

4 DETAILING CONSIDERATIONS 4.2 Base plate detailing

- 1 Generally four anchor bolts are preferred in order to maximise the stability of the free-standing column while the rest of the steelwork is erected. Two bolt arrangements should be restricted to situations involving short columns or door posts.

Reference 7 indicates that the US Occupational Safety and Health Administration (OSHA) requires four anchor bolts in all column base plate connections unless the small column or post weighs less than 140 kilograms (300 pounds) in which case two bolts may be used. OSHA also requires column base plates and anchor bolts to be designed for a specific bending moment to reflect the stability required with an ironworker on the column. Since Australian OH&S requirements require steel to be erected from 'cherry-pickers' or elevated work platforms, this requirement is not included in this Design Guide. Some Australian states have steelwork erection requirements that mandate the use of four anchor bolts.

- 2 Base plate should be a preferred plate thickness in Grade 250 plate to AS/NZS 3678 (Ref. 11). A minimum thickness of 12 mm is recommended for posts and lightly loaded columns, while 20 mm minimum thickness is recommended for normal applications (after Ref. 7).

Preferred plate thicknesses for the base plate are: 12, 16, 20, 25, 28, 32, 36, 40.

Base plates are typically cut to size using thermal processes. Edge roughness requirements are nominated in AS 4100 Clause 14.3.3.

- 3 Base plates larger than 600 mm in one direction should be provided with at least one grout inspection hole of 50 to 75 mm diameter through which the grout will rise indicating a satisfactory grouting operation. The grout hole will also prevent air pockets forming under the base plate. Such a hole is not considered necessary if dry pack grout is used or for base plate dimensions less than 600 mm long.

- 4 Fillet welds are preferred to butt welds when welding the column to the base plate. With this connection, over-welding is prevalent (the 'weld all round' philosophy) and this can be expensive. If designed for light loadings, the amount of welding may tend to the other extreme and some fabricators may prefer to increase the amount of welding above that shown on the design drawings in order to prevent damage during handling and shipping. There is usually a compromise possible between these extremes. Another design consideration is the likelihood of a nominally 'pinned' base being subjected to some bending moment in a real situation, especially during erection where some frame stability may be temporarily absent while the frame is assembled.

Basic welding guidelines summarized from Reference 7 are as follows:

- (a) fillet weld should be used wherever possible rather than butt welds;
 - (b) avoid weld all round symbols since the weld across the toes of the flanges and around the web fillets have little strength and are costly to produce;
 - (c) for most I-section columns, welding on one side of the flange and along both sides of the web will generally be adequate and economical;
 - (d) for RHS and SHS columns, welding only along part or all of the flat portion of each side will be adequate and economical, avoid welding around the radiused corners;
 - (e) use the minimum fillet weld sizes of AS 4100 Clause 9.7.3.2.
- 5 Column shafts with cold-sawn ends normally provide full bearing contact with the base plate, complying with Clause 14.4.4.2 of AS 4100, which then allows the amount of welding to be minimised for the case of axial compression and shear force. The portion of base plate in contact with the column section should be flat to within this tolerance also.



- 6 Prior to erecting the column/base plate assembly, the level of the base plate area should be surveyed and shims placed to indicate the correct level of the underside of the base plate (Figure 4). For lighter column/base plate assemblies, levelling-nut arrangements may be used in order to allow accurate levelling of the base plate.
- 7 Hole sizes in base plates may be up to 6 mm larger than the anchor bolt diameter (AS 4100, Clause 14.3.5.2). Holes would normally be drilled. Holes require a special plate washer of 6 mm minimum thickness under the nut if the bolt hole is more than 3 mm larger than the anchor bolt diameter. The oversize holes will accommodate reasonable misalignment in the location of the anchor bolts and allow adjustment of column bases to meet the tolerance requirement between column centres permitted in AS 4100 (Figure 6). Recommended diameters of bolt holes, minimum washer dimensions and thickness are given in Table 4.
- 8 A shear key may be welded to the underside of the base plate in order to resist the design shear force (see Figure 5).

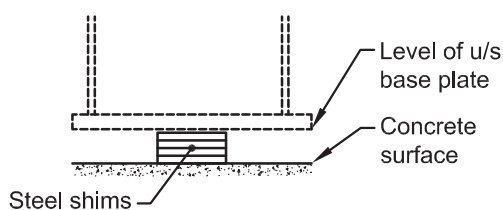


FIGURE 4 USE OF STEEL SHIMS

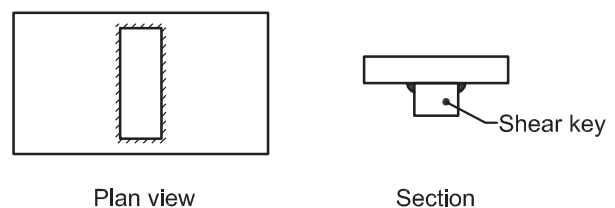


FIGURE 5 SHEAR KEY DETAILS

- 9 The size and location of any permanent steel shims under the base plate should be shown on the structural/shop detail drawings. Temporary steel shims which are used for erection purposes until the underside of the base plate is grouted or concreted should be left to the erector to use as required on site.
- 10 The minimum space between the underside of the base plate and the concrete foundation should be:

25 mm	for grouting
50 mm	for mortar bedding

Grout strength should have a characteristic compressive cube strength at least twice that of concrete foundation (Ref. 7). Cube strength is the normal method of specifying grout strength rather than cylinder strength used for other concrete work.
- 11 Edge distance requirements for bolt holes should comply with AS 4100 Table 9.6.2 on the assumption of a machine flame cut/sawn edge (edge distance greater than $1.5 \times$ bolt diameter).
- 12 Plate dimensions and hole pitch and gauge should be such that the anchor bolts don't create construction problems by interfering with any reinforcing steel in the concrete foundations.

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Pinned base plate connections for columns
by

T.J. Hogan

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