12. ILLUSTRATED GUIDE TO DESIGNING FOR GALVANIZING

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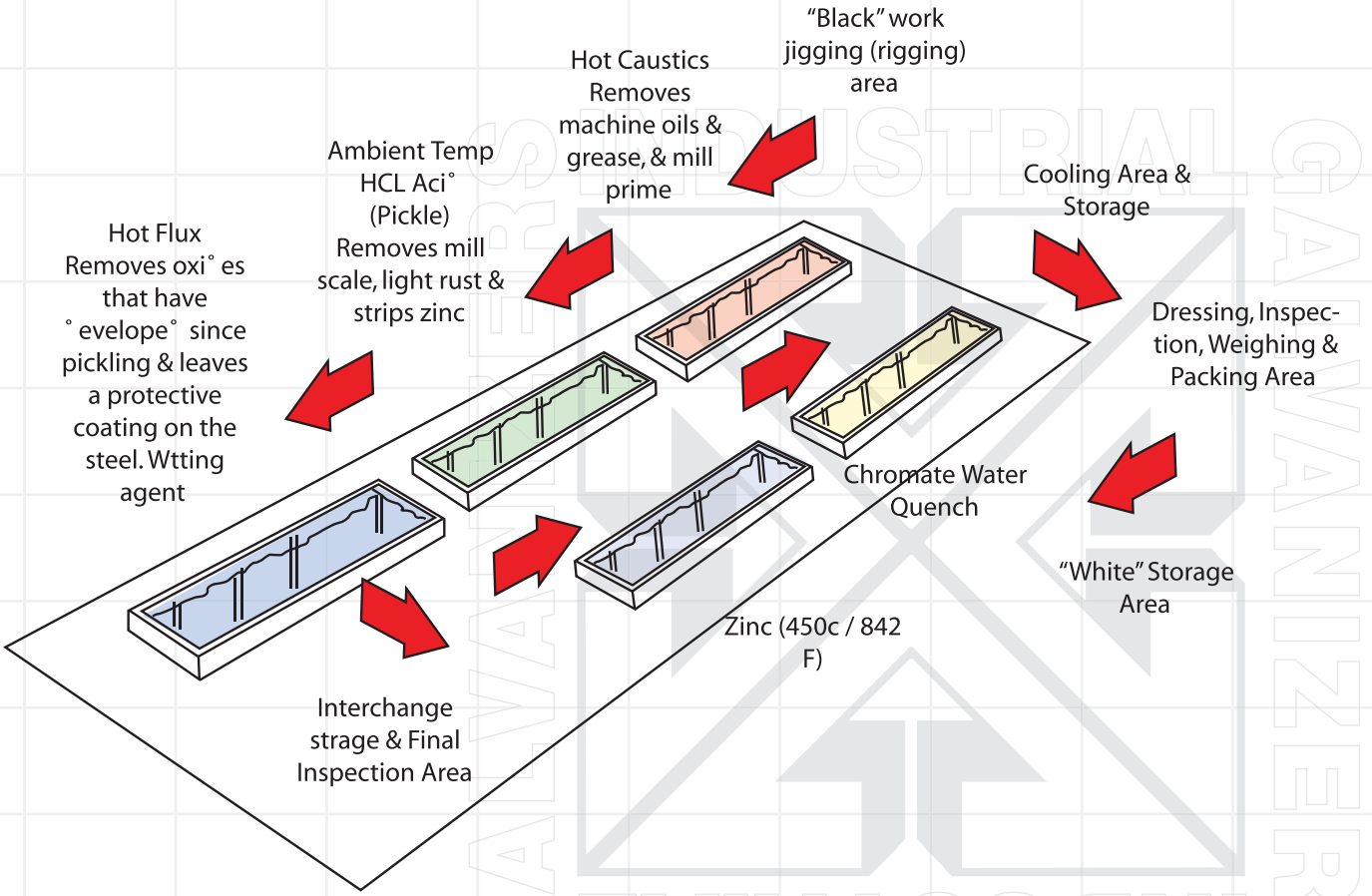
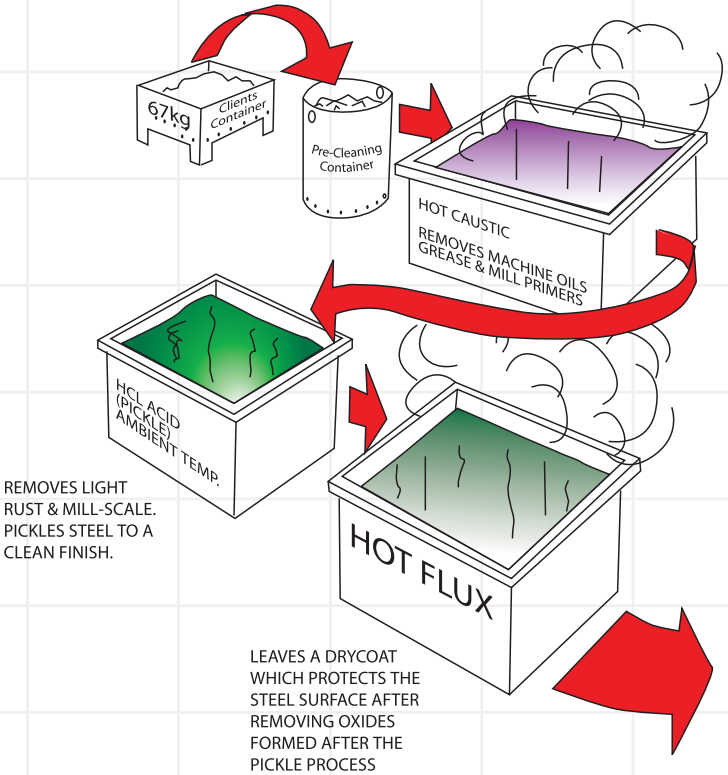
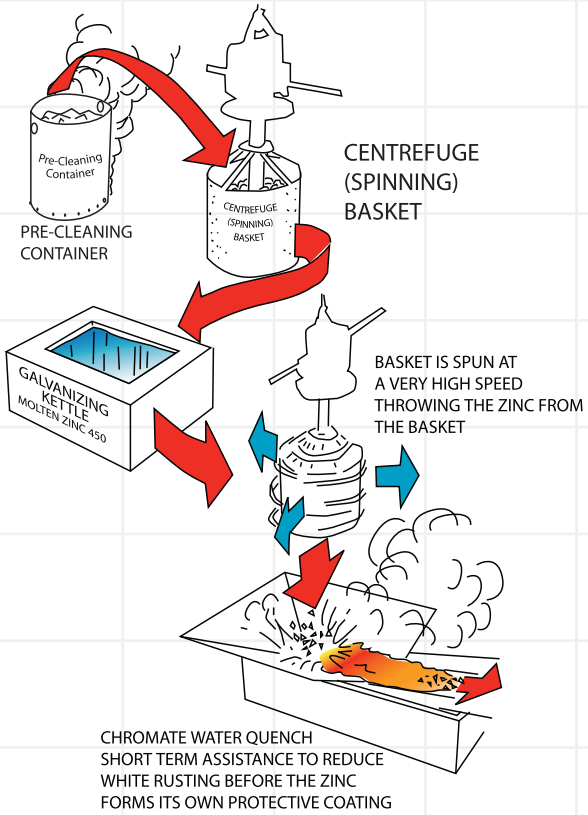
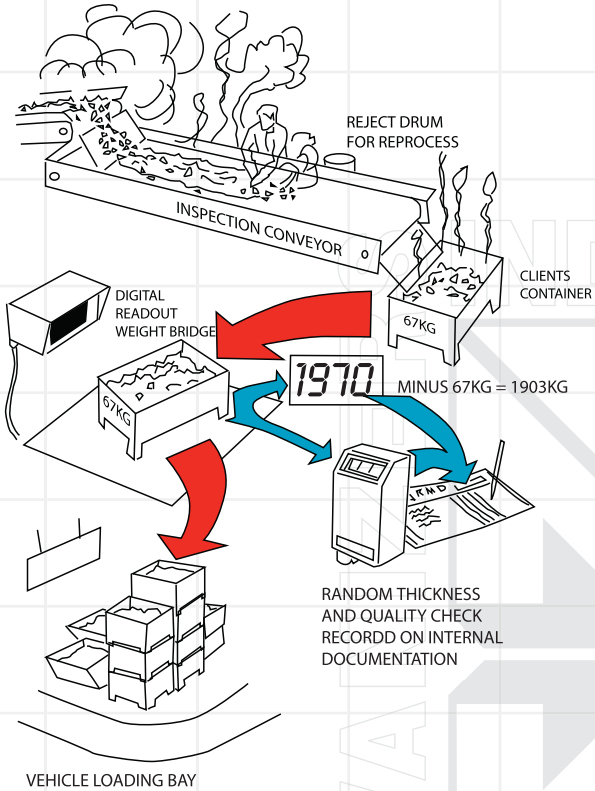
19. Design for fence panels and balustrade



