Hot Dip Galvanizing Data Sheet GA

2.5 Sectional Steel Fabrications

Sectional steel fabrications are used predominantly in steel girder construction. The following guidance therefore applies principally to structures involving steel girder construction.

1. Materials and Thickness of Materials

The steel used in the manufacture of sectional steel fabrications should be suitable for hot dip galvanizing in accordance with BS 729: 1971 (1986). An appropriate agreement between the processor and the steel supplier should be made when placing the order for the steel (see also Data Sheet 2.2).
As a rule, larger thicknesses of material require a longer period of immersion in the zinc bath before assuming the bath temperature. The sectional steel with the largest thickness of material always determines the period of immersion of the whole component. Sectional steel workpieces which exhibit a uniform or almost uniform thickness of material are therefore best for hot dip galvanizing. Large differences in the thickness of material should be avoided wherever possible.
Early agreement with the galvanizer should also be sought regarding the maximum dimensions and weights of components and workpieces (see also Data Sheet 2.3).

2. Surface Preparation

Generally speaking, sectional steel fabrications should arrive at the galvanizer in an untreated state as the preparation necessary for hot dip galvanizing is usually carried out at the galvanizer. Some common problems such as paint markings, grease, or welding slag which cannot always be alleviated by pickling and degreasing should be dealt with by the supplier (see also Data Sheet 2.1).
When steel structures are to be shot blasted this should be done at the steel fabricator's but care must be taken that any residue of the blasting material is completely removed from the component (e.g. from corners and hollows).
Where there are edges in the sectional steel left from cutting by acetylene, and especially on workpieces produced by plasma-arc cutting, changes in the surface of the workpiece may occur in the area of the cut (e.g. decarbonization). These changes may also affect the zinc-iron reaction resulting in the formation of hot dip galvanized coatings with a reduced thickness. In such cases it may be necessary to work on the edges to a depth of at least 0.1mm, e.g. by grinding.

3. Internal Stresses and Distortion

When internal stresses are relieved by the heat of the galvanizing process this may result in the distortion of sectional steel fabrications. Various types of internal stresses may be present in any fabrication due to welding, rolling, or extrusion. These internal stresses initially remain in equilibrium but the introduction of heat may relieve these built in stresses and distortion results.
There are certain constructive measures which can be taken to overcome the dangers of distortion on steel fabrications, or even distortion due to welding.
Cross-sections to be joined together, which are galvanized individually and then assembled by some mechanical means (e.g. screws) cause no problems. Where such a method is not possible, the welding seams at the join should be arranged so that they are situated near the main axis of the steel section. Otherwise they should be placed as symmetrically as possible equidistant from the main axis and welding carried out as simultaneously as possible.
The danger of distortion is minimised by using symmetrical cross-sections. Asymmetrical cross-sections exhibit a greater danger of distortion if thicker welding seams are arranged on one side at a greater distance from the main axis. (see Fig. 1).

4. Overlaps

Overlapping surfaces should be avoided as far as possible for reasons of corrosion prevention (Fig. 2). Liquid from the pre-treatment baths can penetrate the resulting gaps. It then vaporises when immersed in the molten zinc causing small explosions. Such overlaps should be welded to ensure that no gaps are present for liquids to penetrate.
If large overlaps are necessary (e.g. with additional flange plates), drill holes to relieve the stress should therefore be made on at least one side of the overlapping plate so as to avoid the resulting excess pressure caused by heating of the air in the gap between the layers (Fig. 3.).

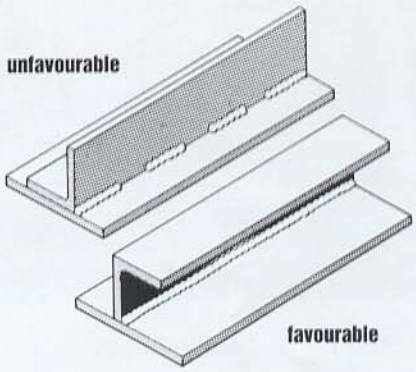

Figure 2: Avoid overlaps with large holes where possible.

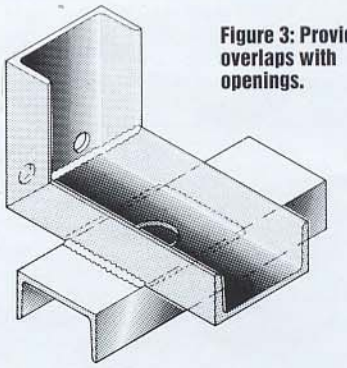

Figure 3: Provide overlaps with openings.

