

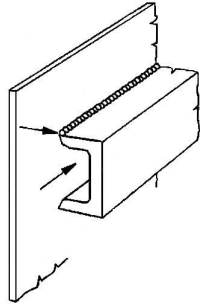
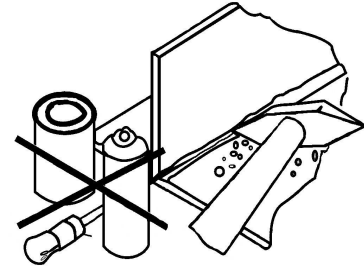
TECHNICAL ANNEX

RECOMMENDATIONS AND REQUIREMENTS concerning base material and surfaces of items for Hot Dip Galvanization

Feature	Requirements and Recommendations
BASE MATERIAL	<p><u>Requirement:</u> the base material (steel) must be fit for hot dip galvanizing according to EN ISO 14713 / ASTM A 385, with the following maximum chemical elements in their composition:</p> <ul style="list-style-type: none">• C: < 0.25%• Mn: < 1.35%• Si + P: < 0.05%• Al: < 0.04% <p><u>Recommended:</u> according to 7.4.3 of EN ISO 10025-2:2004, material types may be steel products in S235 / S275 / S355 corresponding to:</p> <ul style="list-style-type: none">• Class 1 ($Si \leq 0.03\%$ and $Si + 2.5 P \leq 0.09\%$) or• Class 3 ($0.14\% \leq Si \leq 0.25\%$ and $P \leq 0.035\%$)
SURFACE	<p><u>Requirement:</u> all surfaces shall be clean and in particular free from:</p> <ul style="list-style-type: none">• paint / primer / varnish• indelible marker• pitch• labels

INSTRUCTIONS FOR THE DESIGN AND MANUFACTURING OF PRODUCTS
for assuring the best anti-corrosion protection by Hot Dip Galvanization

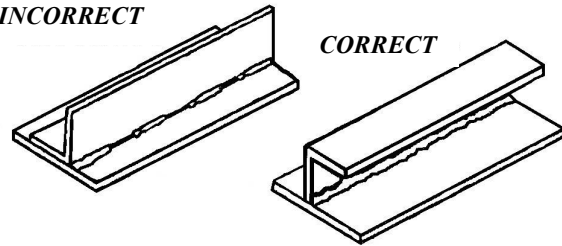
- Do not bring parts with paint, Vaseline or welding silt residues.



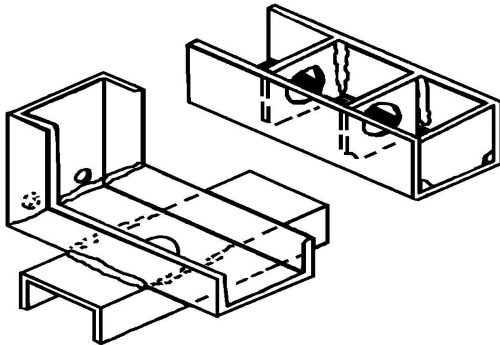
- Welding seams must be continuous, with no pores and perfectly deburred

INCORRECT

CORRECT

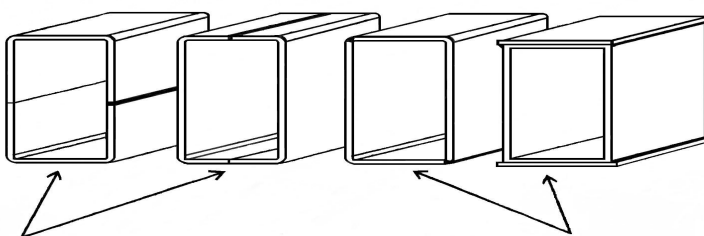
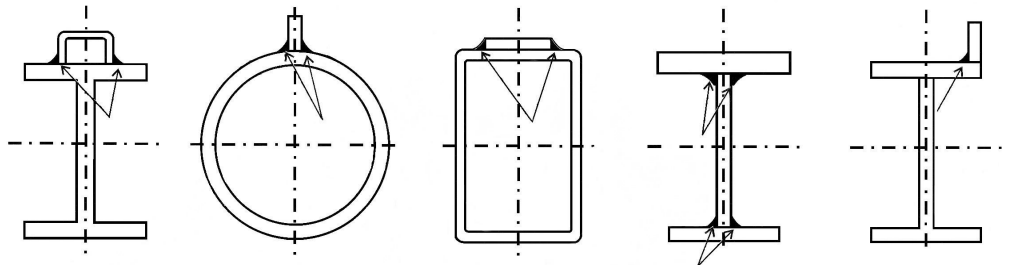