1. Hot Dip Galvanizing: The hot dip galvanizing process involves at least 5 operations. Plant design and layout will determine the maximum size of fabrications that can be galvanized.

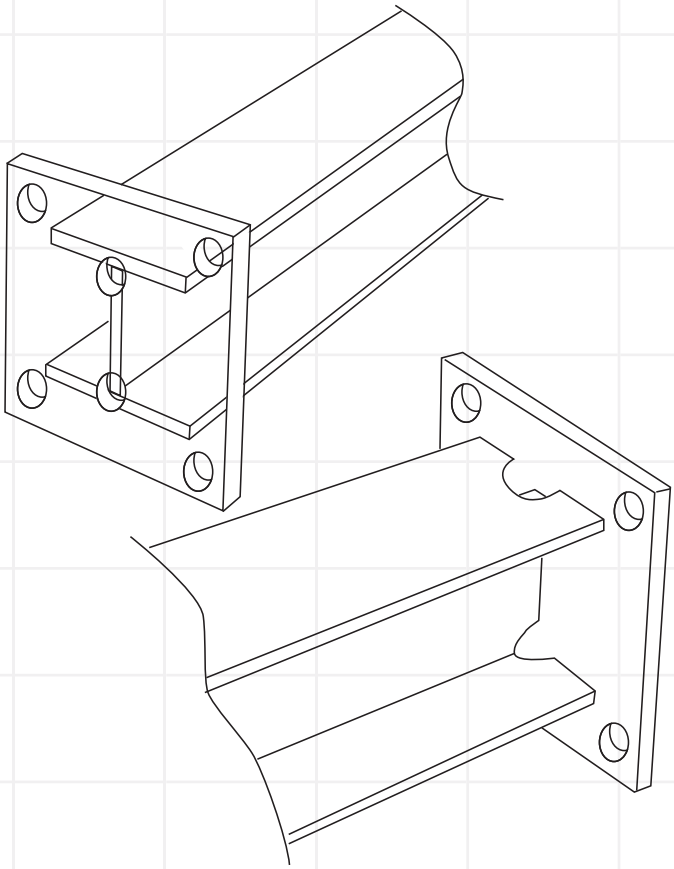






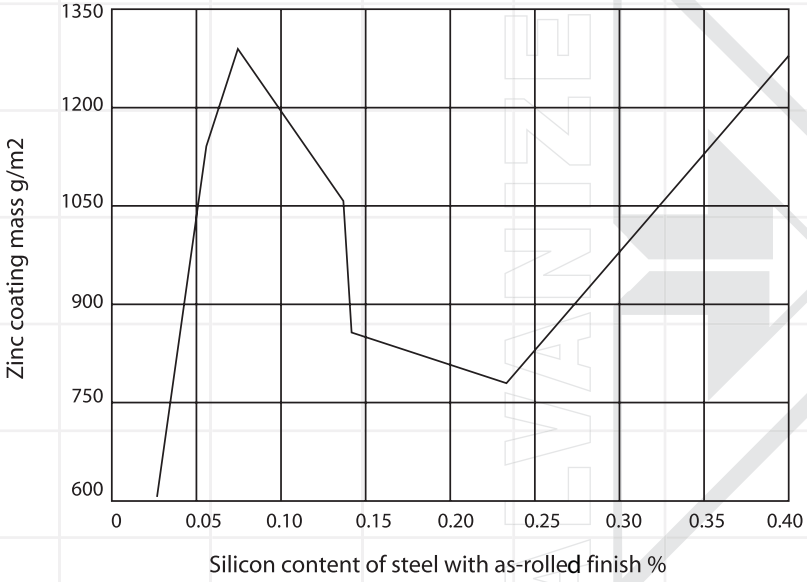
2. Centrifuge processing of small parts. Hot dip galvanizing of small parts is done using the centrifuge process, where the pre-treated parts are galvanized in baskets that are spun at high revolutions after withdrawal from the molten zinc to remove excess zinc from their surfaces.

