THE 'Z' FILES

DATA SHEET
No. 20

FACTS AND CASE HISTORIES

VENTING AND DRAINING - HOW TO GET THE HOLE SIZE RIGHT

INTRODUCTION

One of the most common issues in designing fabrications for hot dip galvanizing is ensuring that fabrications are vented and drained correctly. All steel to be galvanized needs to be immersed in molten zinc and the zinc needs to be able to flow freely into and out of all hollow sections and corners.

The flow of molten zinc into, off, and out of the fabrication is one of the most important factors in determining the final quality of the coating. Inadequate venting and draining can cause the following galvanized coating defects:

- misses in the coating caused by air locks preventing molten zinc contacting the steel surface.
- puddling of zinc in corners, wasting zinc and interfering with subsequent assembly
- ash trapped on zinc surface causing surface defects
- irregularities in surface appearance caused by erratic immersion and withdrawal because of item floating or trapping zinc internally
- thick zinc runs on surface caused by zinc freezing during draining
- steel is only about 15% heavier than zinc. A relatively small amount of air trapped inside a hollow section will prevent the section from sinking in the molten zinc
- any water trapped inside a hollow section will expand 1750 times its original volume as steam and generate pressures as high as 50 MPa (7250 psi).

BASIC VENTING RULES

- no vent hole should be smaller than 8 mm
- the preferred minimum size is 12 mm
- about 200 grams of zinc ash will be produced for each square metre of steel surface galvanized. This ash is a solid powder and will not pass through small openings. Venting large internal areas required larger vent holes to allow ash to escape
- hollow vessels require 1250 mm^2 of vent hole for each cubic metre of enclosed volume. This means that a 40 mm^2 diameter hole is required for each cubic metre of volume
- hollow sections such as tube, RHS and SHS require minimum vent hole area equivalent to 25% of the section' diagonal cross section
- vent holes should be at the edges of hollow sections

BASIC DRAINING RULES

- no drain hole should be less than 10 mm
- preferred minimum drain hole size is 25 mm
- large hollow sections (tanks, pressure vessels) require a 100 mm diameter drain hole for each cubic metre of enclosed volume
- drain holes should be at the edges of hollow sections.
- hollow sections such as tube, RHS and SHS require minimum drain hole area equivalent to 25% of the section' diagonal cross section. The preferred design option is to leave the ends of tubes, RHS and SHS open.

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TABLE OF DRAIN AND VENT HOLE SIZES FOR VARIOUS HOLLOW SECTIONS - RECOMMENDED MINIMUMS

HOLLOW SECTION, TYPE, AND SIZE

Circular Hollow Section Nominal bore mm	Rectangular Hollow Section Size mm	Square Hollow Section Size mm	Vent Hole Diameter mm Single	Double
8			8	
10			10	
15			10	
20		13x13	10	
25		16x16	10	
32		19x19	10	
40	38x19	25x25	10	
50	38x25	32x32	12	2x10
65	64x38 76x38	51x51	16	2x12
80	76x51 89x38	64x64	20	2x14
100	102x51 102x76	76x76	25	2x18
	127x51 127x64	89x89	25	2x18
125	127x76 152x76	102x102	32	2x22
150	152x102	127x127	38	2x27
200	203x102 203x152	152x152	50	2x35
250	254x152	203x203	63	2x45
300	305x203	254x254	75	2x54
350	305x254	305x305	88	2x63
400			100	2x70

TABLE OF VENT AND DRAIN HOLES FOR TANKS AND PRESSURE VESSELS

Capacity - litres	Single drain hole diam. mm	Double drain hole diam. mm	Vent hole diam. mm
500	80		25
1000	115	2x 80	40
1500	140	2x100	45
2000	160	2x115	55
2500	175	2x125	60
3000	200	2x140	70
3500	225	2x150	75
4000	225	2x160	80
4500	240	2x170	85
5000	250	2x175	90
5500	265	2x185	95
6000	280	2x200	100
7000	300	2x220	110
8000	325	2x225	115
9000	350	2x240	120
10000	350	2x250	125

Large tanks require large drain holes. This tank will contain over 7 tonnes of molten zinc when immersed, which must be able to flow in and out freely.