 to 50 Microns DFT) | <br>32<br>20 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy mastic (200 to 250 microns DFT)[5]<br>Alkyd Gloss (35 to 50 Microns DFT) | <br>32<br>20 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (65 to 75 microns DFT)<br>High-Build Epoxy (100 to 125 Microns DFT)<br>Two-Pack Epoxy Gloss (40 to 50 Microns DFT) | 1<br><br>13<br><br>24 | MP5 - A | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Epoxy Gloss (40 to 50 Microns DFT) | <br>32<br>13<br>24 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy Mastic (200 to 250 microns DFT)[5]<br>High-Build Epoxy (100 to 125 Microns DFT)<br>Two-Pack Epoxy Gloss (40 to 50 Microns DFT) | <br>32<br>13<br>24 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (65 to 75 microns DFT)<br>High-Build Epoxy (100 to 125 Microns DFT)<br>Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 1<br><br>13<br>33 | MP5 - B | Body | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT) High-Build Epoxy (100 to 125 Microns DFT) Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | <br>32<br>13<br>33 |
| | | | Weld | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy Mastic (200 to 250 microns DFT)[5]<br>High-Build Epoxy (100 to 125 Microns DFT)<br>Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | <br>32<br>13<br>33 |

**Notes!! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)

? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems .

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation. .

4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

# CORROSION PROTECTION FOR DURAGAL - SUBSTITUTION TABLE - Continued

| Selected Paint System for Black Steel | PRN * | AS 2312 System Ref. No. | Part to be Painted | Recommended Equivalent Corrosion Protection System for DuraGal | PRN * |
|---|---|---|---|---|---|
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Inorganic Zinc Silicate (65 to 75 microns DFT) | 1 | | | Epoxy Mastic (150 to 200 microns DFT) | 32 |
| | | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| High-Build Epoxy (100 to 125 Microns DFT) | 13 | **MP5 - D** | | Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 |
| Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 | | **Weld** | Hand or Power Tool Clean, Class 1. [1] | |
| | | | | Epoxy Mastic (200 to 250 microns DFT)[5] | 32 |
| | | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | | | Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 |
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Two-Pack Epoxy Primer (35 to 50 microns DFT) | 6 | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | **MP5 - I** | | Two-Pack Epoxy Gloss (40 to 50 Microns DFT) | 24 |
| High-Build Epoxy (100 to 125 Microns DFT) | 13 | | **Weld** | Hand or Power Tool Clean, Class 1. [1] | |
| Two-Pack Epoxy Gloss (40 to 50 Microns DFT) | 24 | | | Epoxy mastic (150 to 200 microns DFT) | 32 |
| | | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | | | Two-Pack Epoxy Gloss (40 to 50 Microns DFT) | 24 |
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Two-Pack Epoxy Primer (35 to 50 microns DFT) | 6 | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | **MP5 - J** | | Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 33 |
| High-Build Epoxy (100 to 125 Microns DFT) | 13 | | **Weld** | Hand or Power Tool Clean, Class 1. [1] | |
| Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 33 | | | Epoxy mastic (150 to 200 microns DFT) | 32 |
| | | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | | | Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 33 |
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Two-Pack Epoxy Primer (35 to 50 microns DFT) | 6 | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | **MP5 - K** | | Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 |
| High-Build Epoxy (100 to 125 Microns DFT) | 13 | | **Weld** | Hand or Power Tool Clean, Class 1. [1] | |
| Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 | | | Epoxy mastic (150 to 200 microns DFT) | 32 |
| | | | | High-Build Epoxy (100 to 125 Microns DFT) | 13 |
| | | | | Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 |
| Hand or Power Tool Clean, Class 1, or abrasive Blast Class 1. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| | | **MP8 - A** | | Epoxy Mastic (150 to 200 microns DFT) | 32 |
| Epoxy Mastic (125 to 175 microns DFT) | 32 | | **Weld** | Hand or Power Tool Clean, Class 1. [1] | |
| | | | | Epoxy Mastic (150 to 200 microns DFT) | 32 |

**Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)

? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems .

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

# CORROSION PROTECTION FOR DURAGAL - SUBSTITUTION TABLE - Continued

| Selected Paint System for Black Steel | PRN * | AS 2312 System Ref. No. | Part to be Painted | Recommended Equivalent Corrosion Protection System for DuraGal | PRN * |
|---|---|---|---|---|---|
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (65 to 75 microns DFT)<br>High-Build Epoxy (125 to 150 Microns DFT) | 1<br>13 | MP9 - A | **Body** | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT)<br>High-Build Epoxy (125 to 150 Microns DFT) | <br>32<br>13 |
| | | | **Weld** | Hand or Power Tool Clean, Class 1. [1]<br>Epoxy Mastic (200 to 250 microns DFT) [5]<br>High-Build Epoxy (125 to 150 Microns DFT) | <br>32<br>13 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (70 to 85 microns DFT)<br>2 Coats of High-Build Epoxy (Each 100 to 125 Microns DFT) | 1<br>13 | LP1 - A | **Body** | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT)<br>2 coats of High-Build Epoxy (Each 250 to 300 Microns DFT) | <br>32<br>13 |
| | | | **Weld** | Class 2½ Blast the Weld [1]<br>Epoxy Mastic (200 to 250 microns DFT) [5]<br>2 coats of High-Build Epoxy (Each 100 to 125 Microns DFT) | <br>32<br>13 |
| Abrasive Blast, Class 2½ or acid pickle. [1]<br>Two-Pack Epoxy Primer (65 to 75 Microns DFT)<br>2 Coats of High-Build Epoxy / MIO (Each 100 to 125 Microns DFT) | 6<br>13 | LP1 - I | **Body** | DuraGal, Solvent Cleaned with Clean Rag<br>2 Coats of High-Build Epoxy / MIO (Each 100 to 125 Microns DFT) | <br>13 |
| | | | **Weld** | Class 2½ Blast the Weld [1]<br>Epoxy Mastic (150 to 200 microns DFT)<br>2 Coats of High-Build Epoxy / MIO (Each 100 to 125 Microns DFT) | <br>32<br>13 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (70 to 85 microns DFT)<br>High-Build Epoxy / MIO (175 to 200 Microns DFT) | 1<br>13 | LP2 - A | **Body** | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT)<br>High-Build Epoxy / MIO (175 to 200 Microns DFT) | <br>32<br>13 |
| | | | **Weld** | Class 2½ Blast the Weld [1]<br>Epoxy Mastic (200 to 250 microns DFT) [5]<br>High-Build Epoxy / MIO (175 to 200 Microns DFT) | <br>32<br>13 |
| Abrasive Blast, Class 2½. [1]<br>Inorganic Zinc Silicate (70 to 85 microns DFT)<br>High-Build Epoxy (175 to 200 Microns DFT) | 1<br>13 | LP2 - C | **Body** | DuraGal, Solvent Cleaned with Clean Rag<br>Epoxy Mastic (150 to 200 microns DFT)<br>High-Build Epoxy (175 to 200 Microns DFT) | <br>32<br>13 |
| | | | **Weld** | Class 2½ Blast the Weld [1]<br>Epoxy Mastic (200 to 250 microns DFT) [5]<br>High-Build Epoxy (175 to 200 Microns DFT) | <br>32<br>13 |

**Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)

? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems .

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

# CORROSION PROTECTION FOR DURAGAL - SUBSTITUTION TABLE - Continued

| Selected Paint System for Black Steel | PRN * | AS 2312 System Ref. No. | Part to be Painted | Recommended Equivalent Corrosion Protection System for DuraGal | PRN * |
|---|---|---|---|---|---|
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Inorganic Zinc Silicate (70 to 85 microns DFT) | 1 | **LP4 - A** | | Epoxy Mastic (150 to 200 microns DFT) | 32 |
| High-Build Epoxy (125 to 150 Microns DFT) | 13 | | | High-Build Epoxy (150 to 200 Microns DFT) | 13 |
| Acrylic Latex (35 to 50 Microns DFT) | 21 | | | Acrylic Latex (35 to 50 Microns DFT) | 21 |
| | | | **Weld** | Class 2½ Blast the Weld [1] | |
| | | | | Epoxy Mastic (200 to 250 microns DFT)[5] | 32 |
| | | | | High-Build Epoxy (150 to 200 Microns DFT) | 13 |
| | | | | Acrylic Latex (35 to 50 Microns DFT) | 21 |
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Inorganic Zinc Silicate (70 to 85 microns DFT) | 1 | **LP6 - A** | | Epoxy Mastic (150 to 200 microns DFT) | 32 |
| High-Build Epoxy (150 to 200 Microns DFT) | 13 | | | High-Build Epoxy (150 to 200 Microns DFT) | 13 |
| Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 33 | | | Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 33 |
| | | | **Weld** | Class 2½ Blast the Weld [1] | |
| | | | | Epoxy Mastic (200 to 250 microns DFT)[5] | 32 |
| | | | | High-Build Epoxy (150 to 200 Microns DFT) | 13 |
| | | | | Two-Pack Acrylic Gloss (40 to 50 Microns DFT) | 33 |
| Abrasive Blast, Class 2½. [1] | | | **Body** | DuraGal, Solvent Cleaned with Clean Rag | |
| Inorganic Zinc Silicate (70 to 85 microns DFT) | 1 | **LP6 - B** | | Epoxy Mastic (150 to 200 microns DFT) | 32 |
| High-Build Epoxy (150 to 200 Microns DFT) | 13 | | | High-Build Epoxy (150 to 200 Microns DFT) | 13 |
| Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 | | | Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 |
| | | | **Weld** | Class 2½ Blast the Weld [1] | |
| | | | | Epoxy Mastic (200 to 250 microns DFT)[5] | 32 |
| | | | | High-Build Epoxy (150 to 200 Microns DFT) | 13 |
| | | | | Two-Pack Polyurethane Gloss (40 to 50 Microns DFT) | 26 |

**Notes !! Additional protection is required for Unpainted DuraGal in Marine and Industrial classifications where the surface is not washed by rain, ie under eaves or horizontal faces of members. Painting as specified in the next highest option is recommended.**

* PRN - paint reference number (see Appendix C of AS/NZS 2312 :1994.)

