



STEEL INDUSTRY
GUIDANCE NOTES

Design for Hot Dip Galvanizing of Steelwork

This SIGNS provides guidance on ‘Design for Hot Dip Galvanizing of Steelwork’. Early consultation between galvanizer, steel contractor and designer is key to obtaining the best results from the galvanizing process. Design features which aid the access and drainage of molten zinc will enable steelwork to be galvanized safely and will improve the quality and appearance of the coating.

Hot dip galvanizing is a process where steelwork is dipped into molten zinc to produce a corrosion resistant coating.

Filling, venting and drainage

Good design requires:

- means for the access and drainage of molten zinc
- means for escape of gases from internal compartments (venting)

It is important to bear in mind that the steelwork is immersed into a bath of molten zinc at a temperature of 450°C. Thus any features which aid the access and drainage of molten zinc will improve the quality of the coating and reduce costs.

With certain fabrications, holes which are present for other purposes may fulfil the requirements for venting and draining; in other cases it may be necessary to provide extra holes for this purpose.

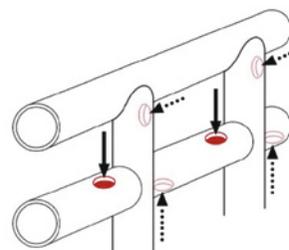
For complete protection, molten zinc must be able to flow freely to all surfaces of a fabrication. With hollow sections or where there are internal compartments, good venting eliminates the risk of an explosion at the galvanizing bath. The galvanizing of the internal surfaces also eliminates any danger of hidden corrosion during service.

General principles:

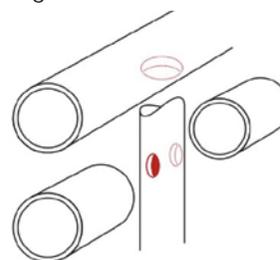
1. Holes for venting and draining should be as large as possible. The minimum hole diameters are given in the table below.

size of hollow section	minimum diameter of hole (mm)
< 25	10
≥ 25-50	12
> 50 - 100	16
> 100 - 150	20
> 150	Consult galvanizer

Closed sections or internal chambers must never be incorporated in a fabrication. External holes may be positioned as in the figure below, a method which is often preferred by the galvanizer, since quick visual inspection shows that the work is safe to galvanize.



Sections can be interconnected using open mitred joints, or interconnecting holes can be drilled before fabrication. Pipe ends can be left open, or be plugged after galvanizing .



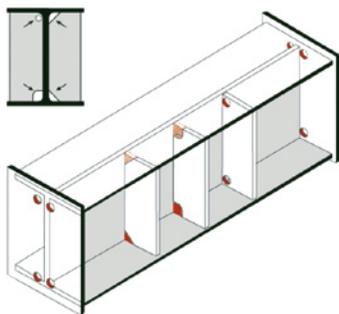
2. Holes for venting and draining should be diagonally opposite to one another at the high point and low point of the fabrication as it is suspended for galvanizing. Very long hollow sections may require additional vent holes to aid drainage and to help produce a better surface finish.

3. With hollow sections sealed at the ends, holes should be provided, again diagonally opposite one another, as near as possible to the ends. In some cases it may be more economical to provide V or U shaped notches in the ends, or to grind corners off rectangular hollow sections – these holes provide ideal locations for venting and draining.

4. Where holes are provided in end plates or capping pieces, they should be placed diagonally opposite one another, off-centre and as near as possible to the wall of the member to which the end plate is connected.

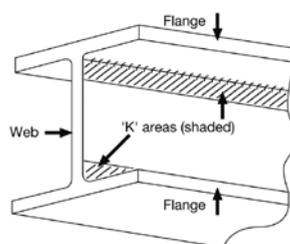
5. Internal and external stiffeners, baffles, diaphragms, gussets etc., should have the corners cropped to aid the flow of molten zinc. The gaps created should be as large as possible without compromising structural strength. If welding is required around the edge created, a radiused corner is desirable, to facilitate continuity of the weld around the cut end to the other side. Circular holes are less effective; if used, they should be as close to corners and edges as practicable. Consultation with the galvanizer regarding the appropriate vent and drainage hole sizes is recommended.

Where venting of a longer hollow section is required, (e.g. > 3m) there may be a need for additional or larger vent holes to help achieve the best possible surface finish and advice should be sought from the galvanizer.



Additional guidance for design of structural steelwork for hot dip galvanizing

In circumstances where, due to design restrictions, general design guidance (as set out above) cannot be followed and the introduction of holes or other

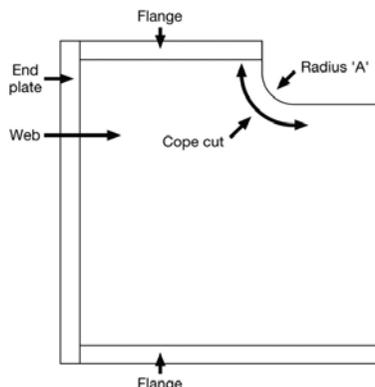


fabrication features into the 'K' areas of a section (where the web and flange meet) is unavoidable, please consult Galvanizers Association to discuss how best to finalise the design of the fabrication.

Cope cutting of beams is a common feature in modern steel construction.

For optimum results during galvanizing, where flame-cut copes have been introduced into a fabrication, the following steps are recommended;

- use a large radius for the cope - 20mm minimum if possible
- after cope cutting, grind off any hardened steel surface layer
- provide a smoothly ground cope cut surface avoiding notches, grooves and other surface irregularities
- chamfer the edges to the cope cut.



It should be noted that during the dipping process, differential thermal stresses will be generated as the article is lowered into and raised out of the galvanizing bath. Good design for galvanizing (incorporating adequate venting arrangements) will allow these stresses to be minimised. This can be particularly important where fabrications involving highly restrained joints are to be galvanizing.

Where articles are too large to fit into the galvanizing bath, they can often be adequately galvanizing by using a procedure known as 'double-dipping'. This entails the normal pretreatment of the steel article followed by galvanizing the article in (usually) two stages, turning the article to allow all parts to be immersed into the zinc melt where the galvanized coating forms. Double dipping can contribute additional thermal stresses to the article and this should be considered when designing the article for galvanizing.

Key Points

Hot dip galvanizing has many benefits as a method of corrosion protection. Importantly, it will:

- Provide steel with a coating which has a long, predictable and maintenance-free life

- Be highly competitive on a first-cost basis
- Be a sustainable solution

Further sources of Information

For further information, contact

Galvanizers Association on 0121 355 8838

or visit www.galvanizing.org.uk