



The Birmingham International Arena

For The National Exhibition Centre Ltd

In April 1979 National Exhibition Centre Ltd gave instructions to the design team which had been responsible for the construction of the first six halls at the NEC site (which were opened in 1975) for a new Hall to form a public arena and column free exhibition space totalling 10,000m².

The team comprised Edward D Mills & Partners, Ove Arup & Partners and Francis C Graves & Partners. Redpath Engineering Ltd were responsible for the steel structure with R M Douglas as the Main Contractor.

The time allowed for design and construction between April 1979 and August 1980 was 16 months. In addition to the column free arena measuring 108m x 90m, restaurants, offices and other operational facilities for either an audience of up to 12000 people or a full range of exhibition space was to be provided. By comparison with the existing exhibition halls the new arena was required to incorporate a much enhanced range of environmental services for the comfort and enjoyment of the large audiences. These services are accommodated in a 3m wide perimeter zone constructed from a frame of rectangular hollow section steelwork. This was erected first and clad using profiled steel sheet spanning horizontally so as to minimise the amount of secondary steelwork required. This area was roofed in profile steel sheeting and weather protected to allow an early start with installation of services.

The main roof structure covering the auditorium comprises nine Nodus space frames which are simply supported on their four sides by tubular box section trusses, two in each direction, spanning across the hall at approximately the third point of each side. The central Nodus frame is situated at a higher level to give increased headroom and afford clerestory daylighting when this is required.

The four main trusses are in turn supported at their intersection points by tubular steel (273mm CHS) tension members. These tension members pass over the tops of eight 32m high box section towers and via extended outriggers are secured into an anchorage of tension piles at ground level. The towers are each four legged, using 450mm x 250mm RHS members to form vierendeel box columns, and are supported on a hinge at ground level to allow wind and thermal movements at roof level.

The nine Nodus space frames forming the roof were assembled complete with their sprinkler systems and lighting services at ground level and craned into position. Trusses were delivered to site in 30-34m lengths. Internally the profiled steel roof sheeting is perforated for acoustic absorption and both roof and walls are constructed as a thermal sandwich.

A great deal of thought was given to erection procedures in order to ensure completion on time. In all 1250 tonnes of steel was used with the roof itself accounting for 1160 tonnes. At an equivalent of 106Kg/m² this is remarkably economic.

Architects: Edward D Mills & Partners
Structural Engineers: Ove Arup & Partners
Steelwork Contractor: Redpath Engineering Ltd.

Judges' Comments

The need to create, within a very short timescale, a large exhibition hall unobstructed by internal columns has produced an impressive and exciting structure. The abundance of surrounding space has enabled the designers to adopt the unusual method of supporting the roof at the four internal intersection points by means of out-riggers which provide the dominant feature of the building.

The project convincingly demonstrates the advantages, under such circumstances, of the off-site fabrication of structural steel components and of their speed of assembly when well designed and accurately made.