? There is no PRN number in AS/NZS 2312 for a Chlorinated rubber primer.

1 Refer to AS 1627 Parts 2,4,5,7 or 9 for surface preparation.

2 If the weld area needs to be colour matched with the DuraGal finish, use an aluminium pigmented coating of the paint type listed. Galmet DuraGal Silver paint is generally suitable as an additional coat applied to the above systems .

3 Where a decorative finish is required on the Duragal body, apply one or two coats of gloss acrylic latex. Where maximum resistance to wear, abrasion or general chemical attack is required apply finish coats of two pack polyurethane. DuraGal must not be "white rusted" and will also require solvent cleaning with clean rags before application of the decorative coating. "White rust " must be mechanically or chemically removed before solvent cleaning and painting. See the DuraGal painting guide for more information on surface preparation.

4 If this weld touch-up is applied in two coats, ie base coat & the second coat which is the body coat, each coat should be 150 to 200 microns DFT to ensure suitable coalescence of the spray droplets & thus minimise pin holes.

# Coating Systems for DuraGal Profiles and Hollow Sections for AS/NZS 2312:1994 Exposures

The coatings manufacturers listed on the following pages have carried out their own evaluation for the DuraGal Family of Products® and the atmospheric exposure categories listed within AS/NZS 2312:1994.

For further information on the coatings listed, OneSteel recommends you contact the coatings manufacturer directly to discuss the details of your application, and obtain detailed data sheets on surface preparation, application and safe use of their products.

OneSteel Direct can assist you by providing the nearest location and contact details for the nominated coatings manufacturers listed in this guide.

## OneSteel Direct

Freecall: 1800 065 415
Freefax: 1800 800 744
e-mail: onesteeldirect@onesteel.com

# Coating Systems for DuraGal Profiles and Hollow Sections for AS/NZS 2312:1994 Exposures

## Akzo Nobel

**Surface Preparation**: Refer to manufacturer's data sheets.
**Note1:** For specifications refer to Akzo Nobel personnel
**Note2:** Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

| AS/NZS 2312 Exposure | Weld Coat and cut edges | DFT micron | Primer | DFT micron | Intermediate Coat | DFT micron | Top Coat | DFT micron | Total film thickness | Coating System Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mild *** | | | | | | | | | | |
| Short Term | Interzinc 352 | 30 | Interprime 741 | 10 | - | - | Interlac 645 | 50 | 60 | Vinyl/Alkyd |
| Medium Term | Interzinc 352 | 50 | Interprime 741 | 10 | - | - | Interfine 629 | 75 | 85 | Vinyl/Two pack acrylic |
| Long Term | Interzinc 42 | 50 | Intergard 269 | 40 | - | - | Interfine 629 | 75 | 115 | Epoxy/Two pack acrylic |
| **Moderate *** | | | | | | | | | | |
| Short Term | Interzinc 352 | 30 | Interprime 741 | 10 | Interlac 645 | 50 | Interlac 645 | 50 | 110 | Vinyl/Alkyd |
| Medium Term | Interzinc 352 | 30 | Intergard 269 | 40 | Interplus 356 | 75 | Interfine 629 | 75 | 190 | Epoxy/Two pack acrylic |
| Long Term | Interzinc 42 | 50 | Intergard 269 | 40 | Interplus 356 | 75 | Interfine 629 | 75 | 190 | Epoxy/Two pack acrylic |
| **Tropical *** | | | | | | | | | | |
| Short Term | Interzinc 42 | 50 | Intergard 269 | 40 | - | - | Interfine 629 | 75 | 115 | Epoxy/Two pack acrylic |
| Medium Term | Interzinc 42 | 50 | Intergard 269 | 40 | Interplus 356 | 75 | Interfine 629 | 75 | 190 | Epoxy/Two pack acrylic |
| Long Term | Interzinc 42 | 50 | Intergard 269 | 40 | Interplus 356 | 75 | Interfine 629 | 75 | 190 | Epoxy/Two pack acrylic |
| **Industrial** | | | | | | | | | | |
| Short Term | Interzinc 42 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| Medium Term | Interzinc 42 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| Long Term | Interzinc 42 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| **Marine** | | | | | | | | | | |
| Short Term | Interzinc 42 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| Medium Term | Interzinc 42 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| Long Term | Interzinc 42 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| **Severe marine** | | | | | | | | | | |
| Short Term | Interzinc 52 | 50 | Intergard 269 | 40 | Integard 475 HS | 125 | Interfine 629 | 75 | 240 | Epoxy/Two pack acrylic |
| Medium Term | Interzinc 52 | 50 | Intergard 269 | 40 | Integard 475 HS | 200 | Interfine 629 | 75 | 315 | Epoxy/Two pack acrylic |
| Long Term | Interzinc 52 | 50 | Intergard 269 | 40 | Integard 475 HS | 200 | Interfine 629 | 75 | 315 | Epoxy/Two pack acrylic |

