7.4 Curtain walling

Curtain walling is the general description used for the external walls of buildings when they are constructed using a prefabricated framework that supports infill panels of glass or other materials. The framework is supported by the primary steel structure.

The connections used to fix curtain walling to a building are a key part of the whole walling system; they ensure that the panels perform correctly, and may affect the critical path of the construction programme. Depending on the curtain walling system and the procurement process, the connections may be designed by either the structural designer or the curtain walling specialist.

Connection details are similar for all types of panel; metal, concrete, glass or brickwork. One of their main tasks is to ensure that the curtain wall can be fixed in a position which satisfies specified tolerances, despite any allowed deviation of the primary steel frame. Curtain wall tolerances are more onerous than those for the steel frame. Typical tolerances on line, level, plumb and plane for a curtain wall are ±2 mm over one storey height or structural panel width, and ±5 mm overall.

Connection to the building frame may be constrained by the perimeter steelwork, the slab edge details and any services near the building perimeter. Connection positions should be defined early so that other parties involved in the building design have all the necessary information, and clashes are avoided.

The use of standard connection details and panel sizes facilitates work on site. To achieve standardisation, the number of different edge conditions should be minimised. For example, the structural designer could choose to specify the same size edge beams throughout the height of a building, when design requirements would allow the use of smaller beams in some locations. The extra frame costs will be compensated by savings in the cladding costs, or a shortening of the construction programme.

Curtain wall connections should be positioned to allow easy access for installation and inspection, and for the application of corrosion and fire protection. Top-of-slab connections are accessible, as are connections to the sides of columns. Several details are given and evaluated in *Curtain wall connections to steel flames*[64]. Unless constrained by panel size or architectural requirements, connections should be made at or near column positions. When this is not possible, the edge beams may need to be designed to avoid excessive sag under vertical loads, and to resist torsional loading. This may result in heavier sections, or extra steelwork being needed.

Connections should be designed so that they can be pre-set to ensure panels are correctly aligned when attached. Doing so removes adjustment of the connections from the critical path. It also avoids double handling of the panels if they can be lifted straight from the delivery lorry into position. This reduces crane time, and eliminates the need for storage space. Because of these savings, the greater expense of the pre-set connections themselves may be more than justified. 'Fine tuning' of panel line and level, without the need of a crane, should be possible once the panel has been positioned. This will further reduce crane time requirements, and benefit the erection programme.

ACTIONS - Curtain walling

Responsibility for designing different aspects of the curtain walling will vary depending on the specified system and procurement process. The following list of actions may not therefore necessarily relate to the structural designer:

- communicate and cooperate with other designers, so that connection positions are identified early in the design process
- specify connections which allow sufficient adjustment to accommodate different tolerance requirements
- position connections so that they are accessible
- use connections which can be pre-set to ensure alignment before panels are lifted into place
- standardise and repeat details.

7.5 Glazing

There is an increasing use of sophisticated structural glazing in modern buildings. This term is normally used to describe systems where the glass is hung directly from a building or structure, without secondary framing for the glazing panels. The absence of secondary framing means that systems achieve a high degree of transparency, free from the visual intrusions of conventional transoms or mullions. The supporting steel structures are often based upon cables or tubes, and can themselves be highly expressive architectural elements.

One of the major difficulties to overcome is the detailing between the glass panels and supporting elements. Responsibility for this will depend on the project, but in all cases both the structural designer and glazing specialist must be aware of the interface requirements. Connections must be able to accommodate thermal movements, and different tolerance requirements for the two components. Examples may be found in Reference 65.

The most common form of attachment used in structural glazing involves bolting panels to the building edge, or to a supporting structure, through holes drilled in the glass. Holes are normally at the corners and along the long edges of rectangular sheets. Two examples of recent projects are the Waterloo international rail terminal, and the Chur rail and bus terminal in Switzerland. These are illustrated in Figures 7.4 and 7.5.