options for venting and draining end plates

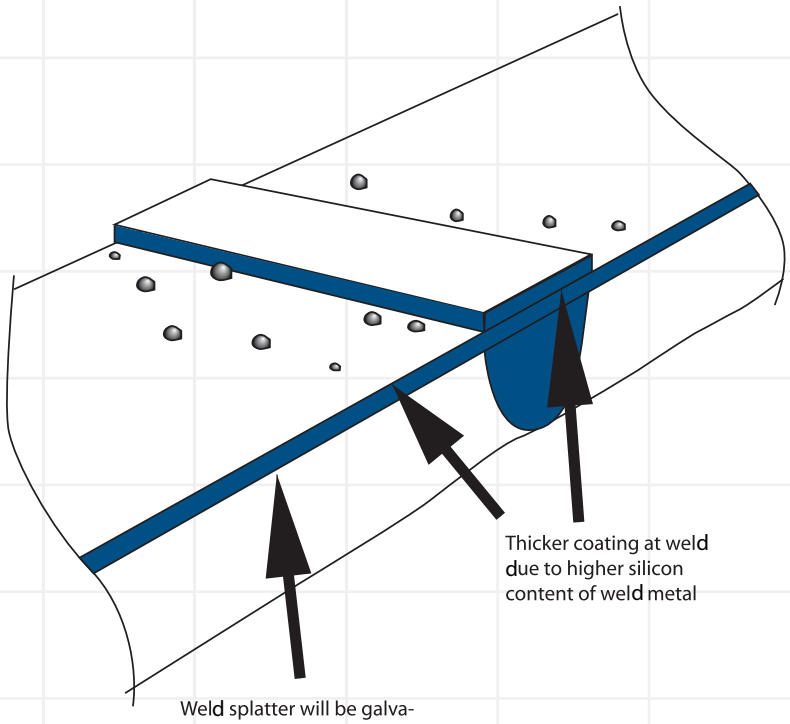


3. End plate design. Base plates and end plates need to be designed for adequate venting and draining. Simple detailing during fabrication, as shown here, will produce good galvanizing results.

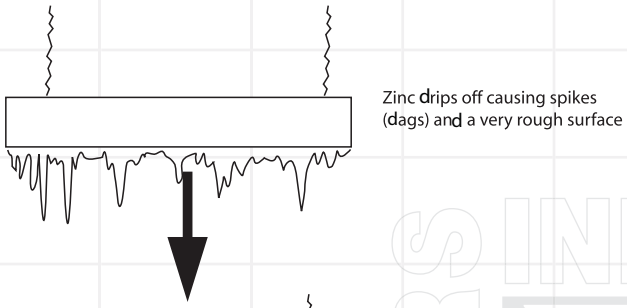
Effect of silicon content of steels on galvanized coating mass and appearance

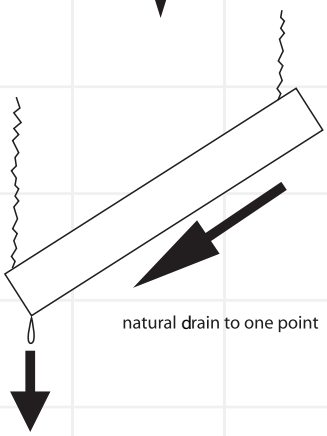


4. The Sandelin Diagram. Steel chemistry determines the rate at which the steel will react with the molten zinc alloy in the galvanizing bath to form the galvanized coating. Silicon is the most significant reactive alloying element in structural steels. This graph shows the reaction rate of steel with zinc at various steel silicon levels, and will give an indication of the likely galvanized coating characteristics of a steel of known silicon composition.

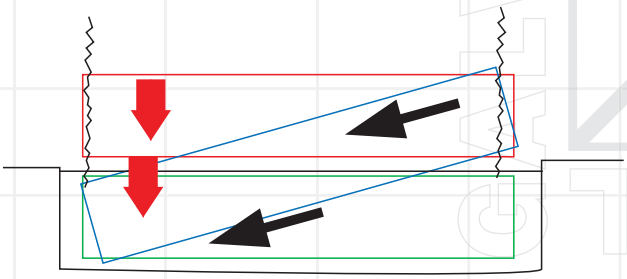


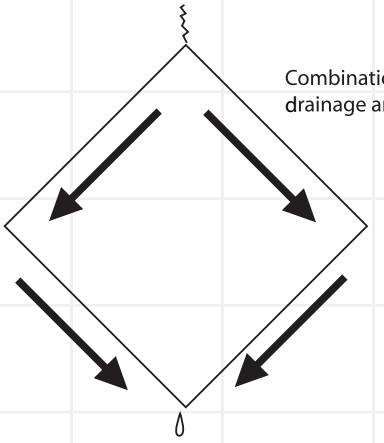
5. Welding and weld metal. Weld metal composition and welding techniques can affect the finished appearance of fabrications. Weld metal is normally high in silicon content and will react with the molten zinc alloy at a higher rate that the parent metal. Weld areas ground flush prior to galvanizing may thus appear raised above the metal surface after galvanizing. Weld splatter will not be removed in the pre-treatment process and will be galvanized on the surface, creating an unsightly appearance.



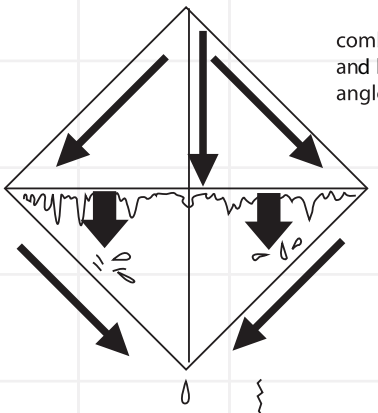


6. Zinc drainage off large items. The angle with which large fabrications can be withdrawn from the bath will determine the effectiveness of the drainage of excess zinc from its surfaces.