* Coatings generally not required for these atmospheric exposures - refer to the table on page 7 of this guide.


Issue February 2001

# Coating Systems for DuraGal Profiles and Hollow Sections for AS/NZS 2312:1994 Exposures

## Ameron Coatings

**Surface Preparation:** Refer to manufacturer's data sheets.
**Note1:** For additional corrosion protection of DuraGal sections without barrier polymer coating, an application of Ameron Multietch 302 may be beneficial. Contact Ameron for details.
**Note2:** Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

| AS/NZS 2312 Exposure | Weld Coat and cut edges | DFT micron | First Coat | DFT micron | Second Coat | DFT micron | Third Coat | DFT micron | Total DFT micron | Coating System Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mild *** | | | | | | | | | | |
| Short Term | Zinc rich 311 | 50 | Amercoat 148K | 50 | Amercoat 5401 | 50 | - | - | 100 | Galv' iron primer/Gen purpose enamel |
| Medium Term | Zinc rich 311 | 50 | Amercoat 148K | 50 | Amercoat 5401 | 50 | - | - | 100 | Galv' iron primer/Gen purpose enamel |
| Long Term | Zinc rich 311 | 50 | Amercoat 148K | 50 | Amercoat 5401 | 50 | - | - | 100 | Galv' iron primer/Gen purpose enamel |
| **Moderate *** | | | | | | | | | | |
| Short Term | Zinc rich 311 | 50 | Amercoat 148K | 50 | Amercoat 5401 | 100 | - | - | 150 | Galv' iron primer/Gen purpose enamel |
| Medium Term | Zinc rich 311 | 50 | Amercoat 148K | 50 | Amercoat 5401 | 100 | - | - | 150 | Galv' iron primer/Gen purpose enamel |
| Long Term | Zinc rich 311 | 50 | Ameron 783 | 25 | Ameron Iso Free 977 | 75 | - | - | 100 | Modified resin primer/Two pack acrylic |
| **Tropical *** | | | | | | | | | | |
| Short Term | Amercoat 68K | 25-50 | Ameron 783 | 25 | Ameron Iso Free 977 | 75 | - | - | 100 | Modified resin primer/Two pack acrylic |
| Medium Term | Amercoat 68K | 25-50 | Amercoat CC24 | 75 | Ameron Iso Free 977 | 75 | - | - | 150 | Two pack epoxy/Two pack acrylic |
| Long Term | Amercoat 68K | 25-50 | Amercoat CC24 | 100-125 | Ameron Iso Free 977 | 75 | - | - | 175-200 | Two pack epoxy/Two pack acrylic |
| **Industrial** | | | | | | | | | | |
| Short Term | Amercoat 68K | 25-50 | Amercoat CC24 | 75 | Ameron Iso Free 977 | 50-75 | - | - | 125-150 | Two pack epoxy/Two pack acrylic |
| Medium Term | Amercoat 68K | 25-50 | Amercoat CC24 | 75 | Ameron Iso Free 977 | 75 | - | - | 150 | Two pack epoxy/Two pack acrylic |
| Long Term | Amercoat 68K | 25-50 | Amercoat CC24 | 125 | Ameron Iso Free 977 | 75 | - | - | 200 | Two pack epoxy/Two pack acrylic |
| **Marine** | | | | | | | | | | |
| Short Term | Amercoat 68K | 25-50 | Amercoat CC24 | 75 | Ameron Iso Free 977 | 50 | - | - | 125 | Two pack epoxy/Two pack acrylic |
| Medium Term | Amercoat 68K | 25-50 | Amercoat CC24 | 100 | Ameron Iso Free 977 | 75 | - | - | 175 | Two pack epoxy/Two pack acrylic |
| Long Term | Amercoat 68K | 25-50 | Amercoat CC24 | 125 | Ameron Iso Free 977 | 75 | - | - | 200 | Two pack epoxy/Two pack acrylic |
| **Severe Marine** | | | | | | | | | | |
| Short Term | Amercoat 68K | 25-50 | Amercoat CC24 | 125 | Ameron Iso Free 977 | 75 | - | - | 200 | Two pack epoxy/Two pack acrylic |
| Medium Term | Amercoat 68K | 25-50 | Ferroclad EX316 | 125 | Ferroclad EX316 | 125 | - | - | 250 | Micaceous iron oxide epoxy |
| Long Term | Amercoat 68K | 25-50 | Ferroclad EX316 | 125 | Ferroclad EX316 | 125 | - | - | 250 | Micaceous iron oxide epoxy |

* Coatings generally not required for these atmospheric exposures – refer to the table on page 7 of this guide.

