



Greater Manchester Exhibition and Event Centre

For Central Station Properties Limited

Central Station at Manchester is a unique structure. Constructed over 100 years ago, its basic form comprises 18 wrought iron arches spanning 65 metres with a height of 25.85 metres. These sit on an Undercroft of brick vaulting which extends over an area of some 7 hectares, providing the approaches to the station and incorporating various iron and steel bridges of similar vintage.

The Client's brief was to provide clear span exhibition facilities of 10,000 sq metres together with the necessary ancillary accommodation including foyer, restaurants, and administration facilities.

The building was to be fully serviced to give environmental control, together with the provision of all the necessary piped supplies to exhibition facilities through the accommodation. In addition, the exhibition area was to be capable of providing a venue for major cultural and sporting activities and to include seating for at least 5,000 people.

The primary design philosophy was to enhance the grandeur of the existing structure and to carefully integrate the complex services required for a sophisticated building within both new and existing structures.

The recurring theme is reflected primarily in the treatment of the main gables, and the front foyer including reviving the employment of cast iron and use of the wind brace girder to carry the primary ventilation system.

To achieve harmony with the splendid wrought iron arches, a large proportion of the ancillary buildings are supported using existing cast iron forms, re-cast from original columns and brackets taken from platform extensions to the side of the Main Hall. This use of cast iron has been found to be entirely sympathetic and has exploited the existing geometry of the arch form and hopefully added to the vocabulary of the Architecture and Engineering.

Both main gables of the Train Hall have been reglazed, this time internally, thus expressing for the first time, the existing handsome gable trusses. Originally, timber and cast glazing had covered these structures from view and by the repositioning of glazing to the internal face, the exciting structural form is now expressed and further enhanced by floodlighting at night to dramatise the form.

Careful choice of colouring has been undertaken in White, Silver and Grey to express the scale of the structure in colours which do not date and which form a sympathetic surround to the multitude of colours evident during exhibitions and event venues.

The architectural constraints involved in the foyer were the requirements for the low level section to be supported on cast-iron columns – replicas of those used in the original Central Station building – the unacceptability of any system of bracing or other



means of lateral stability within the foyer area, and the requirement for clean and well-aligned connection details for the RHS rafters and purlins, in view of the visual prominence of the structure.

In order to comply with these requirements, a horizontal diaphragm was formed at column head height. The forces on the foyer on each axis were taken at this level, utilising a system of tie rods and struts, to four lattice towers linked by lattice box girders located under the main (existing) gable frame. These lattice structures also served to house the air conditioning ducts from the basement plant rooms. The magnitude and distribution of the forces in this complex grid were analysed by computer, which also provided the horizontal deflections at the column heads to confirm that the movement of the cast-iron was within acceptable limits.

The structural solution to the castings was to use S.N.G. (Spheroidal/Nodular Graphite) iron which, because of the increased ductility and tensile strength in relation to the grey flake, was able to accommodate the appropriate movement. Obviously these columns were subject to stringent controls by testing during their production.

The multi-slope roofs to the foyers are carried on posts and beams which reflect the original structure of the platform canopies. For similar reasons, non-structural brackets in grey flake cast iron – again moulded from the originals, are attached to the beams, posts and the purlins which they support.

The tented structure provides the transition to the gable of the Train Hall and is supported vertically on the gable. However, to prevent additional lateral forces being transferred to the existing wrought iron, each member connection incorporates a rocker-hanger form of universal joint.

Major features of the existing structure have been adapted to the new design. For example the double arches at the gable, which support the gable framing, have been utilised to act as ducts to carry the conditioned air from plant rooms into the roof of the Train hall.

The complex includes a large number of buildings utilising steelwork, both in a totally independent manner, and compositely with other building materials, continuing the architectural theme of the Front Foyer, especially in the walkways and perimeter canopies.

JUDGES COMMENTS:

Central Station was one of the best examples of our built heritage, and it has been rescued by painstaking work in which steel is a vital element. The new steelwork structures around the original building are well conceived and complementary. The overall result is most stimulating.

ARCHITECT
EGS Design

STRUCTURAL ENGINEERS
Brian Colquhoun & Partners

STEELWORK CONTRACTOR
Redpath Dorman Long Ltd.