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INDUSTRIAL
GALVANIZERS
CORPORATION

Tech Tips

Tolerances for Moving Parts that are hot-dip galvanized.

WHY GALVANIZE?

Hot dip galvanized coatings are applied to steel to improve the anti-corrosion performance of the steel to ensure that it lasts as long as possible with a minimum of maintenance

COATINGS DIFFER

Only hot-dip galvanizing gives a coating that can reach the 50 year life required of structural building products.

THICKNESS COUNTS

Compared to other zinc-rich coatings, hot-dipped galvanizing is:-

- THICKER
- HARDER
- FULLER

HOT-DIP GALVANIZED PRODUCTS LAST LONGER...

Moving components can be galvanized but tolerances must be designed to account for the hot-dip coating.

There are many applications where galvanized components have to fit together after galvanizing and galvanizers receive regular inquiries about dealing with the clearances required. There are many factors that interact and the following information is to provide some basic rules for determining tolerances on moving parts.

Fasteners and threaded components There are a large number of threaded components presented for hot dip galvanizing in the form of U bolts, rag bolts, foundation cages, studs and threaded attachments. Where possible, threaded components are centrifuged to 'spin' off excess zinc. Where this is not possible because of the size of the item, mechanical cleaning of the threads is required after galvanizing.

This is done by heating the threaded area* until the excess zinc starts to melt and then wire brushing the threads to remove excess zinc.

It is not recommended that nuts or internally threaded components be galvanized. Nuts must be tapped oversize for use on galvanized bolts. The dimensions for over tapping of female threads are as follows:

On larger diameter threaded items, where

12 mm and smaller	0.40 mm
Over 12 mm to 25 mm	0.53 mm
Over 25 mm	0.79 mm

standard taps may not be available for over tapping, cutting threads on bolts 0.79 mm undersize will allow accommodation of the galvanized coating.

Theoretical clearances.

On most galvanized items that need to accommodate moving parts, the thickness of the galvanized coating is typically 100 microns or 1/10 mm. In an axle/socket arrangement, there are 4 such galvanized surfaces, which add a theoretical 400 microns (0.4 mm) to the surfaces in contact. On the full range of sections, from under 3 mm to over 10 mm, galvanized coatings may range from 50 microns on the lighter material to 150 microns on the heavier sections.

*Note: The hot dip galvanized coating, because of its alloy layers, has a higher melting point that the free zinc that makes up the excess coating. Provided the item is not heated above about 550-600oC, there will be no damage to the majority of the galvanized coating.

INDUSTRIAL GALVANIZERS
A valmont COMPANY

Tolerances for Moving Parts that are hot-dip galvanized.

TRIED & PROVEN

Over 40 years of field testing shows that galvanized coatings perform well even in harsh environments.

WHAT IS THE 'RULE OF THUMB' FOR CLEARANCES?

When designing for clearances after galvanizing, a factor of a minimum of 4X over the expected coating thickness should be applied, after adding up all the surfaces involved in the assembly.

WHY GALVANIZE WITH INDUSTRIAL GALVANIZERS?

For steel users requiring fast, proven corrosion protection for local or national projects Industrial Galvanizers is the established hot dip galvanizer with nationwide coverage.

Practical clearances.

Galvanized coatings are specified in Australian and international standards in coating mass (grams per square metre) and not in thickness. They are commonly converted to thickness because it is easier to relate to for most specifiers as all paint coatings are specified in terms of thickness.

In practice, galvanized coatings are not of uniform thickness. Hot dip galvanized coatings in particular can vary widely in coating thickness due to localised variations in steel composition, surface condition and orientation during the galvanizing process. These variations need to be accommodated with moving or closely fitting parts.

Radial clearances.

Radial clearances in socket and shafts should be not less than 1.6mm and preferably 2.0mm.

Double sided surfaces (hinges) should provide not less than 0.8 mm clearances prior to galvanizing to allow correct closing or mating of surfaces after galvanizing.

Moving part assemblies.

Galvanizing moving part assemblies is not recommended. All components should be separated prior to galvanizing and assembled afterwards. Even if the assemblies are designed with adequate clearances, the surface tension effects of the molten zinc will trap excess zinc in joints. This will 'solder' moving parts together and is very difficult to remove without risking damage to the coating.

Closer fitting parts.

Where tighter tolerances are required, machining of the bearing area of pins and shafts may be required after galvanizing.

Because of the nature of the galvanized coating, which consists of a series of hard (harder than 250 grade steel) alloy layers coated with a soft free zinc layer, it is often possible to ream holes and sockets with correctly sized reamers to remove excess zinc without removing the galvanized coating entirely.

As long as there is an adequate zinc coating on one surface, and the uncoated steel surface is in intimate contact with it, then the zinc will cathodically protect the uncoated steel and prevent corrosion inside the assembly. This phenomenon is used universally with fasteners, where the close contact between the threads on a galvanized bolt and the uncoated female threads on the nut provide acceptable protection from corrosion.

Example.

Item: Heavy shaft and bush.

Number of surfaces: Shaft 2, bush 2 = 4

Expected coating thickness: 125 microns

Clearance required: 4 x 125 x 4 = 2000 microns (2.0 mm)

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