# Coating Systems for DuraGal Profiles and Hollow Sections for AS/NZS 2312:1994 Exposures

## Dulux

( Dulux, an Orica business)

**Surface Preparation**: Refer to manufacturer's data sheets. Any welds or cut edges should be power or hand tool cleaned to AS1627.7 Class2

**Note1:** For specifications refer to Orica personnel

**Note2:** Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

| AS/NZS 2312 Exposure | Weld Coat and cut edges | DFT micron | First Coat | DFT micron | Second Coat | DFT micron | Third Coat | DFT micron | Total DFT micron | Coating System Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mild *** | | | | | | | | | | |
| Short Term | Zinc Rich 1P | 50-60 | Gal Iron Primer | 20-25 | Weathershield X10 | 25-35 | - | - | 45-60 | Galvanised Iron Primer/ Acrylic |
| Medium Term | Zinc Rich 1P | 50-60 | Gal Iron Primer | 20-25 | Weathershield X10 | 25-35 | - | - | 45-60 | Galvanised Iron Primer/ Acrylic |
| Long Term | Zinc Rich 1P | 50-60 | Duremax GPE | 100-150 | Luxathane | 50-60 | - | - | 150-210 | Epoxy/urethane |
| **Moderate *** | | | | | | | | | | |
| Short Term | Zinc Rich 1P | 50-60 | Duremax GPE | 100-150 | Luxathane | 50-60 | - | - | 150-210 | Epoxy/urethane |
| Medium Term | Zinc Rich 1P | 50-60 | Duremax GPE | 100-150 | Luxathane | 50-60 | - | - | 150-210 | Epoxy/urethane |
| Long Term | Zinc Rich 1P | 50-60 | Durebild STE | 150-200 | Luxathane | 50-60 | - | - | 200-260 | Epoxy/urethane |
| **Tropical *** | | | | | | | | | | |
| Short Term | Zinc Rich 1P | 50-60 | Duremax GPE | 100-150 | Luxathane | 50-60 | - | - | 150-210 | Epoxy/urethane |
| Medium Term | Zinc Rich 1P | 50-60 | Durebild STE | 150-200 | Luxathane | 50-60 | - | - | 200-260 | Epoxy/urethane |
| Long Term | Zinc Rich 1P | 50-60 | Durebild STE | 150-200 | Luxathane | 50-60 | - | - | 200-260 | Epoxy/urethane |
| **Industrial** | | | | | | | | | | |
| Short Term | Zinc Rich 1P | 50-60 | Durebild STE | 150-200 | Luxathane | 50-60 | - | - | 200-260 | Epoxy/urethane |
| Medium Term | Zinc Rich 1P | 50-60 | Durebild STE | 150-200 | Luxathane | 50-60 | - | - | 200-260 | Epoxy/urethane |
| Long Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |
| **Marine** | | | | | | | | | | |
| Short Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |
| Medium Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |
| Long Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |
| **Severe marine** | | | | | | | | | | |
| Short Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |
| Medium Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |
| Long Term | Zincanode 402 | 75 | Durebild STE | 150-200 | Weathermax HBR | 80-120 | - | - | 230-320 | Epoxy/urethane |

* Coatings generally not required for these atmospheric exposures - refer to the table on page 7 of this guide.

# Coating Systems for DuraGal Profiles and Hollow Sections for AS/NZS 2312:1994 Exposures

## Jotun

**Surface Preparation**: Refer to manufacturer's data sheets.
**Note1**: Contact Jotun Personnel for coating specifications
**Note2:** Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

