Multi-storey braced frame

A typical (efficient) erection sequence for a multi-storey braced frame with composite floors is given below.

1. Erect columns after 'shaking-out' members i.e. steel is unloaded as a batch and individual items then distributed to positions from which they can be easily erected. 'Shaking-out' reduces crane hoisting and slewing. It is not needed when 'just in time' delivery allows erection straight from the delivery lorry.
2. Guy or prop columns to maintain temporary stability if necessary.
3. Erect lower floor beams.
4. Erect upper floor beams.
5. Place enough bolts to secure member (typically one third of final number).
6. Erect bracing members.
7. Plumb and bolt-up columns.
8. Tighten upper floor bolts.
9. Tighten lower floor bolts.
10. Tighten bracing member bolts.
11. Place decking bundles on lower floor.
12. Place decking bundles on upper floor.
13. Spread decking on upper floor and use as a 'shake-out' area for next tier.
14. Complete decking, edge trims and shear studs on lower floor.
15. When next tier steelwork is erected complete decking etc. on upper floor.

Reducing hoisting and slewing enables a greater number of pieces to be lifted by a crane during a given period (Figure 4.2). Making use of the decking avoids working on open steelwork at a height of more than two storeys (except at the edges of the frame), and eliminates the need for temporary access and loading platforms.

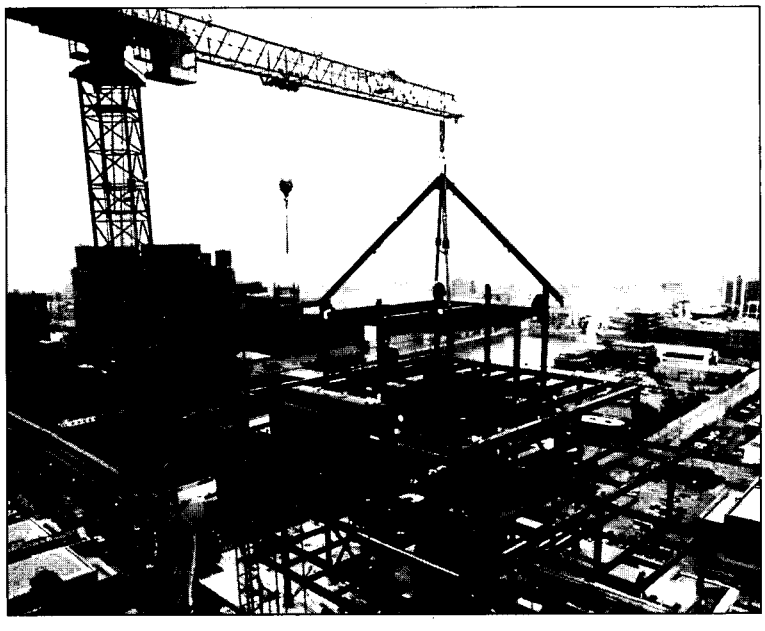

Figure 4.2 *South Quay station under construction (courtesy of British Steel)*

Braced portal frame

A typical erection sequence for a single bay braced portal frame is given below. Erection begins by creating a braced unit, or 'stiff box', to which other members are joined (see Section 3.2).

1. Erect a line of columns (or less if their stability is a problem).
2. Erect eaves beams between the columns.
3. Erect bracing members between the appropriate columns.
4. Erect opposing line of columns.
5. Erect corresponding eaves beams.
6. Erect corresponding vertical bracing.
7. Align and plumb the columns so that the rafter connections can be made (the bases of the columns may need to be restrained to prevent spreading when the rafters are erected).
8. Make the apex splice between the first pair of rafters (at ground level).
9. Erect rafters between the first pair of opposing columns, and bolt-up connections.
10. Repeat the above two steps for the rafters between the subsequent pairs of opposing columns.
11. Erect roof bracing between the appropriate rafters.
12. Tighten bracing bolts and re-tighten rafter to column bolts.
13. Fix end-bay purlins (with double span purlins, stagger joints so that some purlins extend into next bay to provide stability).
14. Fix purlins for subsequent bays.

For a multi-bay portal frame (Figure 4.3), erection should ideally begin with the central bay, and this should remain one line of columns ahead of the side bays. Side thrust from the rafters in the outer bays affects the plumb of the columns in the central bay. The deflected shape of the frame will alter as adjacent bays are erected and loads are progressively applied. This must be recognised when checking the frame position at different stages (see Section 4.1.6).

Figure 4.3 *Typical portal frame*