Corporation Street Footbridge, Manchester

Corporation Street's new footbridge is an important milestone in the redeveloping of Manchester City Centre, the original bridge having been severely damaged during the terrorist bomb attack of June 1986. The new bridge provides an enclosed link between the new flagship Marks & Spencer store and the greatly enhanced Arndale Centre, and is the result of a design competition devised by the City Council.

The bridge's tower form represents a significant and exciting addition to the current trend in bridge design for ever more adventurous structural solutions, in that the outer steel lattice structure is both the primary spanning medium and the cladding support framework, there are no hidden main girders. The primary structure consists of a welded frame of nine perfectly straight 114mm diameter tubes with the curved hyparic flared ends being derived from the circular arrangement of these tubes within a spatial horizontal arc. This horizontal arc is believed to be a first in footbridge design.

Alternating with the 114mm diameter tubes are an equal number of 28mm diameter tension rods which contribute to the overall symmetry of the bridge as a result of their placement. The level of stress has been set to suit no design loading conditions result in a stress reversal in any of the rods. This again represents an innovative use of material commonly seen in modern construction, and was made possible by the use of the advanced computer analysis techniques used in the design.

The structure of the internal walkway deck consists of steel plate spanning lengthways into steel connections coincident with hoop frames located at alternate node points of the primary structure. The level of this walkway deck varies by some 400mm from the level of the bridge. This is clearly accommodated within the confines of the primary structure itself, as stated before. This change of deck level, whilst maintaining a horizontal appearance was fundamental to the design brief set by Manchester City Council. The total floor levels at each end could not be altered.

There are eight circular hoops (two in each collar and four in the centre section) which perform important roles in restraining the primary structure against buckling. Maximising the visual impact of the hoops was important in achieving the right visual hierarchy of bridge elements. The sympathetic answer was a value engineered H profile machined from a solid 75 x 75 x 7 steel billet.

The design brief required that the new bridge be fully enclosed in order to protect transverse shoppers from the Manchester weather. This has been achieved by glazing the central section and cladding the end columns with decorative ribbed open mesh grilles enclosing a weather tight membrane inner layer.

The principal cladding challenge lay with the centre glazed section. Here cast stainless steel discs have been fitted to the primary structure nodes. Each node supports an outer disc with a corresponding inner disc and central securing bolt. Between the two discs there is a "sandwich" of six glass panel layers. Aesthetics was key to this method of fixing to ensure that the discs were not overly large leading to an overall "pokka dot" type appearance which would compromise the otherwise slender structural form. The problem was further complicated by the differing performance requirements for the glass above and below deck level. Above the deck the usual wind, snow and self-weight loading conditions governed the design. Below deck, access for maintenance introduced a further more rigorous loading criterion. The solution in both situations was the use of silicon jointed laminated glass, with thicker, stronger panels for the below deck area. An additional requirement was that of inherent residual strength deemed necessary in the unlikely event of panel breakage. It was decided that from a health and safety perspective that an individual glass panel should not be allowed to drop out of its fixings. This was achieved by the innovative use of a drawn polyester interlayer developed expressly for use in glazing designed to withstand flying debris during hurricane conditions. Projecting tabs of interlayer fabric have been designed and detailed to be clipped within the cast steel flange plates. These provide a positive fail-safe fixing for each panel, even if the glass is completely fractured.

Judges' comment: A unique solution to provide pedestrian access across one of Manchester's busiest streets. With a combination of straight tubes and pre-tensioned rods meshing together to provide an elegant lightweight framing it appears to defy the misalignment between the linked buildings.