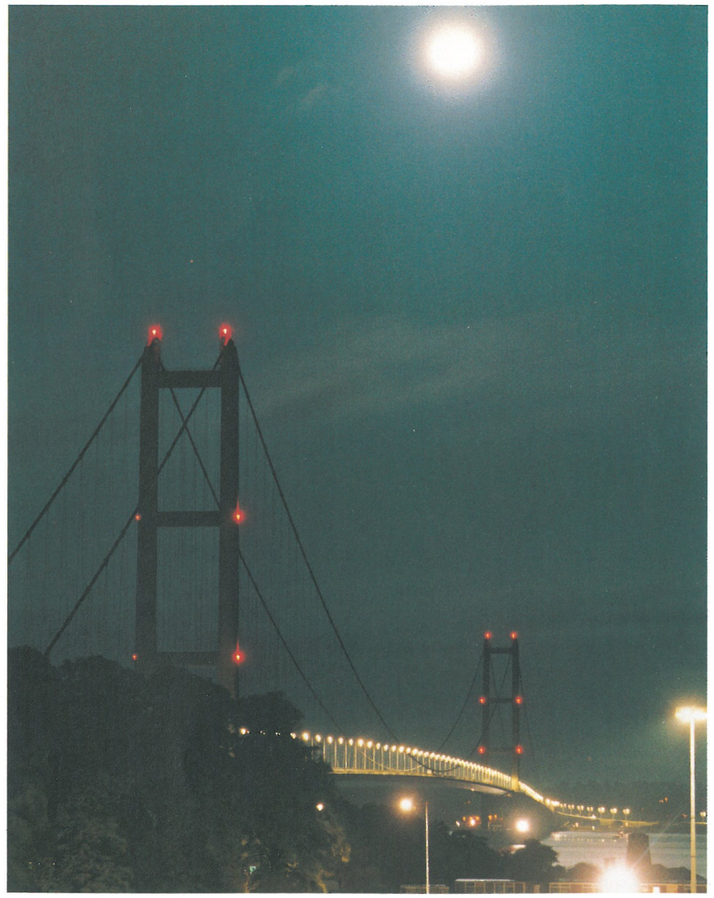

AWARD

The Humber Bridge

For the Humber Bridge Board

The Humber Bridge spans the Humber estuary between Hessle and Barton upon Humber, cutting road distances between major towns by as much as 50 miles. The objective for its construction is to assist the future development of the newly formed county of Humberside.

The general principles of the design are similar to those of the Severn and Bosphorus bridges though there are important differences. The main span is 1410 metres exceeding the length of the Verrazano Narrows bridge (New York) by 112m.

The bridge is designed to carry HA loading (as specified in BS 153) with the intensity increased by 50% for long loaded lengths. This approximates to the HA loading specified in BS 5400. In addition it is designed for 45 units of HB loading. There are dual two-lane main carriageways and combined footway/cycle tracks along both sides which are capable of carrying maintenance vehicles. Design wind speeds are 47m/sec at deck level and 66m/sec over the tops of the 162.5m high concrete towers.

The cables comprise just under 15,000 galvanised 5mm parallel wires of 3 tonne breaking load. These were placed by the conventional aerial spinning method. The hangers are inclined so as to resist relative longitudinal movement between cables and deck and are so designed as to damp incipient oscillations and prevent vibration. The decks themselves are of streamlined cross section to greatly reduce the effect of wind forces on the structure and at 4.5m depth are relatively shallow and light in weight.

For fabrication, assembly and erection the suspended structure was divided into separate boxes, generally 18.1m long and weighing about 140t. There were 124 boxes, and the total weight of the suspended structure steelwork is about 17,000t.

The top flange forms the roadway deck, and is of 12mm plate of grade 50c, stiffened with V-shaped trough stiffeners. There are diaphragms at 4.525m spacing; these maintain the shape of the section, form effective cross-girder webs, and support the deck. With the exception of the top flange and V-troughs, the suspended structure is all mild steel.

A standard box is made up of 23 stiffened panels which were fabricated at various workshops throughout the country. The fabricated panels were assembled into boxes in a yard about 3km downstream of the bridge site. The protective treatment applied before assembly was grit blasting followed by a blast primer and three coats of Zinc Phosphate Epoxy Ester paint. Two coats of chlorinated rubber paint were applied after erection.

The completed boxes were taken to the site on pontoons and raised directly into position by lifting gantries straddling the main cables. They were pinned to the previously erected suspenders, and secured by temporary connections at top flange level to the adjacent box. In the early stages the boxes hang with the bottom flange joints open but as more boxes are erected, the gaps begin to close up until welding is possible.

The roadway surfacing of mastic asphalt on rubber bitumen was preceded by grit blasting, zinc spraying, etch and adhesive primers. It was laid by machine, a successful innovation providing more rapid completion and superior riding quality.

The designers took full account from the outset of the impact which such a very large and high structure would have within the context of the generally flat landscape, creating a stimulating visual entity.

Structural Engineers: Freeman Fox & Partners
Consultant Architect: R E M Slater RIBA.
Steelwork Contractor: British Bridge Builders Ltd

Judges' comments

Engineering excellence and structural innovations have been combined with high aesthetic quality in this magnificent structure which has the longest single span in the world.