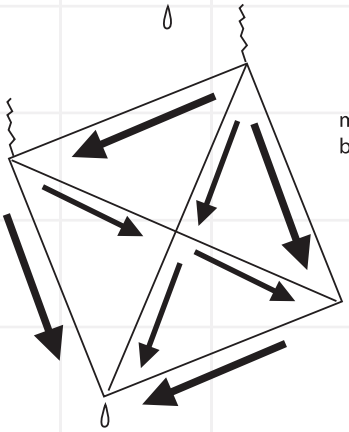




Combination of good drainage angles

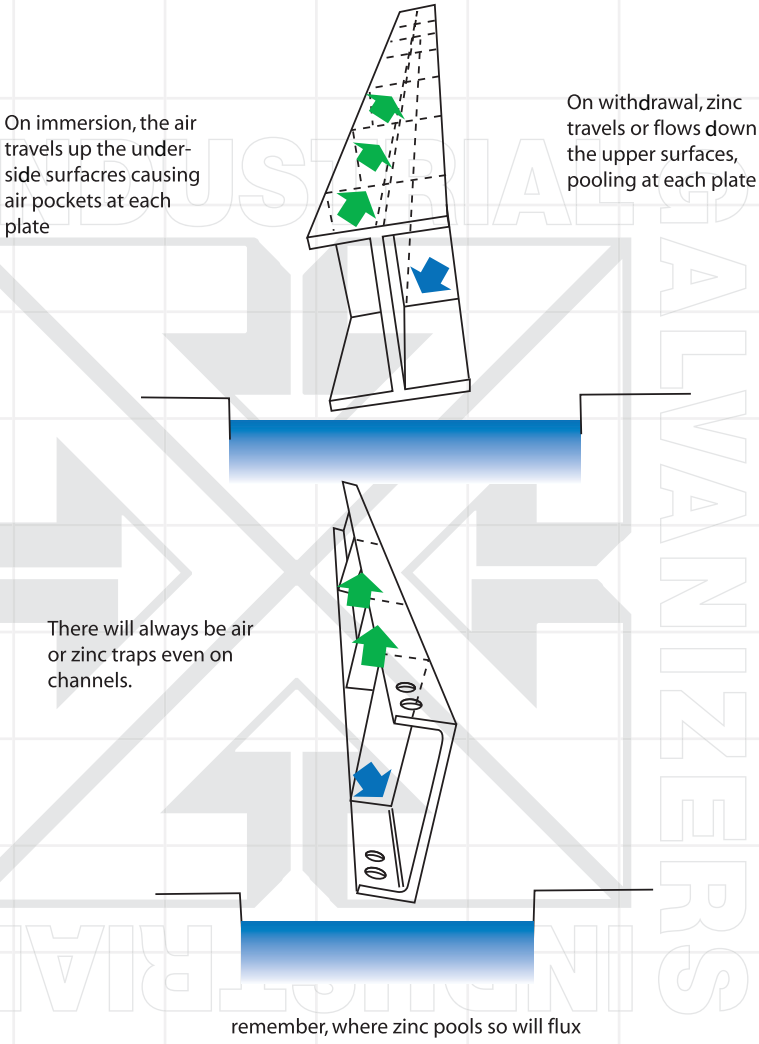


combination of good and bad drainage angles

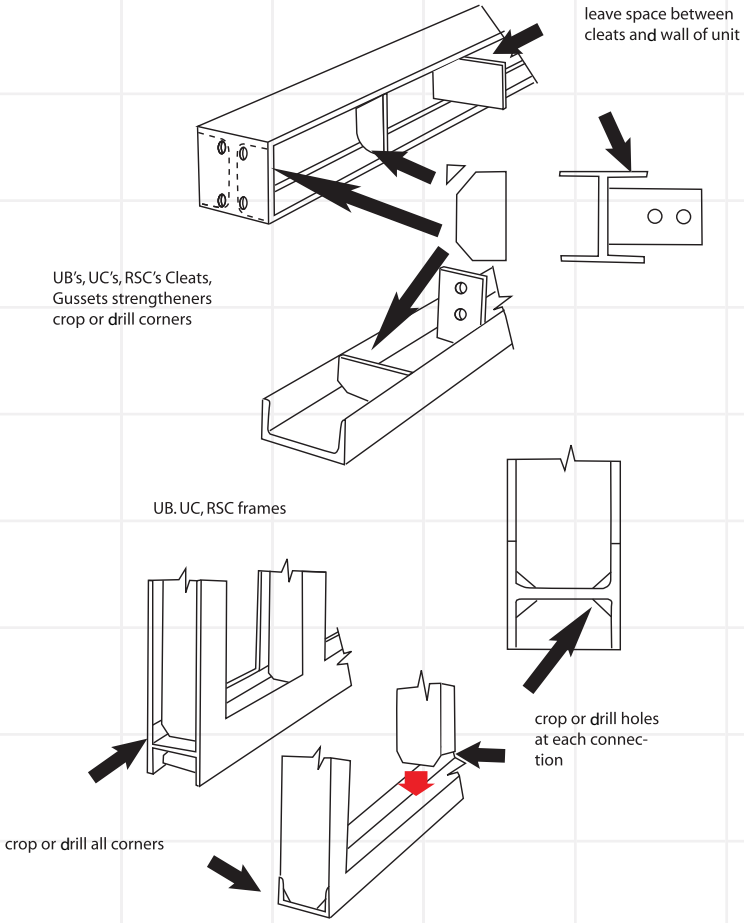


multiple hanging points for best drainage angles

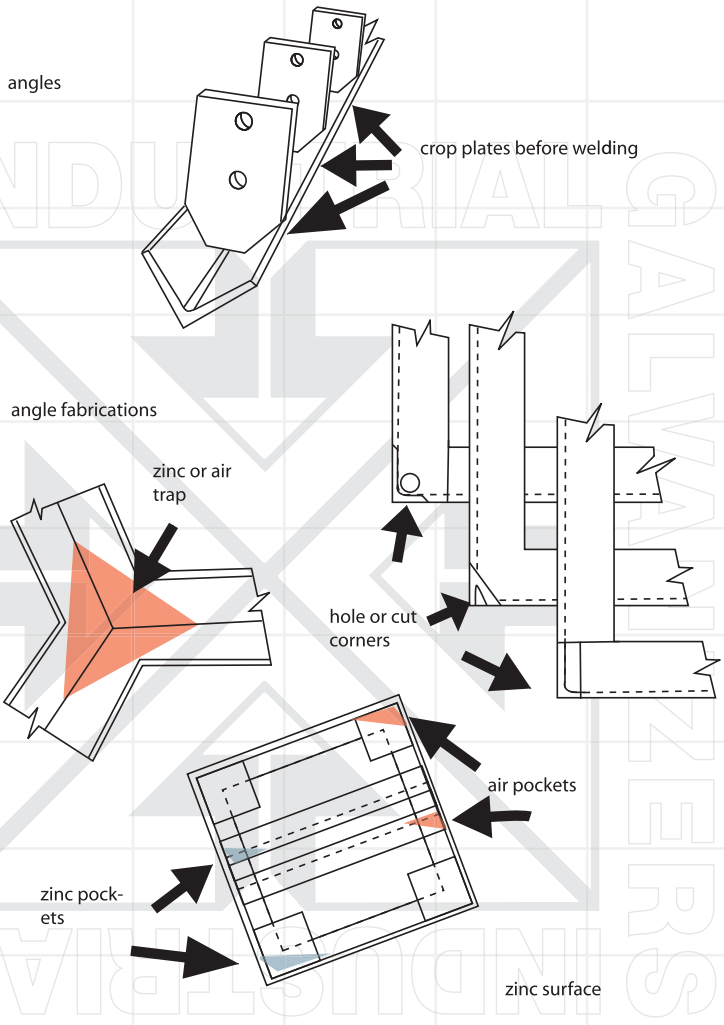
7. Orientation and surface finish. The steeper the angle at which a fabrication can be withdrawn from the galvanizing bath, the smoother the finish is likely to be. The flatter the surface is with respect to the molten zinc, the more drips, drainage spikes and feathers will occur on the edges. Provision of lifting points to allow the optimum orientation will produce the most consistent surface finish.



