

DESIGN FOR GALVANIZING

Certain rules must be followed when designing components for galvanizing, but the rules are readily applied and in many cases they are simply those which are good practice to ensure maximum corrosion protection.

Adoption of the following design practices will ensure the safety of galvanizing personnel, ease the galvanizer's task, and produce optimum quality galvanizing. If in doubt concerning preferred design details check with your galvanizer or Galvanizers Association of Australia.

Size and shape

Almost any component can be galvanized by designing and building in modules to suit available galvanizing facilities, but it is wise to check work dimensions with your galvanizer at an early design stage.

Safety

Vessels and hollow sections, including those in small diameter tubular fabrications, *must* be vented to atmosphere for the safety of galvanizing personnel and to prevent possible damage to the article. At galvanizing temperatures moisture trapped in closed sections is converted rapidly to superheated steam, generating explosive forces unless vented.

galvanizers
ASSOCIATION OF AUSTRALIA
ABN 60 004 579 828

Galvanizers Association of Australia comprises the leading galvanizing companies in Australia.

GAA provides technical assistance to users, and produces a CD manual 'Hot Dip Galvanizing', a practical reference on hot dip galvanizing and galvanized coatings, including sections on metallurgical aspects, properties and performance. Chapters cover galvanized reinforcement for concrete, design, bolting, welding and painting of galvanized steel.

GAA distributes a range of free technical literature on hot dip galvanizing. We invite you to add your name to the GAA mailing list by contacting the Galvanizers Association of Australia 124 Exhibition Street Melbourne Victoria 3000
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Associate of International Zinc Association

Great effort has been expended to make this wall chart accurate and easy to follow, but no responsibility is accepted for any loss, damage or other consequences resulting from the use of its recommendations.

Tubular fabrications and hollow structurals
Closed sections must never be incorporated. Provide vent holes at least 25% of internal diameter or diagonal dimension at locations agreed with the galvanizer. For 100 x 100 SHS use 36mm dia hole; note that multiple vent/drain holes can be used to achieve same result.

Alternatively 'V' notches can be cut in ends of members before welding.

Welded pipe sections
Closed sections must never be incorporated. Sections should be interconnected using open mitred joints as illustrated at 'A', or interconnecting holes should be put in before fabrication as in 'B'.

Alternatively external holes may be positioned as in 'C', a method which is often preferred by the galvanizer, since quick visual inspection shows that the work is safe to galvanize.

Pipe ends must be left open, or provided with removable plugs.

Small tubular fabrications must be vented, with holes not less than 6 mm diameter.

Open mitred joints

Holes 20 mm or larger

Holes 10 mm or larger

Unwanted vent holes may be closed by the use of epoxy filler after galvanizing and filing off flush with surrounding surfaces.

Overlapping surfaces
Avoid narrow gaps between plates, overlapping surfaces, and back-to-back angles and channels.

When small overlaps are unavoidable, seal edges by welding.

When left unsealed, small overlapping areas may trap pickle acid which can later escape to discolour or damage the galvanized coating.

A Satisfactory

B Satisfactory

C Unsatisfactory

Vent hole 6 mm diameter for every 100 cm² of overlap area.

Larger overlapping surfaces
If contacting surfaces cannot be avoided, a hole 6 mm in diameter for every 100 cm² of overlap area should be placed in one of the members, and the perimeter of the contacting area should be continuously welded. The vent hole in one member will ensure the safety of galvanizing personnel and prevent damage to the article.

When both internal and external surfaces are to be galvanized at least one filling and draining hole must be provided, with a vent diagonally opposite to allow the exit of air during immersion. Holes should be at least 50 mm diameter for each 0.5 cubic metres.

Internal baffles should be cropped as illustrated. Manholes should finish flush inside to prevent trapping excess zinc.

Vent diagonally opposite filling hole

Cropped internal baffle

When vessels and air receivers etc are not to be galvanized inside, 'snorkel' tubes or extended vent pipes must be fitted after discussion with the galvanizer, to allow air to exit above the level of molten zinc in the galvanizing bath.

Vent hole at least 50 mm for each 0.5 cubic metre.

Filling hole at least 50 mm diameter for each 0.5 cubic metre.

Internal baffles cropped top and bottom to allow free passage of zinc, and prevent trapping of air. Flanges should finish flush inside.

Vent pipes connect interior to the atmosphere.

Strengthening gussets and webs
Welded strengthening gussets and webs on columns and beams, and strengthening gussets in members fabricated from channel sections should have corners cropped or holed.

- To prevent the entrapment of air in pockets and corners allowing complete access of pickle acids and molten zinc to the entire surface of the work, and
- To facilitate drainage during withdrawal from acid and rinse tanks, and from the galvanizing bath.

Cropped corners

Alternatively, holes placed as close to corners as practical.

End plates
Provide holes at least 13 mm diameter in end plates on rolled steel shapes, to allow access of molten zinc in the galvanizing bath and drainage during withdrawal.

13 mm holes placed as close to corners as practical.

Clearance for moving parts
Drop handles, hinges, shackles, shafts, and spindles require provision of minimum radial clearances as detailed in the table below, to allow for the thickness of the galvanized coating.

Shaft or spindle size	Minimum radial clearance
Up to 10 mm diameter	1 mm
10 to 30 mm diameter	2 mm
Over 30 mm diameter	2.0 to 2.5 mm

Clearance

Internal threads and nuts must be tapped oversize after galvanizing to accommodate the thickness of the galvanized coating on the stud or bolt.

Australian Standard 1214 specifies the following oversize tapping allowances:

Nominal diameter of internal threads	Allowance, mm
Up to M22	0.40 mm
M24	0.45 mm
M27	0.50 mm
M30	0.55 mm
M36	0.60 mm
M36-48	0.80 mm
M48-64	1.0 mm

The galvanized coating on the stud provides corrosion protection for the internal thread.

Increase tolerance

Identification markings
For permanent identification use heavily embossed, punched or welded lettering. For temporary identification use heavily embossed metal tags wired to the work.

Do not use paints.

OILPAINT

Distortion
Distortion can be prevented or minimised by:

- Use of symmetrical designs
- Use of relatively uniform sections
- Use of accurately preformed members to avoid locked-in stresses
- Use of balanced or staggered welding techniques to avoid locked-in stresses
- Large open fabrications and tanks may require temporary cross stays to prevent distortion during galvanizing

Use of symmetrical sections minimises distortion during galvanizing. Avoid combinations of thick and thin materials.

Heavy angle
Thin sheet

Materials suitable for galvanizing
All ferrous materials are suitable, including stainless steel parts, and sound stress-free castings.

Brazed assemblies may be galvanized, but check first with your galvanizer. Soft soldered assemblies cannot be galvanized.

Combinations of ferrous surfaces
Fabrications containing a combination of castings and other steels, and rusted or mill scaled surfaces must be abrasive blast cleaned before galvanizing.

Weld slags
Must be removed by chipping, grinding, abrasive blast cleaning, flame cleaning, or using a pneumatic needle gun.

Provision for handling
Work not suitable for handling with chains, brackets, hooks or jigs must be provided with significantly large suspension holes or fittings. If in doubt check with your galvanizer