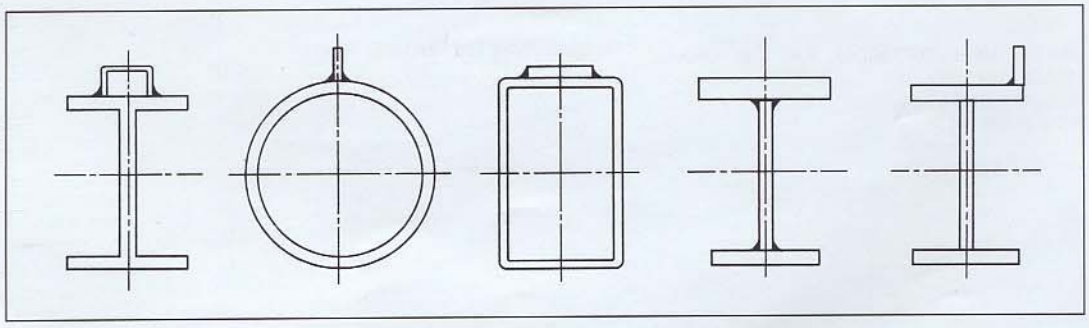

Figure 1: Greater risk of distortion due to asymmetrical welding.

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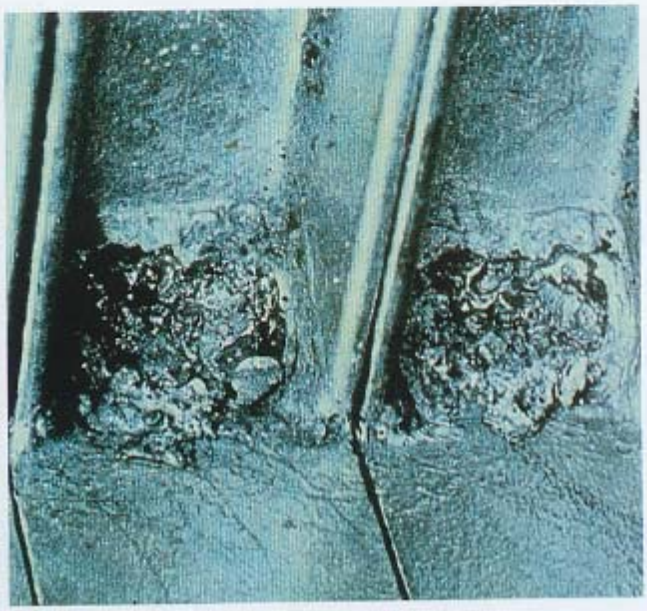

Figure 4: Example of galvanizing defects due to inadequate drainage.

5. Outlets and Drain-holes

In order to hot dip galvanize sectional steel fabrications to a high standard, reinforcing pieces, end plates and similar features must be provided with vent holes. As the components are always immersed at an angle in the various treatment baths in the galvanizing plants, the holes must be so arranged that the zinc can run in and out freely of corners and angles of a component. Otherwise zinc may be drawn out with the component (Fig. 4) or trapped air may result in defects in the galvanizing.

Vents and drain-holes should be arranged in pairs as far as possible. Outlets may be made as shown in Figure 5 in the example for the arrangement for "I" sections. Vent holes on reinforcing plates and overlaps should be made in a similar way.

In general, drain-holes to let out the pre-treatment liquids and the liquid zinc usually have a diameter > 10mm. As a rule of thumb the diameter should always be about 14mm on sectional steel, but this may change depending on the size and number of drain-holes.

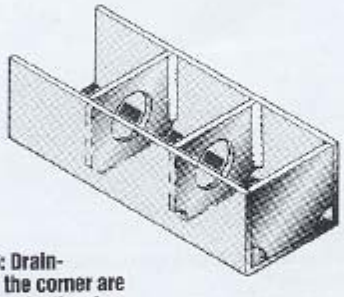

Figure 5: Drain-holes in the corner are necessary for the zinc to run in and out freely.

6. Connections

Connecting sectional steel components by mechanical means, e.g. bolts, can be carried out in the workshop or on site. Assembly joints with a mechanical means of connection are to be used in preference to welded joints as they can easily be dismantled.

Using a mechanical means of connection has the advantage that all surfaces of the individual hot dip galvanized sections and plates placed next to each other are completely protected. Materials used for connections must also be hot dip galvanized.

7. Improving Defective Areas

If welding is to be carried out after hot dip galvanizing, zinc should be removed from the area to be welded for a distance of at least 10 mm to each side of the seam. After welding, corrosion protection in this area must be restored.

Even when transporting or assembling sectional steel fabrications it may happen that the zinc coating is damaged in places. Such defective areas must also be repaired and it is recommended that all areas of a coating are treated in accordance with BS 729 : 1971 (1986). This states that areas may be renovated either by the use of low melting point zinc alloy repair rods or powders made specifically for this purpose, or by the use of at least two coats of good quality zinc-rich paint. Sufficient material should be applied to provide a zinc coating at least equal in thickness to the galvanized layer. This recommended procedure should be followed in the application of any repair medium.

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