Hot Dip Galvanizing Data Sheet GA

2.6 Sheet Metal And Wire Fabrications

1. Sheet Metal Fabrications

Nowadays much of the hot dip galvanized sheet metal used for roofing, wall cladding, signs, and ventilation shafts. is produced from galvanized thin metal sheet made on a continuous process. The hot dip galvanized metal sheet is formed into the finished products on the production line. Other sheet metal fabrications, which include rubbish skips, protective boarding, vehicle chassis, feeding troughs, watering cans, buckets and housings are fabricated first and then hot dipped galvanized.
In the field of horticulture, traditional hot dipped galvanized buckets and watering cans have started to replace plastic equipment because of their superior durability. Sheet metal workmanship and hot dip galvanizing is experiencing something of a come back after the boom years of the plastics industry.

Industrial Production

Apart from sheet metal components and fabrications produced by hand by craftsmen the bulk of these items are mass produced.
When sheet metal components are to be hot dip galvanized the same principles must be applied as with other components e.g. :
- Must be suitable for hot dip galvanizing.
- The design and manufacture must be appropriate for hot dip galvanizing.

However, there are also some specific points to bear in mind when hot dip galvanizing sheet metal fabrications.

Methods of Joining

Because of the large number of products and the wide variety of treatments sheet metal fabrications may be joined after hot dip galvanizing in a number of different ways. Methods include welding, soldering, joining with a lock seam, adhesives, riveting and screwing. Most important criteria for obtaining good hot dip galvanizing results with sheet metal are:
- The choice of a suitable method of connecting sheets.
- The choice of a suitable design.

The commonest method of joining sheet metal fabrications is by welding as this can be carried out either before of after the galvanizing process without difficulty. However, when welding after hot dip galvanizing careful restoration of corrosion protection at the point of the weld is advised. This is because the heat used during the welding process destroys the zinc coating in the immediate area around the weld.
If other methods of joining such as riveting, screwing, soldering, or adhesives are used after galvanizing no special measures need to be taken but the effect of the zinc coating on the connection must be borne in mind (e.g. on the properties of soldered joints of the strength of adhesive joints). Where fabrications are joined together using screws these fixings should be hot dip galvanized to afford the same level of corrosion as the rigid component under construction. Adhesive joining of sheet metal components can only be carried out properly post galvanizing as there is presently no adhesive capable of withstanding the temperature used in the hot dip galvanizing process.

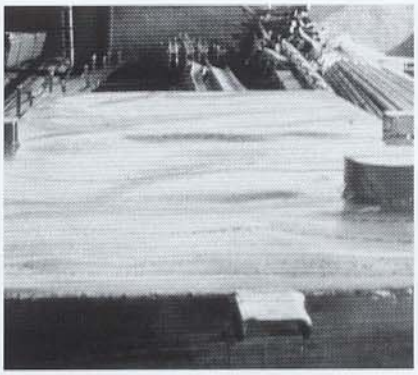

Figure 1. Distortion due to expansion on a sheet metal fabrication with a large surface area.

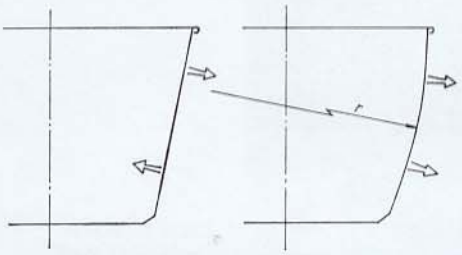

Figure 2. Recommended: The material can spread uniformly by heating/expansion. Not recommended: Warping caused by heating in the zinc bath may occur depending on the position and size of the material.

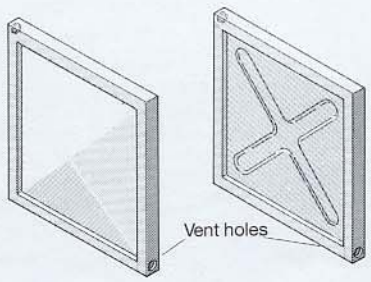

Figure 3. Drill holes.

