Approximately 90% of simple connections could be made using M20, 60 mm long bolts. With a choice of three lengths, 95% of connections could be covered.

3.6 Welding and inspection

Welding and inspection are discussed in the CIMsteel *Design for manufacture guidelines*[1], to which reference should be made for more information. The following points provide a summary:

- good access is needed for site welding and inspection
- fillet welds up to 12 mm leg length are preferred to the equivalent strength butt weld.

In-situ welding is not normally preferred if a suitable bolted connection is possible. When in-situ welding is adopted, provision must be made for protection against inclement weather. Providing such protection may have programme implications, as well as the direct costs involved.

3.7 Corrosion protection

Corrosion protection is also dealt with in the CIMsteel *Design for manufacture guidelines.* The following points provide a summary:

- choose a protection system to suit the environment - don't protect if it's not necessary
- use a single coat system applied during fabrication if possible
- ensure compatibility with the fire protection system
- clearly distinguish between any requirements for decorative coatings and protection requirements.

Further information may be found in Section 7.7 of this document.

3.8 Interfaces

Interfaces occur between numerous components (structural or non-structural), and the steel frame. Although these components are often not the responsibility of the structural designer, they may have an influence on the frame and are therefore appropriate for inclusion in this guide. The final objective of 'construction led' design is to reduce the overall building cost, not the cost of individual items such as the steel frame. Several examples in Section 7 of this document indicate how a little extra spent on one item can produce a saving in overall cost. Building services are a particularly good example to consider (see Section 7.1).

Component interfaces often coincide with trade interfaces. To avoid potential disruption on site it is essential that responsibilities, and specifications, are clearly defined at an early stage. Both design and construction are affected, and the flow of information may be one or two way. All parties involved should have a responsible attitude to not compromise the work of others. 'Cooperation' will increase the overall efficiency of the project.

Getting the interfaces 'right' is essential when designing for construction. Considerable detail concerning the interfaces listed below is given in Sections 6 and 7 of this document:

Structural (Section 6)

- foundations
- concrete and masonry elements
- timber elements
- composite beams and floors
- precast concrete floors
- crane girders and rails
- cold formed sections.

Non-structural (Section 7)

- services
- lift installation
- metal cladding
- curtain walling
- glazing
- brickwork restraints
- surface protection (corrosion and fire protection).

ACTIONS - Designing for construction

The designer should:

- standardise and repeat components
- specify appropriate tolerances
- specify suitable components and procedures
- consider the overall building cost, not just the frame cost

3.9 Further reading

(For further information, see Section 9, References)

The National Structural Steelwork Specification for Building Construction, 3rd edition[6]. See Section 2.4.

Design for manufacture guidelines[1]. A companion document to these guidelines, considering fabrication rather than construction. Its aim is to bring a degree of understanding of the manufacturing implications to the early design phases of a project.

Buildability: an assessment[3]). See Section 2.4

Comparative structure cost of modern commercial buildings[12]. Different frame options are considered and costed. Gives good guidance on different beam and slab possibilities. All aspects of cost, including time related savings, are considered.

Joints in simple construction, vol 1 and vol2 ([14,15]*),* and *Joints in steel construction: moment connections*[16]. Authoritative design guides for structural steelwork