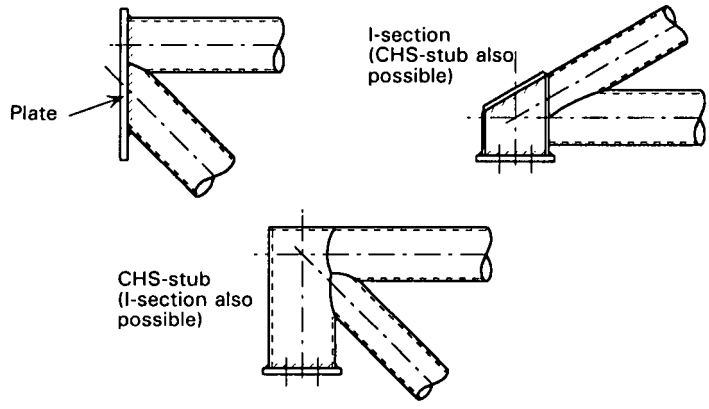

Figure 3.12 *Bolted truss support connections*

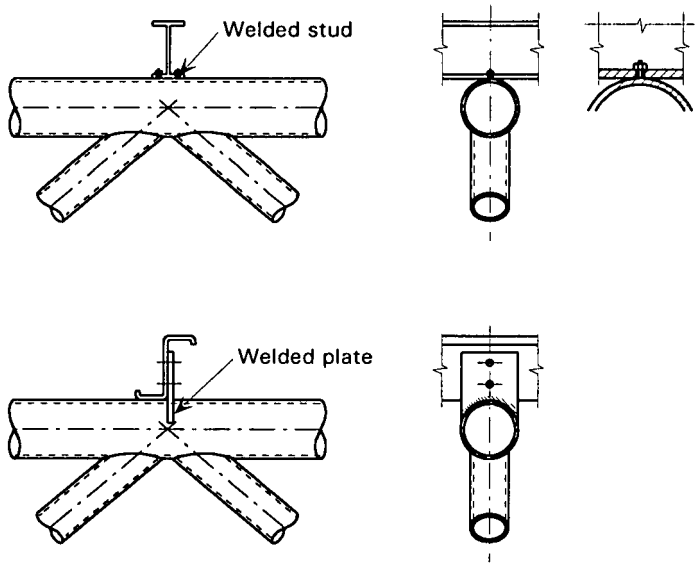

Figure 3.13 *Bolted purlin connections*

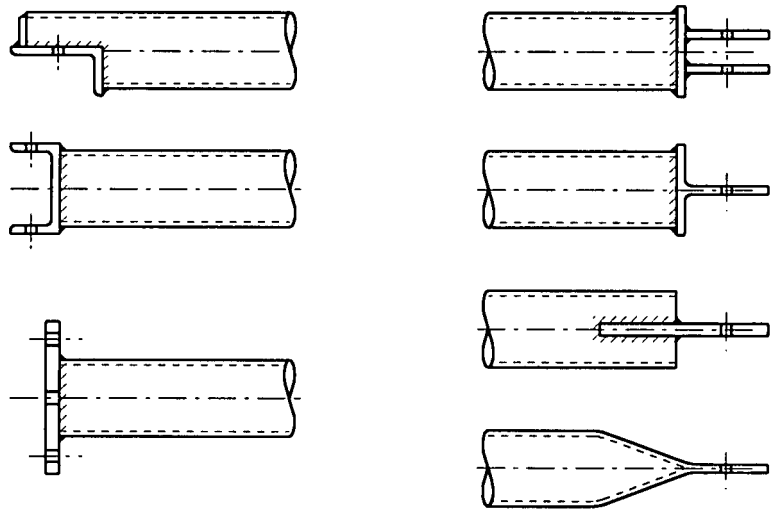

Figure 3.14 *Bolted end connections*

3.4.6 Column bases

Column bases are discussed specifically in Section 6.1. A typical detail for a nominally pinned base, which can nevertheless resist some moment, is presented in Figure 6.1. Bases capable of resisting substantial moments are heavier, with more extensive, and therefore more expensive, foundations. From an erection point of view, when extra bolts are required these may increase the likelihood of lack-of-fit problems, and difficulties in landing a column on the base. Control of frame deflections may also prove a problem when moment resisting bases are used, since columns will be smaller than in an equivalent frame with pinned bases. Information is also given in *Joints in simple construction, volume 2,* to which reference should be made for more details [15] .

3.5 Bolts

Bolts are discussed in the CIMsteel *Design for manufacture guidelines*[1] **,** from which the following points are taken:

- preloaded bolts should be used where relative movement of connected parts (slip) is unacceptable, or where there is a possibility of dynamic loading, but not elsewhere
- the use of different grade bolts of the same diameter on the same project should be avoided
- washers are not required for strength with non-preloaded bolts in normal clearance holes
- when appropriate, bolts, nuts and washers should be supplied with a corrosion protection coating which does not require further protection on site
- bolt lengths should be rationalised
- bolts should be threaded full length where possible (see below).

Although connection details have been standardised, on a typical major project, 70 different bolts may still be used. With rationalisation, this number could be reduced by a factor of up to 10. The single largest reason for the number of bolt variations is the practice of part threading the bolts, and ordering them in 5 mm length increments. Fully threaded bolts, including preloaded bolts, are known to behave adequately in shear and are allowed by British Standards. Circumstances in which the use of fully threaded bolts may not be appropriate are relatively rare[20] . Although there are potential minor extra manufacturing costs due to an increase in the average bolt length and a need for more threading, significant overall savings are possible when standard, fully threaded bolts are used:

- reduced prices due to bulk purchasing
- 'just in time' (JIT) purchasing
- no need to compile extensive bolt lists (giving details of bolt types and locations)
- smaller stock
- less handling due to reduced sorting
- faster erection
- reduced errors (therefore increased safety)
- reduced wastage.