| AS/NZS 2312 Exposure | Weld Coat and cut edges | DFT micron | First Coat | DFT micron | Second Coat | DFT micron | Third Coat | DFT micron | Total DFT micron | Coating System Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mild *** | | | | | | | | | | |
| Short Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| Medium Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| Long Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| **Moderate *** | | | | | | | | | | |
| Short Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| Medium Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| Long Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| **Tropical *** | | | | | | | | | | |
| Short Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| Medium Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| Long Term | Penguard Special | 50 | Penguard Special | 50 | Jotacote 371 | 40 | - | - | 90 | Epoxy/Catalysed Acrylic |
| **Industrial** | | | | | | | | | | |
| Short Term | Jotacote 605 | 75 | Jotacote 605 | 100 | - | - | - | - | 100 | Epoxy |
| Medium Term | Penguard Special | 75 | Penguard Special | 75 | Jotacote 371 | 40 | - | - | 115 | Epoxy/Catalysed Acrylic |
| Long Term | Jotacote 605 | 100 | Jotacote 605 | 100 | Jotacote 371 | 40 | - | - | 140 | Epoxy/Catalysed Acrylic |
| **Marine** | | | | | | | | | | |
| Short Term | Jotacote 605 | 75 | Jotacote 605 | 100 | - | - | - | - | 100 | Epoxy |
| Medium Term | Penguard HB | 75 | Penguard HB | 75 | Jotacote 371 | 40 | - | - | 115 | Epoxy/Catalysed Acrylic |
| Long Term | Penguard Special | 75 | Penguard Special | 75 | Hardtop AS | 40 | - | - | 115 | Epoxy/Polyurethane |
| **Severe marine** | | | | | | | | | | |
| Short Term | Jotamastic 87 | 100 | Jotamastic 87 | 150 | - | - | - | - | 150 | Epoxy Mastic |
| Medium Term | Penguard Special | 75 | Penguard Special | 100 | Imperite 300 | 40 | - | - | 140 | Epoxy/Polyurethane |
| Long Term | Jotacote 605 | 100 | Jotacote 605 | 150 | Imperite 300 | 40 | - | - | 190 | Epoxy/Polyurethane |

* Coatings generally not required for these atmospheric exposures - refer to the table on page 7 of this guide.

## Coating Systems for DuraGal Profiles and Hollow Sections for AS/NZS 2312:1994 Exposures

# Wattyl Protective Coatings

**Surface Preparation**: Refer to manufacturer's data sheets.
**Note1**: For specifications refer to Wattyl personnel
**Note2**: Please refer to manufacturer's data sheets for detailed information on safety requirements, application and paint properties.

| AS/NZS 2312 Exposure | Weld Coat & cut edges | DFT micron | First Coat | DFT micron | Intermediate Coat | DFT micron | Topcoat | DFT micron | Total DFT micron | Coating System Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mild *** | | | | | | | | | | |
| Short Term | Galvit E90 LV | 50 | Killrust Gal Iron Primer* | 30 | Killrust Gloss Enamel* | 35 | Killrust Gloss Enamel* | 35 | 100 | Single pack |
| Medium Term | Galvit EP100 | 50 | Sigma EP Primer* | 75 | - | - | Paracryl IFC* | 50 | 125 | Two pack epoxy/catalysed acrylic |
| Long Term | Galvit EP100 | 50 | Sigma EP Primer* | 50 | Sigmacover CM* | 75 | Paracryl IFC* | 50 | 175 | Two pack epoxy/catalysed acrylic |
| **Moderate *** | | | | | | | | | | |
| Short Term | Galvit EP100 | 50 | Killrust Gal Iron Primer* | 30 | Killrust Gloss Enamel* | 35 | Killrust Gloss Enamel* | 35 | 100 | Single pack |
| Medium Term | Galvit EP100 | 50 | Sigma EP Primer* | 75 | - | - | Paracryl IFC* | 50 | 125 | Two pack epoxy/catalysed acrylic |
| Long Term | Galvit EP100 | 50 | Sigma EP Primer* | 50 | Sigmacover CM* | 75 | Paracryl IFC* | 50 | 175 | Two pack epoxy/catalysed acrylic |
| **Tropical *** | | | | | | | | | | |
| Short Term | Galvit EP100 | 50 | Killrust Gal Iron Primer* | 30 | Killrust Gloss Enamel* | 35 | Killrust Gloss Enamel* | 35 | 100 | Single pack |
| Medium Term | Galvit EP100 | 50 | Sigma EP Primer* | 75 | - | - | Paracryl IFC* | 50 | 125 | Two pack epoxy/catalysed acrylic |
| Long Term | Galvit EP100 | 50 | Sigma EP Primer* | 50 | Sigmacover CM* | 75 | Paracryl IFC* | 50 | 175 | Two pack epoxy/catalysed acrylic |
| **Industrial** | | | | | | | | | | |
| Short Term | Galvit EP100 | 50 | Killrust Gal Iron Primer | 30 | Killrust Gloss enamel | 35 | Killrust Gloss Enamel | 35 | 100 | Single pack |
| Medium Term | Galvit EP100 | 50 | Sigma EP Primer | 75 | - | - | Paracryl IFC | 50 | 125 | Two pack epoxy/catalysed acrylic |
| Long Term | Galvit EP100 | 50 | Sigma EP Primer | 50 | Sigmacover CM | 75 | Paracryl IFC | 50 | 175 | Two pack epoxy/catalysed acrylic |
| **Marine** | | | | | | | | | | |
| Short Term | Galvit EP100 | 50 | Sigma EP Primer | 75 | - | - | Paracryl IFC | 50 | 125 | Two pack epoxy/catalysed acrylic |
| Medium Term | Galvit EP100 | 50 | Sigma EP Primer | 75 | - | - | Paracryl IFC | 50 | 125 | Two pack epoxy/catalysed acrylic |
| Long Term | Galvit EP100 | 50 | Sigma EP Primer | 50 | Sigmacover CM | 75 | Paracryl IFC | 50 | 175 | Two pack epoxy/catalysed acrylic |
| **Severe marine** | | | | | | | | | | |
| Short Term | Galvit EP100 | 50 | Sigma EP Primer | 50 | Sigmacover CM | 75 | Paracryl IFC | 50 | 175 | Two pack epoxy/catalysed acrylic |
| Medium Term | Galvit EP100 | 50 | Sigma EP Primer | 50 | Sigmacover CM | 100 | Paracryl IFC | 50 | 200 | Two pack epoxy/catalysed acrylic |
| Long Term | Galvit EP100 | 50 | Sigma EP Primer | 50 | Sigmacover CM | 150 | Paracryl IFC | 50 | 250 | Two pack epoxy/catalysed acrylic |