Design

The design of sheet metal fabrications should take into account the fact that the sheet metal will expand due to the temperature of the molten zinc. This temperature (approximately 450 °C) causes an expansion of approximately 4–5mm per linear metre of sheet metal. This property of expansion usually prevents twisting or warping of the sheet metal components. Designs using smooth sheet metal surfaces are unsuitable for galvanizing as the stability of this type of sheet metal is very poor. If, in addition, its expansion during the galvanizing process is restricted, as for example when frames have been welded on or with circular welding seams, warping can occur (Fig. 1). Sheet metal with a large bend radius should therefore be arranged in a suitable way during the process (Fig. 2).
If sheet metal with a large surface area cannot be avoided then steps must be taken to improve the stability of the metal panels. This can be achieved at the design stage for example, by providing the panels with holes or slightly beveling diagonally (Fig. 3). Likewise relatively thin sheet metal such as in rubbish skips can be hot dip galvanized (Fig. 4). A balance must be reached between welding on reinforcing struts to increase stability and introducing residual stress due to the welding operation. As a rule the level of reinforcement is relatively low and the warping during hot dip galvanizing increases due to the additional internal stresses of the weld.
If the edges of the sheet metal are designed to be joined with a lock seam or flanges this work must be carried out very carefully so that there are no remnants of acid or flux left in any of the small gaps so that these overlaps are fully soldered by molten zinc. If edges are bevelled to provide more stability it must be ensured that the zinc can be run in and run off unhindered; separate drill holes may need to be provided for this as well.

Wire Fabrications

Wire netting or wire mesh which is used in fabrications such as fences is usually hot dip galvanized in a automatic galvanizing plant

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Figure 4. Galvanized rubbish skip.

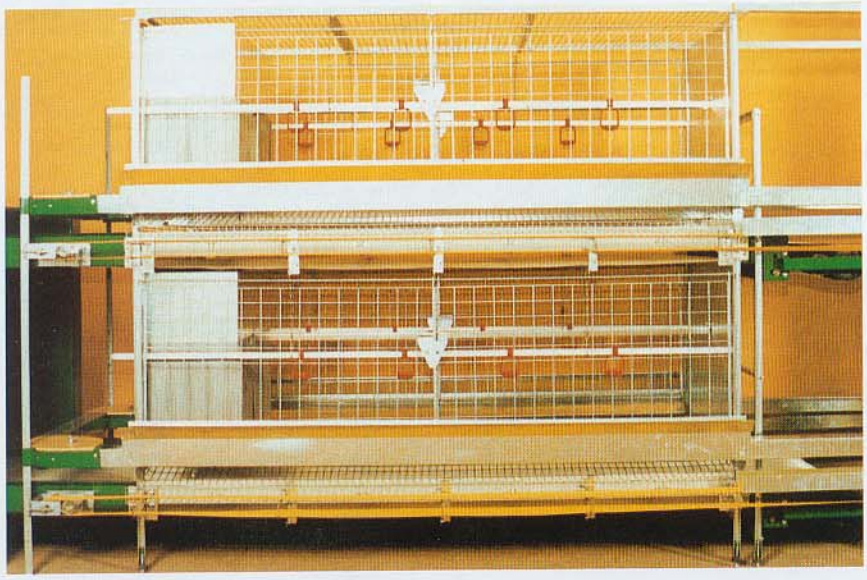

Figure 5. Poultry cages made of galvanized wire material.

and then further treated before final assembly. Wire fabrications which are galvanized individually are much rarer. Such products can however be found on farms such as poultry farming (Fig. 5) and in special fencing.

Apart from the use of steel suitable for hot dip galvanizing no special measures need be considered for the design of wire products. However, it must be remembered that many wire products only retain their strength by cold working. The use of unsuitable steel wire material with considerable cold working can result in the wire becoming brittle (so called strain age hardening) which sometimes only becomes apparent after the galvanizing process. The use of materials which are susceptible to age hardening must be avoided.

As well as providing corrosion protection to wire fabrications, hot dip galvanizing has a further advantage of increasing the rigidity of these products. This occurs because the stability of the wire is increased due to the additional soldering due to the molten zinc at the point where the wires cross.

When galvanizing corrugated wire it should be remembered that corrugated wire has the tendency to expand considerably when dipped in the zinc bath. This can result in gates or fencing panels which consist of a frame filled in with corrugated wire becoming warped after hot dip galvanizing. Design measures should be taken to allow the panel to expand without hindrance. This can be achieved, for example, by not welding the ends of the wires to the frame, or by galvanizing the wire grating and the frame separately before bolting or welding them together.

Published by:
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