08. FACTORS IN HOT-DIP GALVANIZING COATING COSTS

INTRODUCTION

Hot dip galvanized coatings are always costed on the basis of the weight of steel galvanized, with the items being weighed after galvanizing. For contract galvanized products, an agreed price per unit may be negotiated to facilitate invoicing and minimise repetitious handling in the galvanizing process.

Fabrications like this large frame require double dipping, which is typically 30% higher cost than single dipping because of the extra time in handling.

The price is quoted on a $/kg basis for smaller projects or a $/tonne basis on larger tonnages. These costs will be highly variable and will be determined by the ease of handling through the galvanizing process, and the mass that can be processed in a given time, along with the zinc pick-up on the item.

SURFACE AREA PER TONNE

While variable such as the design of the item and its steel chemistry and surface condition will influence zinc pick-up, the main factor in this part of the cost equation is the surface area of the item.

The mass of steel items that can fi t on a galvanizing jig is a major factor in costing. These small items have a high cost factor because of the low dip weight and large amount of handling required in processing them.

The density of steel is 7.85 g/m^2, and this factor can be used to derive a simple equation to calculate surface area per tonne for steel based on its average section thickness. This equation is:

$$\text{Surface area per tonne} = \frac{255}{\text{Section thickness in mm}}$$

Mass per square metre of steel can also be calculated using the following formula:

Mass per square metre in kg = Section thickness in mm x 7.85

When comparing the cost of hot-dip galvanized coatings with other industrial coating systems, it may be necessary to convert the cost per tonne to cost per square metre. This will produce a cost comparison that will allow the competitive position of alternative coatings to be easily compared. This may not be as obvious if assessed on a cost per tonne basis.

For example, light (3 mm) steel fabrications may have a galvanizing cost of $1200/tonne or $1.20/kg. This equates to a cost per m^2 of 1200/85 = $14.00/m^2. This is a very low cost for a high performance steel coating.

On the other hand, heavy (16 mm thick) sections may have a galvanizing cost of only $600/tonne. This equates to a cost per m^2 of 600/16 = $37.50/m^2.

WEIGHT INCREASE AFTER GALVANIZING

Traditionally `white weight' rather than 'black weight' has been used to calculate galvanizing cost. Some clients have questioned this method based on the assumption that the galvanizer might put more zinc on the work to raise the price.

No galvanizer wants to give away zinc that costs $3000/tonne for the cost of galvanizing which is typically 1/4 of that cost.

The zinc pick-up can be a factor when the mass of steelwork needs to be accurately calculated for

engineering dead-load calculations or for safe load limits for transport.

A factor of 5% is commonly used to estimate zinc pick-up for the purposes of calculating the cost of zinc in the galvanizing equation. This takes into account the amount of zinc consumed per tonne of steel processed, which covers zinc consumption on jigs and handling equipment, as well as the zinc

The physical zinc pick-up on the steel is better calculated by measuring the coating thickness (in microns), and proportioning it against the average steel section thickness (in microns).

Thus an 8 mm (8000 micron) section with 100 microns of coating on each surface will have a coating mass representing approximately 200/8000 or 2.5%. There are other factors that make exact assessment difficult. A 2 mm section with a 65 micron coating on each surface will have a physical zinc pickup of 4.3%

New structural steelwork may have 20-50 microns of mill scale on the surface. This mill scale is removed by acid pickling in the pretreatment process and not be accounted for in the conversion of the steel from 'black' to 'white'.

Zinc usage accounts for approximately 33% of the cost of hot-dip galvanizing and is the most volatile cost input in the galvanizing process, as it is priced in $US as a world commodity and fluctuates with both $US and market price movements in commodity process. Since 2005, the zinc price has fluctuated from $1800/tonne to almost $6000/tonne.

Large and simple structural members such as this universal beam can be galvanized at lower cost because of the ease of handing, the signifi cant mass and relatively low zinc pick up on the heavy section.

Box trailers have a very high surface area per tonne (about 200 m^2) and have a low mass compared to their volume, dictating a relatively high galvanizing cost per tonne but a low coating cost per m^2.

EFFICIENCY FACTORS

The major cost-determining factor in hot dip galvanizing is the efficiency with which the fabricated steel can be moved through the galvanizing process. Most Industrial Galvanizers structural galvanizing baths in Australia are 10 – 12.5 meters in length and contain over $1 million worth of zinc. This must be kept molten 365/24/7.

The galvanizing costs are thus based on the number of dollars that have to be earned by the galvanizing bath per hour to recover its fixed and variable costs. For this reason complex or light fabrications (trailers, 3-D shapes) may cost 100% more than simple structural sections (columns and beams) that are the same weight..

Items that are longer or wide than the galvanizing bath, that require double-end dipping will incur a 30% cost penalty over similar single-dipped items.

Where large volumes of standardised light fabrications are to be processed, special jigging or handling systems can be developed in consultation with Industrial Galvanizers to facilitate handling of the work through the process, with significant cost savings.

SUMMARY

Compared with other high-performance anti-corrosion coatings for steel, hot-dip galvanizing offers a very cost-competitive option on a $/m^2 comparison. Even on thicker sections, the cost per square metre for hot dip galvanized coatings is rarely more than $45/m2. As steel sections become thinner, the competitive position of hot dip galvanizing is further enhanced, as its cost does not increase in proportion to surface area. An additional benefit on thicker structural sections is that the galvanized coatings will be thicker that that required by the Standard (AS/NZS 4680:2006), and this will further enhance the durability of the item in service.

Fabrications that are designed for galvanizing will be able to be processed most efficiently, and this will be reflected in lower processing costs.


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01 - SPECIFIERS MANUAL — THIRD EDITION

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

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

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

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

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

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

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

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

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