- Profiles should not be assembled in their sides



- Parts should not have closed corners and dead angles

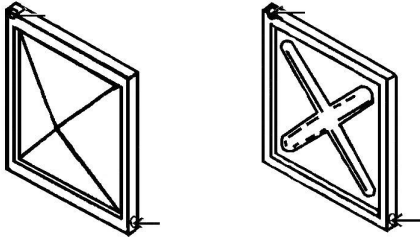
- Welds in the enclosed drawings may cause deformations during hot dip galvanizing.



CORRECT

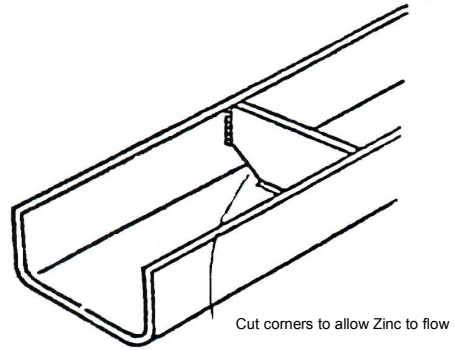
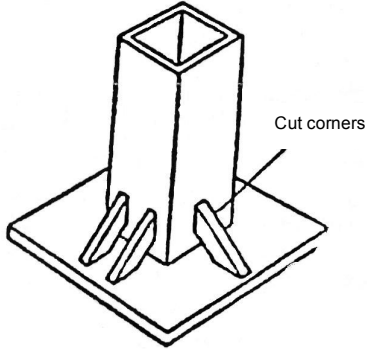
INCORRECT

- To avoid deformation upon immersion into the melted Zn bath, it is recommended:
 - Welds in the axes of the weight center or symmetrically located from them.

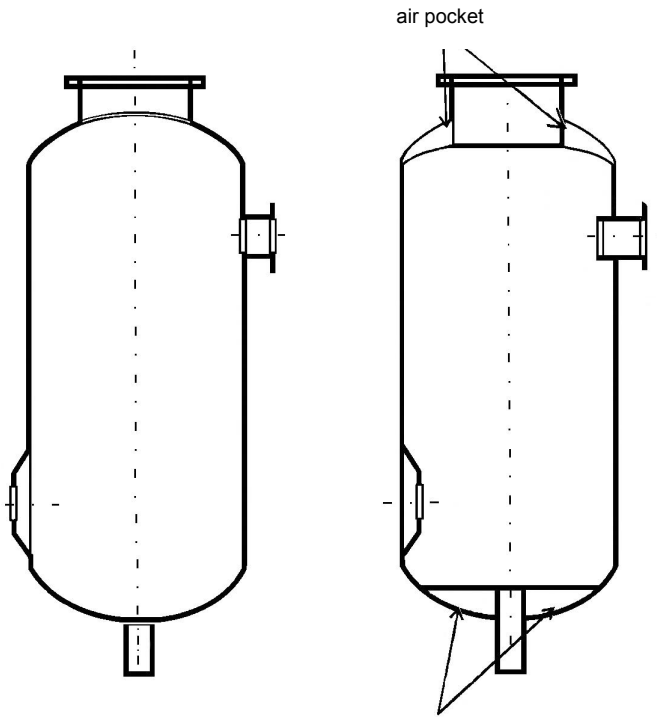


- Flat surfaces (steel sheet) should be allowed dilation by nervure, radial or pyramid cambers, etc.

