AWARD

NEC Halls 6, 7 & 8, Amenity Building & Skywalk

For: The National Exhibition Centre Limited

The buildings submitted form the first phase of the National Exhibition Centre's planned expansion which will ultimately double the original size to give over 200,000 square metres of exhibition space. The expansion is planned in four phases over 20 years.

The original exhibition centre had 5 halls around a central piazza circulation area. In order to achieve a sensible pedestrian flow around the expanded centre the master plan is based on a second central circulation area surrounded by a further series of halls. The two central circulation zones are linked by an elevated pedestrian walkway (The Skywalk) which contains moving pavements. This elevated walkway will also be extended to the adjacent railway station in future years.

This first phase of the expansion consists of a new exhibition hall of approximately 20,000m² which is subdivisible into 3 separate spaces (Halls 6, 7 and 8). Attached to these is the Amenity building which forms the first part of the second circulation area. This will ultimately be extended to form a complete circular access route between halls. A requirement of the brief was, however, that each phase should be designed to stand as an acceptable entity in its own right in the event of postponement or cancellation of future planned phases.

The first phase also includes the elevated pedestrian walkway between the two central circulation areas.

The Halls

Certain basic requirements for the building were retained from the existing halls including columns on a 30m grid, 10m clear height throughout and the ability to hang 10 tonne point loads from the main trusses. In addition the NEC were looking for better environmental conditions within the building. Linked with these requirements was the architects, desire to introduce sloping roofs rather than nominally flat roofs and the elimination of structural movement joints within the building.

From the outset several objectives were set for the structural solution:–

1. Maintain as much repetition as possible in the basic structural components to speed production and allow flexibility in erection.
2. Minimise cross bracing in order to ease erection and to minimise constraints on future building adaptability.
3. Introduce a permanent bracing system which minimises the amount of temporary bracing during erection.
4. Utilise primary steelwork members where possible for cladding support to minimise the amount of secondary steelwork needed.
5. Eliminate sliding bearings and minimise the number of movement joints within the structure.
6. Provide a sloping roof instead of the nominally flat roofs of the original halls.
7. Co-ordinate the building services to ensure minimum interference by structure and to speed up the services installation.

The structural form evolved addresses all of these points. The roof structure consists of plane primary trusses fabricated from RHS and triangular secondary trusses fabricated from CHS steelwork. The very dominant linear form of the roof structure was chosen to integrate with the mechanical services ductwork which is linear. This form allowed the ductwork to be delivered and installed in long lengths. The top chords of the triangular trusses were spaced at approximately 2.75m centres to give direct support for the roof sheeting without the need for purlins. The 30m x 30m roof modules consist of only seven primary components, each of which is self stable, which allowed very quick erection time for the primary roof structure.

Overall stability of the main hall is provided by perimeter raking props on each main grid line. The roof plate is deliberately connected to the perimeter columns below the node point of the column and structure. This allows for the thermal movements of the roof structure to be accommodated by the bending of the column without the need for sliding bearings.

By utilising raking props in both directions for the corner columns the structural form allowed the first corner bay erected to be completely stable. From then onwards the roof was erected with the minimum of temporary bracing. The external wall cladding slopes for the upper part to cover the perimeter services distribution route which runs all round the outside of the hall.

The perimeter structure was developed to be identical all round, whether parallel to or at right angles to the primary trusses. Each 30m bay was designed to be independent of its neighbours with a structural movement joint on each grid line. This controls the temperature movements of the perimeter structure and by careful positioning of the connections to columns the need for sliding bearings was eliminated.

Links are placed at the two ends between the elevated skywalk and the ground floor circulation areas. These links contain lifts, staircases and escalators. Of particular interest is the way the elevated link weaves its way through the end of the existing hall 4 with the minimum number of supports practicable. This part of the walkway had to be installed in windows between exhibitions and close liaison was needed with the NEC to ensure that exhibitions were not disrupted.

The Amenity Building

The Amenity Building is adjacent to but structurally independent of the new hall. It is a four storey steel frame building primarily consisting of simple beam and column construction. At first floor level, storey deep trusses were utilised to span 15m between columns. The depth of the trusses is used for services zones incorporating permanent main access walkways for services maintenance. Also within this zone is a part structural floor supported on the bottom boom of the trusses. This floor is used for switch rooms, store rooms and workshops. The services zone also links directly into the perimeter service route around the halls for services distribution.

In the centre of the Amenity Building is a glazed atrium roof which is supported by CHS trusses and purlins. Care was taken to design joints to provide neat, clean connections because this part of the building forms the main circulation area of the new phase.

The front of the building slopes down to the ground in a cascading form and around the outside are protruding glass towers housing escape stairs. The structural frame for the escape stair towers is predominantly RHS steelwork.

The front entrance canopy, also in RHS steelwork, mirrors the cascading form of the front of the building whilst providing a light open cover.

The Elevated Walkway (Skywalk)

Between the two centres is an elevated, covered moving pavement which acts as a pedestrian link. The elevated structure houses two 105m long moving pavements in each direction. The link consists of steel beams spanning 15m between primary supports. Supporting columns and frames are fabricated from RHS steelwork and the soffit has a curved profile formed by bending the RHS roof beams.

The cross sectional shape of the skywalk was chosen so that the windows are shaded as much as possible from direct sunlight in order to limit solar gain. The sloping sides architecturally mirror the sloping external walls of the hall.

The main 300m straight length of the skywalk has a structural movement joint every 15m to accommodate longitudinal movements evenly. The need for sliding bearings at movement joints has been eliminated by utilising twin columns at each grid which are semi braced to give a "tuning fork" structure. Longitudinal movement of the beams is accommodated by bending of the columns.

Judges' Comments:

These structures incorporate well planned layouts and details which allow the efficient use of steelwork and of building space. The high standard of aesthetics considerably enhances the local environment.

Architects:
Seymour Harris Partnership

Structural Engineers:
Ove Arup & Partners

Steelwork Contractors:
NEI Thompson Limited, Horseley Bridge
Steelcon Limited – (roof plate steelwork)

Main Contractor:
Tarmac Construction Limited