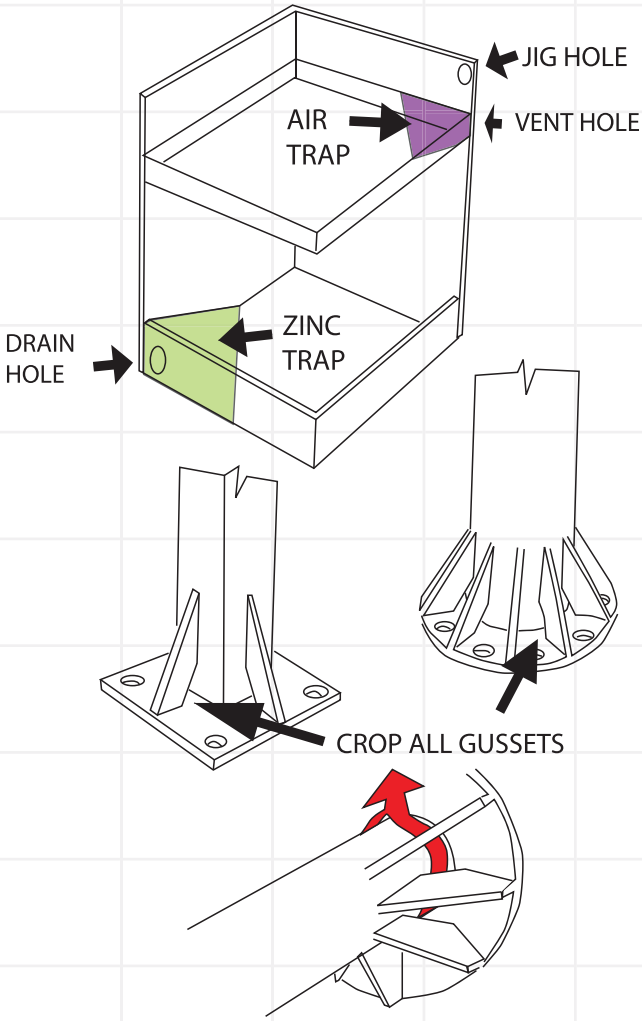
8. Venting and draining of structural sections. Beams, columns and channels that contain gussets, splice plates or stiffeners in their design will not galvanize satisfactorily unless both zinc and air can get free access to all surfaces of the sections. Cropping of gussets and stiffeners fabricated into these sections will ensure a good galvanizing outcome.



9. Design detailing. Simple detailing will ensure that adequate venting and draining of fabricated assemblies will deliver a good quality hot dip galvanized finish.