- Welded constructions should have the corners cut out to allow Zinc flow



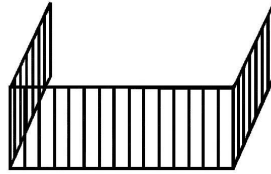
- Joints to containers should be placed correctly, so as to allow full protection of the inner surface, as well as the flow of Zinc



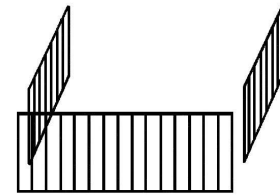
CORRECT

INCORRECT

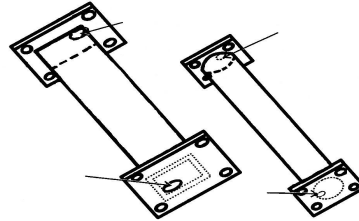
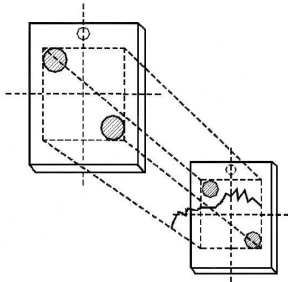
- **Modular design**



Incorrect

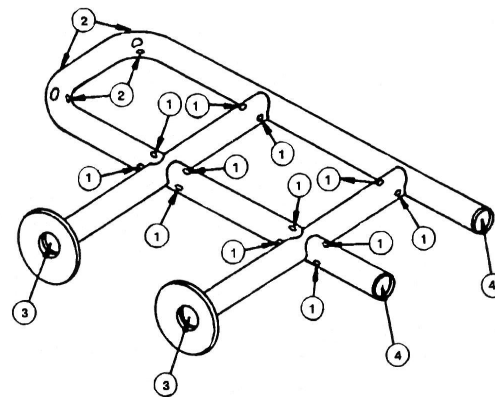
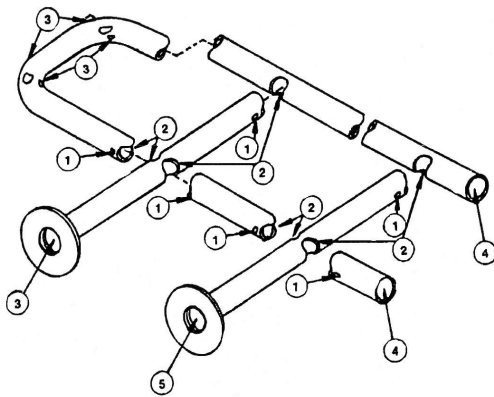
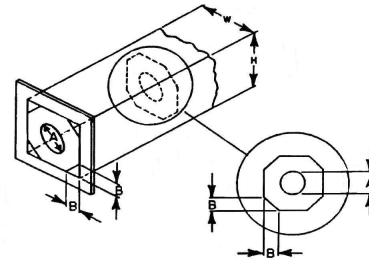


Correct



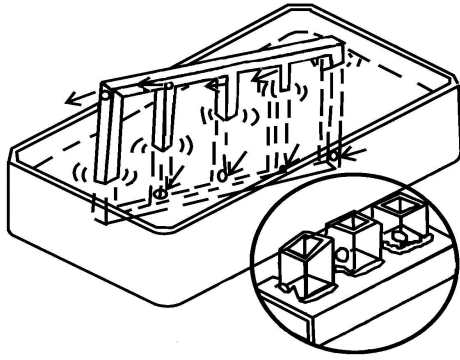
- *It is recommended that even since design the technological holes be provided to allow easy, free flow of the melted Zinc*