* Coatings generally not required for these atmospheric exposures - refer to the table on page 7 of this guide.

## ONESTEEL MARKET MILLS
## FOR MORE INFORMATION CONTACT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**Website: www.onesteel.com**


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market mills



Best Practice Program

Attachment 11



# Austube Mills expands production capacity for DuraGal

by Create Digital — March 10, 2015 in Sponsored 3 min read

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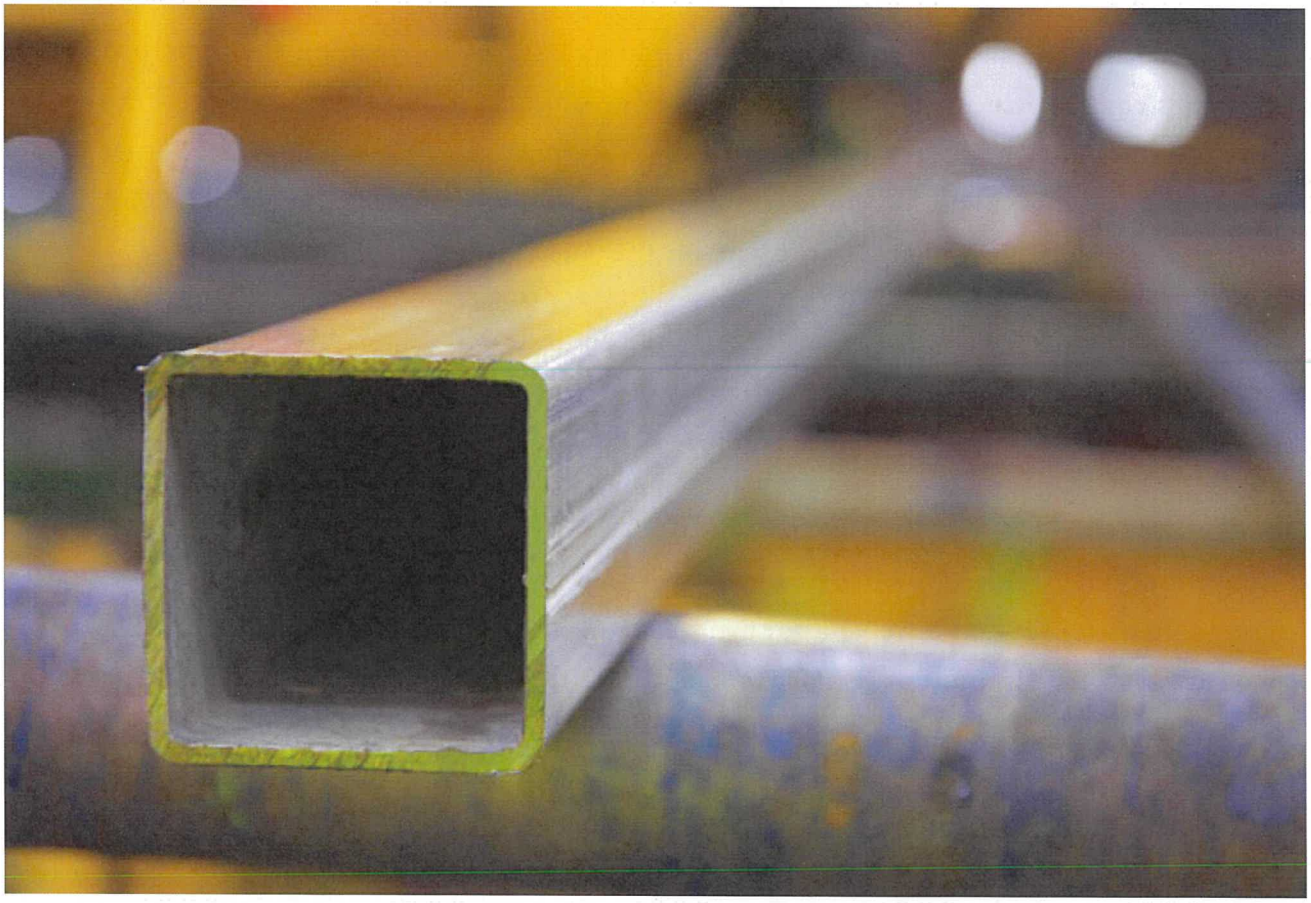

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# The COVID-19 pandemic has caused construction companies some major headaches with the uncertainty of supply and delivery schedules.