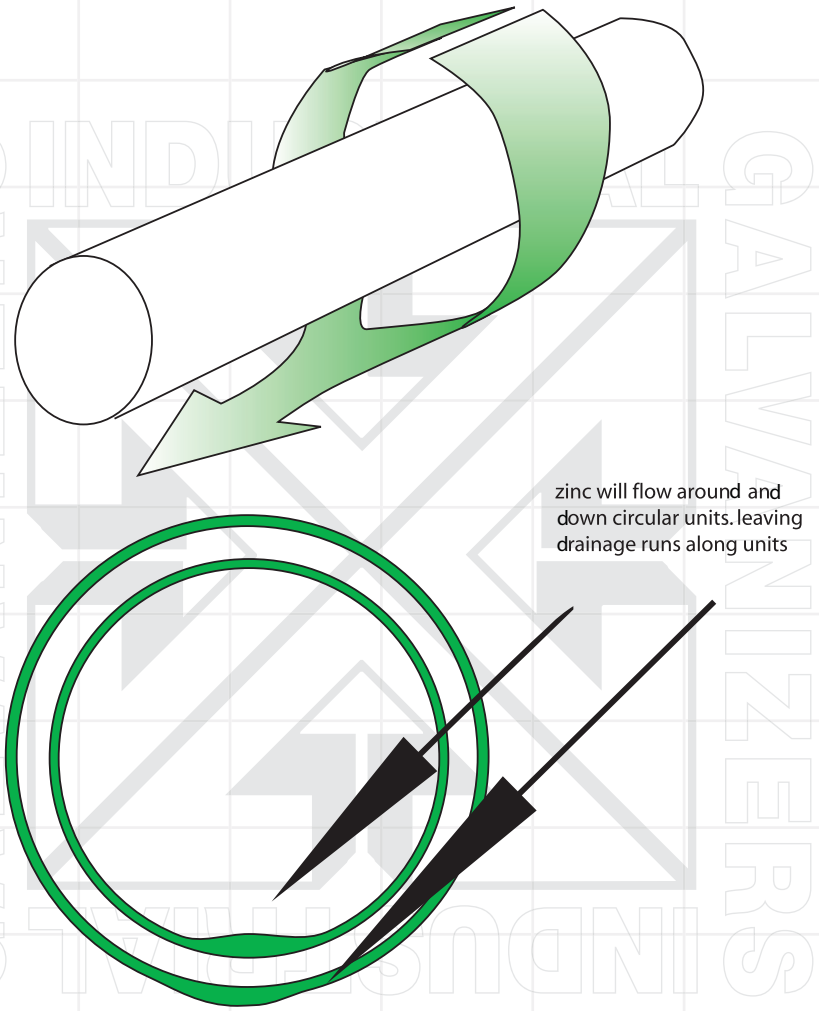


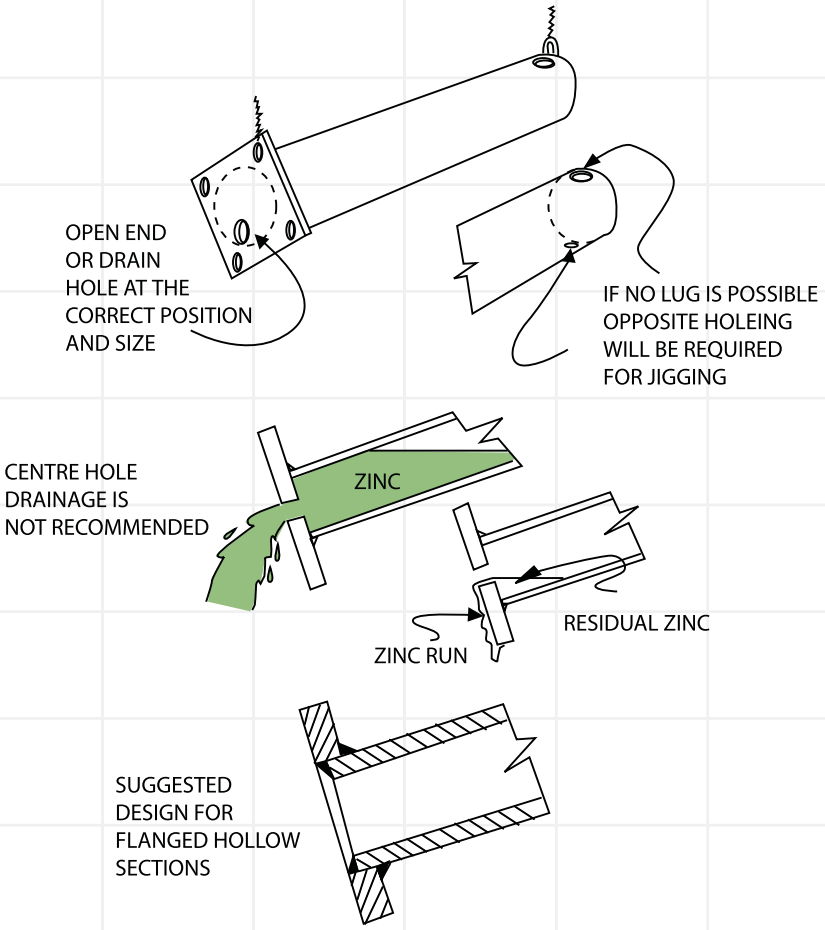
10. Design details for angle fabrications. 1-, 2-, or 3-dimensional angle fabrications need to be designed to consider their venting and draining characteristics during hot dip galvanizing. Using outward facing angles, rather than conventional inward-facing angles, in 3-D fabrications can eliminate the need for any special venting or draining requirements.



11. Detailing complex fabrications. For complex fabrications, advice should be sought from the galvanized to ensure that adequate lifting points, and venting and draining requirements are incorporated into the fabrication.

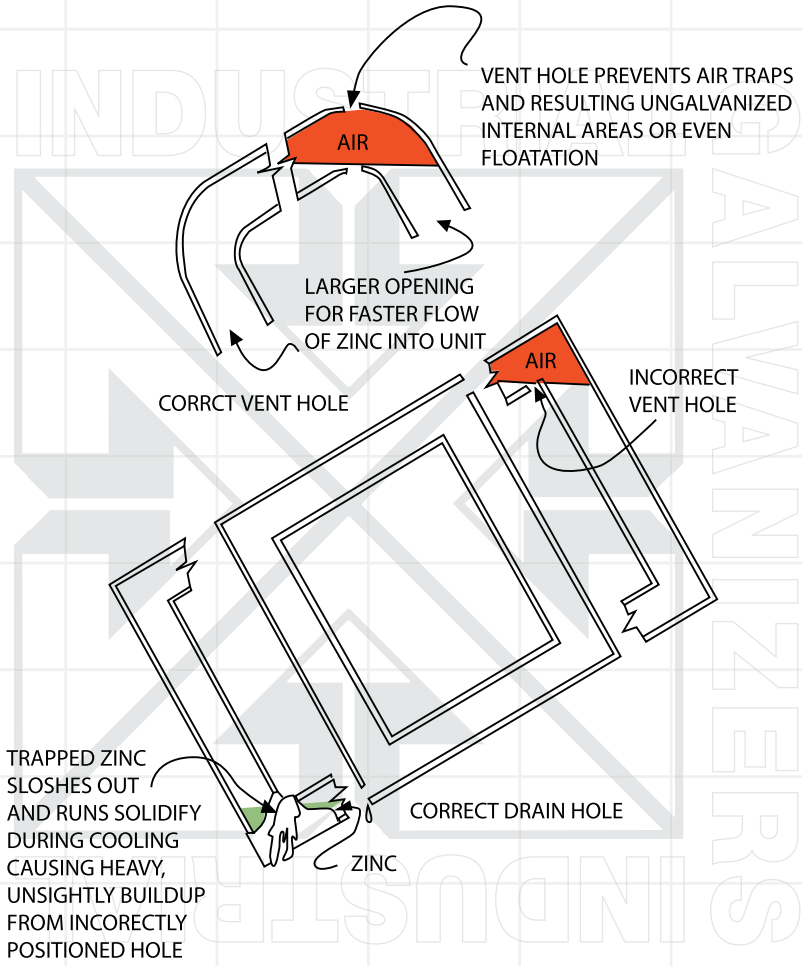
12. Zinc buildup and clearances. The surface tension and fluidity of molten zinc will result in thickening of the galvanized coating at low points on solid and hollow circular sections. Where clearances for the fitting of mating parts is requires, this thickness variation needs to be accommodated in the design, particularly on internal surfaces of hollow sections where removal of excess zinc is difficult.