Profiles Dimensions (mm)			Minimum Diameter (mm) for number of holes:		
○	□	▭	1	2	4
15	15	20 x 10	8		
20	20	30 x 15	10		
30	30	40 x 20	12	10	
40	40	50 x 30	14	12	
50	50	60 x 40	16	12	10
60	60	80 x 40	20	12	10
80	80	100 x 60	20	16	12
100	100	120 x 80	25	20	12
120	120	160 x 80	30	25	16
160	160	200 x 120	40	25	16
200	200	260 x 140	50	30	16

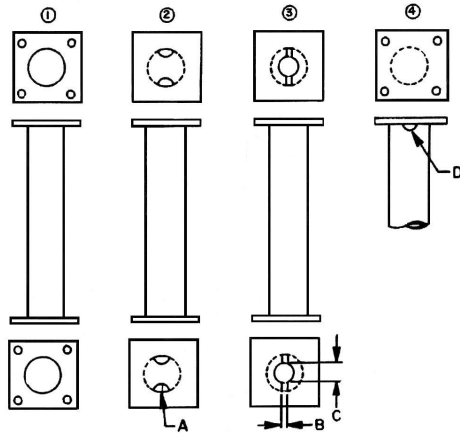
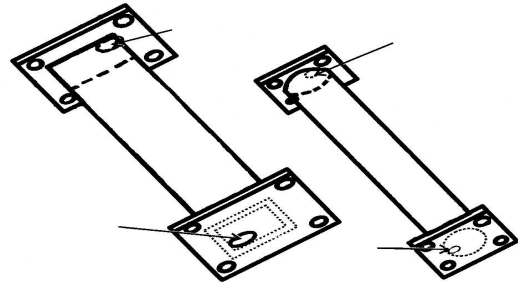


- ① Vent holes should be placed closest to the welding seam and sized min. 9.5 mm in diameter
- ② Inner holes should have same diameter as inner tube diameter
- ③ Vent holes at the ends should be min. 12.7 mm in diameter
- ④ and ⑤ Any handling device that obturates the ends of the structures being galvanized must be mounted after galvanizing. Vent holes must be visible from the outside for each tube forming the ensemble of the part to be galvanized.

- ① Each of the vent holes should be placed closest to the welding seam and sized min. 25% of the tube's inner cross-section, but not less than 9.5 mm.
- ② Vent holes at the ends should be min. 12.7 mm in diameter
- ③ and ④ Any handling device that obturates the ends of the structures being galvanized must be mounted after galvanizing. Vent holes must be visible from the outside for each tube forming the ensemble of the part to be galvanized.



- Access holes should allow the melted Zinc in and out of the part being galvanized



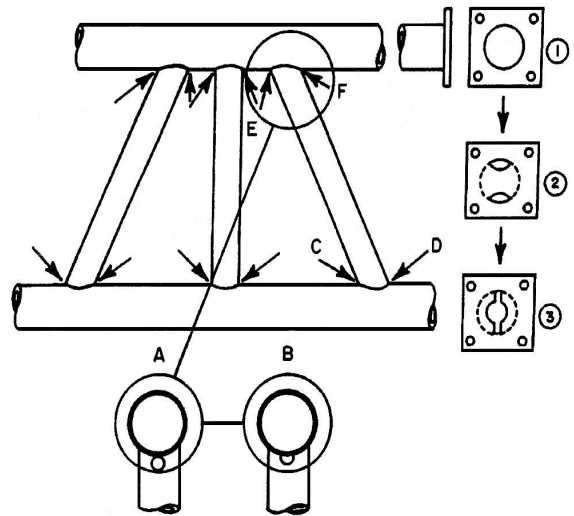
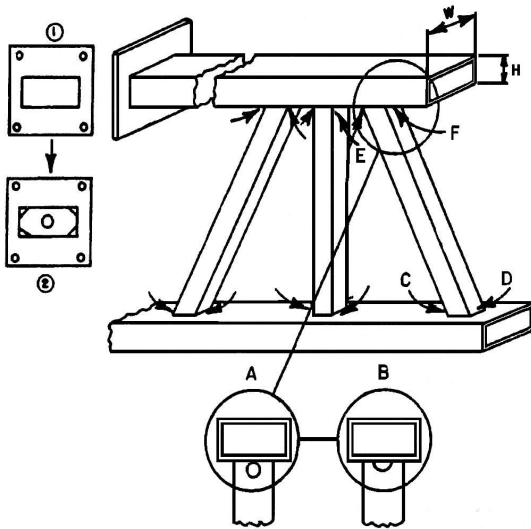
- For pipe columns, lighting poles and transmission masts with base plate, with or without steel sheet support