Over the past year, many construction companies have been warning clients of project delays as compliance, shipping and logistics face ongoing disruption. To help meet demand, the local manufacturer of DuraGal[1] hot dip galvanized structural steel pipes and tubes, Austube Mills, has increased capacity at their manufacturing facilities to ensure a steady supply of steel products for the Australian construction industry.

One such initiative at Newcastle in NSW is that Austube Mills has added an additional shift at its manufacturing facilities to help stay ahead of demand. It comes just in time for Australia's post-COVID-19 infrastructure boom. With many projects already announced, the demand for local galvanized steel products is already on the rise.

"Local sourcing of Austube Mills products will help to avoid headaches around compliance, delivery, and we've added capacity to our team so that we can o er products in a timely manner for local clients that are looking to get their projects back on track," said Geo Cooke, Sales and Marketing Manager at Austube Mills.

"We've got a really great team based out here in Newcastle as well as Acacia Ridge in Queensland, and we are happy to grow and welcome a new shift to help us stay ahead of demand. We hope that construction companies continue to choose to purchase high-quality compliant products like DuraGal, and support their local manufacturing industries," Cooke said.

Austube Mills is Australia's largest structural steel pipe and tube manufacturer and has been manufacturing such quality and innovative products for over eighty years.

Since the 1980s, Austube Mills has o ered a hot dip galvanized steel pipe and tube coating branded as DuraGal. Rather than apply an electrostatic coating or use another method to apply the zinc coating, the hot dip galvanizing process fuses the zinc coating with the steel during the manufacturing stage. This results in a highly durable product with good adhesion and abrasion resistance when compared to other forms of galvanizing.

There can be a misconception that electrogalvanized coating is just the same as in-line hot dip galvanized coatings such as DuraGal, but they are far from the same when it comes to longevity and corrosion resistance. Electrogalvanizing, also known as zinc or electroplating, is a process where zinc is applied using an electrical current. While it provides corrosion protection, it is typically provided in thinner coatings which are not as corrosion resistant as DuraGal's hot dip galvanized coating.

It is well established that for metallic coatings, the zinc thickness is proportional to service life, or the life through to rst maintenance in a corrosive environment. If you double the thickness, the service life is doubled in corrosive environments. DuraGal usually has double the zinc thickness than typical electrogalvanized tubes that are available. Essentially, all gal is not DuraGal.

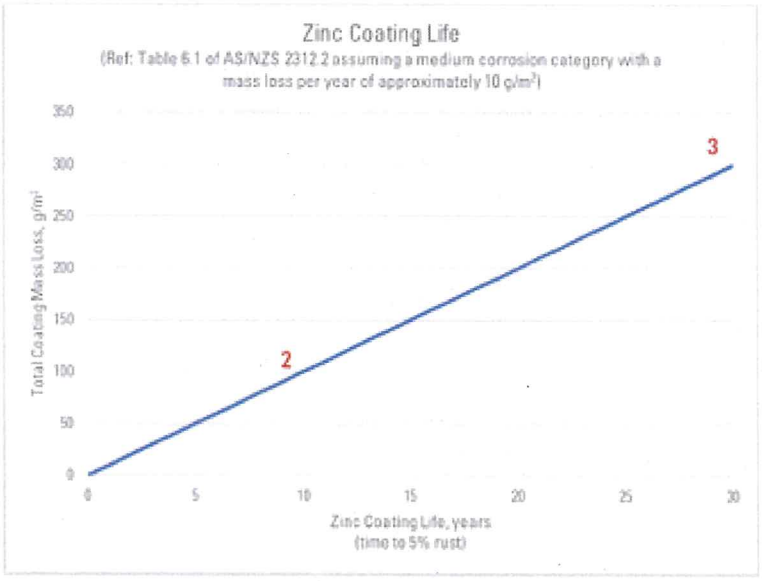


Figure courtesy of the Galvanizers Association of Australia.

Due to DuraGal's high durability, lower cost and longer-term corrosion resistance, it is well suited for use across most of the Australian landscape. The products continue to be extremely popular in Australia and used in roo ng, oor ing and column applications in building, posts, caravan chassis', trailers, large and small signage, gym and recreational equipment and many fencing applications.