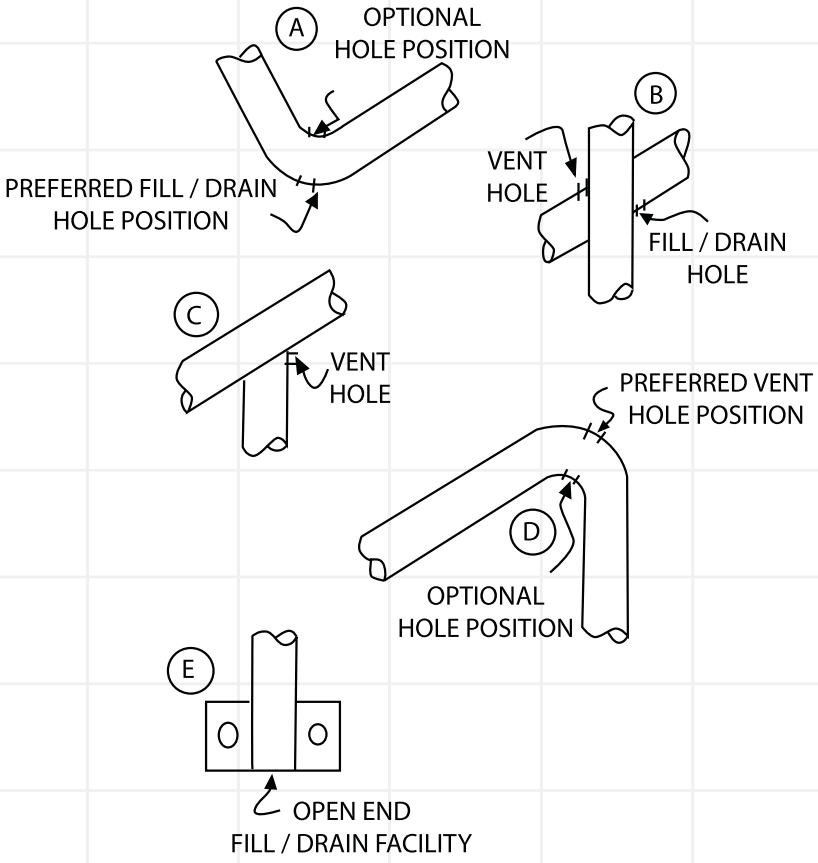




13. Draining larger hollow sections. Larger hollow sections used for structural applications have a significant internal volume so venting and draining of base plates and end plates needs to accommodate the flow of larger volumes of pre-treatment chemicals and molten zinc. The location of drain holes in base plates and end plates will be determined by the orientation of the section during galvanizing.

14. Pipe spools and other 2-D and 3-D hollow section fabrications require careful detailing to ensure safe and satisfactory galvanizing. Moisture trapped inside the fabrication is an explosion hazard, and air trapped inside will prevent the item from sinking into the molten zinc.

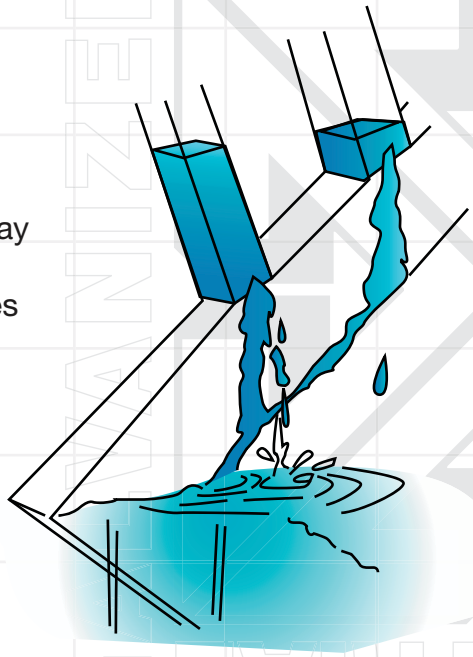




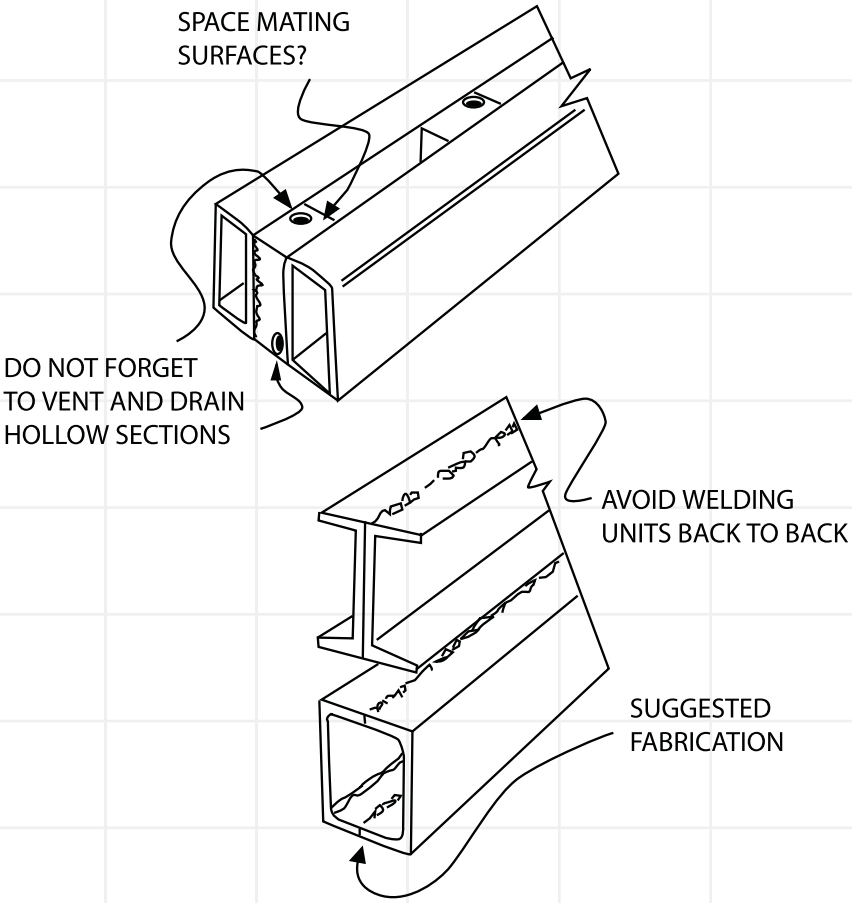
15. Venting and draining of handrails. Stanchions and handrails fabricated from hollow sections need to be vented and drained on the underside or inside to prevent ingress of rainwater and hazards to the pedestrians using the handrails.

VENT AND DRAIN HOLES TOO SMALL!

16. Vent and drain hole size. Vent and drain holes that are too small in hollow sections increase immersion time and may cause unsightly excessive zinc drainage runs as the zinc freezes during the draining period.



VENT AND DRAIN HOLE SIZE. VENT AND DRAIN HOLES THAT ARE TOO SMALL IN HOLLOW SECTIONS INCREASE IMMERSION TIME AND MAY CAUSE UNSIGHTLY EXCESSIVE ZINC DRAINAGE RUNS AS THE ZINC FREEZES DURING THE DRAINING PERIOD.



17. Back-to-back sections. Where back-to-back angle or channel fabrications need to be hot dip galvanized, welding to create large overlapping surface areas should be avoided. The use of packers between the sections, or using channels toe-to-toe will ensure a good galvanizing outcome.

