The airport masterplan produced by the Authority defined the layout of a Terminal Building suitable for an international airport with 35 million passengers a year initially, ultimately rising to 100 million pa. The Design Team was managed by Mott MacDonald who also carried out the design development of the reinforced concrete parts of the building.

The built design retains the plan form of the concept. Three essential strands, the functional planning, the engineering, and the need for a unifying architectural concept are interwoven by returning to the "upside down" building concept developed earlier for the terminal at Stansted Airport. This put the mechanical engineering plan and the baggage handling installation in the basement and the Arrivals and Departures levels above.

As at other terminals, the structural steel enclosure above the Departures level provides the architectural character of the whole project.

The roof oversails the entire Terminal Building, and is a multi-bay steel lattice barrel vault. The vaults are aligned parallel to the direction of passenger flow and help with orientation within the deep plan. The roof changes in height to accommodate the differing requirements of the activities beneath. It is at its most lofty above the processing building to give a large and dramatic space, gently reduces in height along the Central Concourse and rises again above the West Hall.

In the processing building the roof column grid is 36m x 36m and the vaults are tied. In the central concourse the roof column grid is 36m x 18m and it is possible to omit the ties.

Studies of the vault rise found that a rise to span ratio of 1:6 was suitable for all the various loading and restraint conditions. The ties are raised for appearance. To prevent the vaults spreading, the ties are most effective horizontal. However, when raised they allow the vaults to adjust their geometry with changes in temperature. Hence, there are no movement joints parallel to the vaults, despite the roof steelwork being a maximum of 690m wide.

The number of nodes per bay determines the amount of fabrication within the vault and informs the sizing of the elements. A 6m grain was chosen for architectural scale and to simplify the interfaces with the glazed walls.

Wind loads were derived from wind tunnel testing and were substantially higher than those required by the Hong Kong code. Very high local suction pressures of up to 7kPa were measured at the edge of the roof and wall.

Each vault is sensitive to asymmetric loading such as peak uplift on one side of the vault occurring with downward pressure on the other.

Given the repetition inherent in the design concept, the most important connection detail was that at a typical node. Here six elements are joined together - four diagonal Universal Beam (UB) members and two square hollow section longitudinal members. Additional complexity is caused by the node occurring at a crank location in the faceted vault where the members do not lie in the same plane.

The solution was to include a 'node plate' at the centre of the connection onto which the diagonals were welded; this also provided 'ears' for the bolted connection of the longitudinals. The node plate was effective in simplifying the geometry of interconnecting elements at shallow angles and could also be extended to accommodate the connection of tie restraint members and other ancillary details.

The roof structure is expressed architecturally by exposing the bottom flange of all diagonal UB elements. All rooflight and valley locations, the full depth of the roof structure, are exposed and UB elements are again used to give visual continuity. Exposing the structure in the valleys meant that the connections between vault, tie and column head are exposed, celebrating one of the most important structural assemblies of the project.

Whilst generous spaces and thus roof heights could be justified in the processing building, for the remainder of the Terminal Building it was desirable to reduce the roof height to minimise cost. The north and south walls of the concourses were reduced to 4.9m, but the wall along the processing building provides natural light to the 330mm deep floor plate, and was maintained at 16m high above Departures level.

The Departure level cladding support structure spans from the upper concrete level of the processing terminal to the roof. The cladding mullions vary in span from 4.9m to 21m. The mullions are bow-backed Vierendeel trusses fabricated from rectangular and circular hollow sections, at 3m centre. For consistency and standardisation, the mullions were fabricated from uniformly sized elements of varying wall thickness. Thus the transoms and webs of the trusses are 120mm x 80mm RHS sections, whilst the front chord is a 150mm x 100mm RHS and the back chord a 114mm circular section. These were the smallest standard sections that could accommodate the large spans and the typhoon wind loads of up to 5kPa.

The individual elements of the roof were cut to the required length, prepared for jointing at fabrication centres in Singapore and the UK and delivered directly to the island in standard shipping containers. Once there, the elements were welded together to form 18m x 6m 'truss-like' sub-assemblies on a series of accurately formed trestles. Some 107,000 individual elements were required.

When completed, the sub-assemblies were lifted on to purpose-made roof module jigs. The jigs had to be made to a high degree of accuracy and be stiff enough for the precise form of the lattice shells to be readily repeatable. Having installed all the necessary sub-assemblies on the jig, individual linking members were welded into position to complete the roof modules. The largest module was 54m x 36m although generally they were 36m square.

The design of the Terminal Building was completed within 24 months and tendered in August 1994. The construction contract was awarded to The BCJ Joint Venture in February 1995, and steelwork erection took place from April-December 1996.

Passenger Terminal Building, Hong Kong International Airport

Judges' Comment:

The multi-bay barrel vault structure is used to solve volume and plan changes throughout the airport layout while maintaining a constant 36 metre column grid; a noble and elegant solution in both design and fabrication.

Architect:	**Foster and Partners**
Structural Engineer:	**Ove Arup & Partners**
Steelwork Contractors:	**Watson Steel Ltd and Nippon Steel Corporation**
Main Contractor:	**The BCJ Joint Venture**
Owner:	**Airport Authority Hong Kong**