Location of openings

- ① preferably openings should have same diameter both at entry and exit
 - ② and ③ If complete openings cannot be made, then the existing ones should have the maximum possible diameter
- Openings should be at least 30% of the tubes' cross-section surface (for diameters over 76 mm) and 45% of the tubes' cross-section surface (for diameters under 76 mm).

In the case shown, the tube has a 152 mm diameter and the opening should be minim 30% of the surface at each end.

- ② Semicircle with radius $A = 44$ mm
- ③ Canal $B = 19$ mm.. Central hole $C = 76$ mm
- ④ Semicircle with radius $D = 41$ mm



For parts made of profiles

Location of holes should be as shown in sections A or B. Each vertical and horizontal section should have 2 holes at the top and bottom at 180° from one another. The size of the holes should be equal and at least 30% of the tube's cross-section (for zone C and D, or zone E and F)

End plate – Horizontal

① Preferably complete opening

② If $H+W = 610$ mm or more, surface of hole plus cut corners should be at least 25% of the tube's cross-section ($H \times W$)

If $406 \text{ mm} < H + W < 610 \text{ mm}$ --- use 30%

If $203 \text{ mm} < H + W < 406 \text{ mm}$ --- use 40%

If $H + W < 203 \text{ mm}$ ---will be left free

For parts made of tubes

Location of holes should be as shown in sections A or B. Each vertical and horizontal section should have 2 holes at the top and bottom at 180° from one another. The size of the holes should be equal and at least 30% of the tube's cross-section (for zone C and D, or zone E and F)

End plate – Horizontal

① Preferably complete opening

② Equal openings – minimum 30% of the tube's cross-section

INSTRUCTIONS FOR THE HANDLING, TRANSPORT AND STORAGE OF HOT DIP GALVANIZED PARTS

The following measures are designed to assure that the protective zinc coat in hot dip galvanized products is safe from undue damage:

1. HANDLING

- a) Loading/unloading of galvanized items by flipping over or dropping from a height is forbidden in order to avoid shocks that would result in cracking of the zinc layer.
- b) For loading/unloading, only hooks and cables covered in materials softer than zinc (such as cloth or rubber) shall be used.

2. TRANSPORT

- a) When packaging hot dip galvanized items for transport, wooden, plastic or rubber pegs shall be inserted between the parts to avoid strikes, friction or even contact between surfaces. Packaging on pallets is recommended.
- b) Transport of galvanized parts shall be made so as to avoid deteriorating the zinc coating by scratching, impacting or friction against hard materials.
- c) In case of maritime transport, adequate protection measures will be taken to avoid splashing sea water onto the galvanized parts. Containerized solutions are recommended.

3. STORAGE

- a) Galvanized parts shall be stored in properly ventilated spaces. Enclosures with hazardous fumes, steam or excessive humidity will be avoided.
- b) In case of outdoor storage, flat paved areas with efficient drainage will be used. In no case will hot dip galvanized items be stored directly on the soil.
- c) Long-term storage in packages/bundles will be avoided.
- d) For stacking, wooden, plastic or rubber pegs shall be inserted between the parts.
- e) In case of storing galvanized items in areas with extreme weather conditions or marine atmosphere, additional protective measures shall be taken to avoid formation of zinc oxide (white rust).