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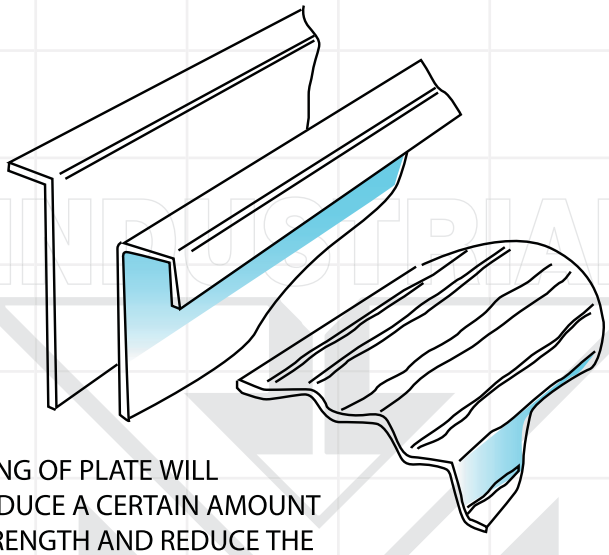
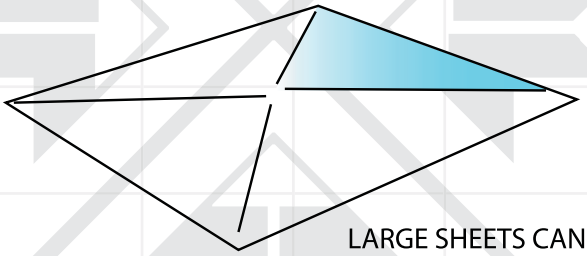
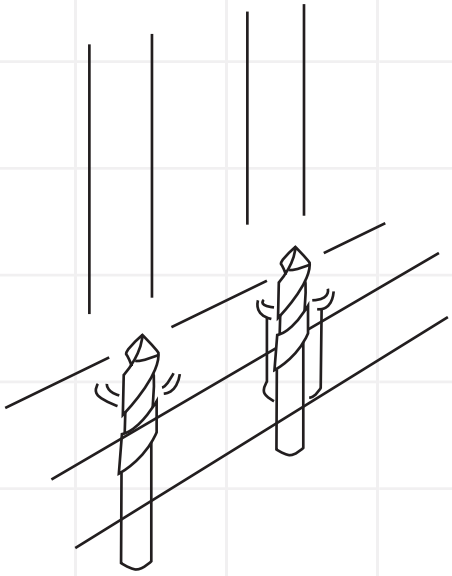


FOLDING OF PLATE WILL INTRODUCE A CERTAIN AMOUNT OF STRENGTH AND REDUCE THE POSSIBILITY OF DISTORTION



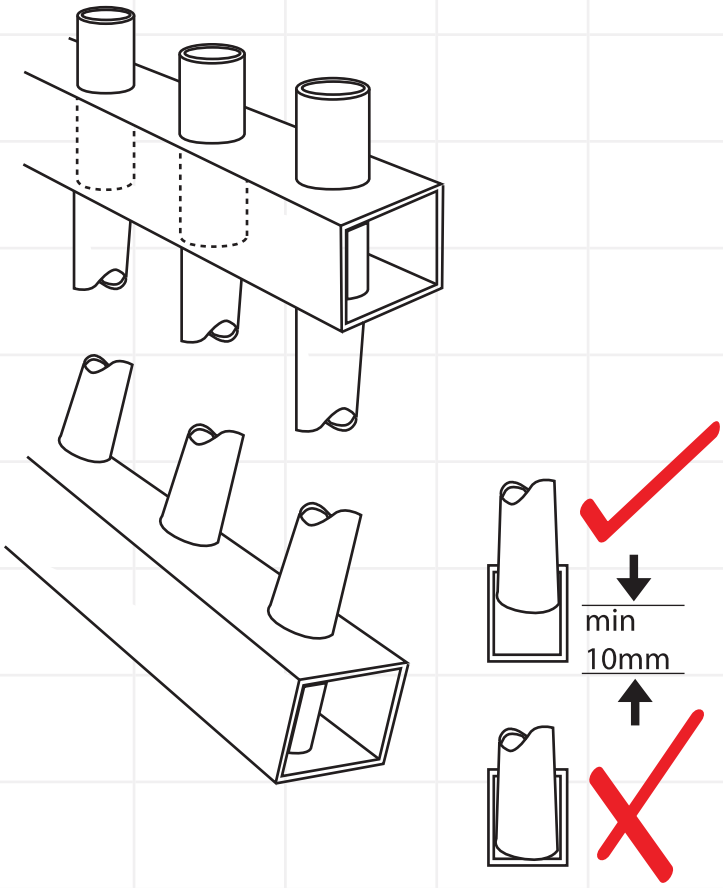
LARGE SHEETS CAN BE BREAK PRESSED WHICH WILL REDUCE THE DISTORTION TO SMALLER AREAS

TWISTING MAY OCCURE EVEN THOUGH THE MEASURES HAVE BEEN TAKEN



Drill up through the bottom of the lower horizontal unit into the uprights

allow for free flow of zinc and air between internal walls



19. Design for fence panels and balustrade. Where hollow sections are used in the fabrication of fence panels and balustrades to be hot dip galvanized, the pre-treatment chemicals and molten zinc must be able to flow freely into and out of the fabrication. Venting and draining on the underside of fence panels and balustrade will not effect their appearance and will not allow weather to enter the panels.


INDUSTRIAL GALVANIZERS
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SPECIFIERS MANUAL

01 - SPECIFIERS MANUAL — THIRD EDITION

Industrial Galvanizers Australian Galvanizing Division (IGAG) operates nine galvanizing plants around Australia, ranging in size from large structural galvanizing facilities to specialised small plants designed to process small parts.

The Australian Galvanizing Division has galvanized in excess of 2 million tonnes of steel products in Australia since its first plant was commissioned in 1965 and is recognized for its ability to handle complex and difficult projects, as well as routine contracts.

This experience has been collated in the Specifiers Design Manual, to assist those involved in the design of steel products and projects to better understanding the galvanizing process and allow the most durable and cost-effective solutions to be delivered to these products and projects. All sections of this Third Edition have been completely updated and additional sections have been included to provide additional technical information related to the use of hot dip galvanized steel.

In addition to its Australian Galvanizing operations, Industrial Galvanizers Corporation has a network of manufacturing operations in Australia, as well as galvanizing and manufacturing businesses throughout Asia and in the USA.

The company's staff in all these locations will be pleased to assist with advice on design and performance of hot dip galvanized coatings and products. Contact details for each of these locations are located elsewhere in this manual.

This edition of the Industrial Galvanizers Specifiers Manual has been produced in both html and .pdf formats for ease of access and distribution and all documents in the Manual are in .pdf format and can be printed if paper documents are required.

The Specifiers Manual is also accessible in its entirety on the company's web site at www.ingal.com.au.

Additional copies of the Specifiers Manual are available on CD on request.

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