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6. Myton Bridge, Kingston upon Hull (England)

Owner: Humberside County Council

Engineer: Freeman Fox & Partners

Consultant Architect: R. E. Slater RIBA

Main Contractor: RDL Contracting Ltd.

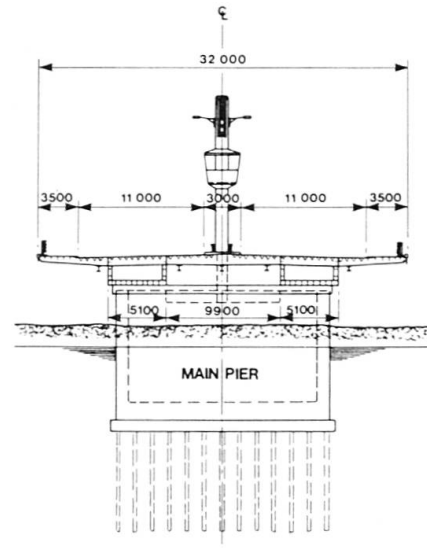
Steelwork Contractor: The Cleveland Bridge & Engineering Co. Ltd.

Construction period: 38 months

Commissioned: December 1980

General

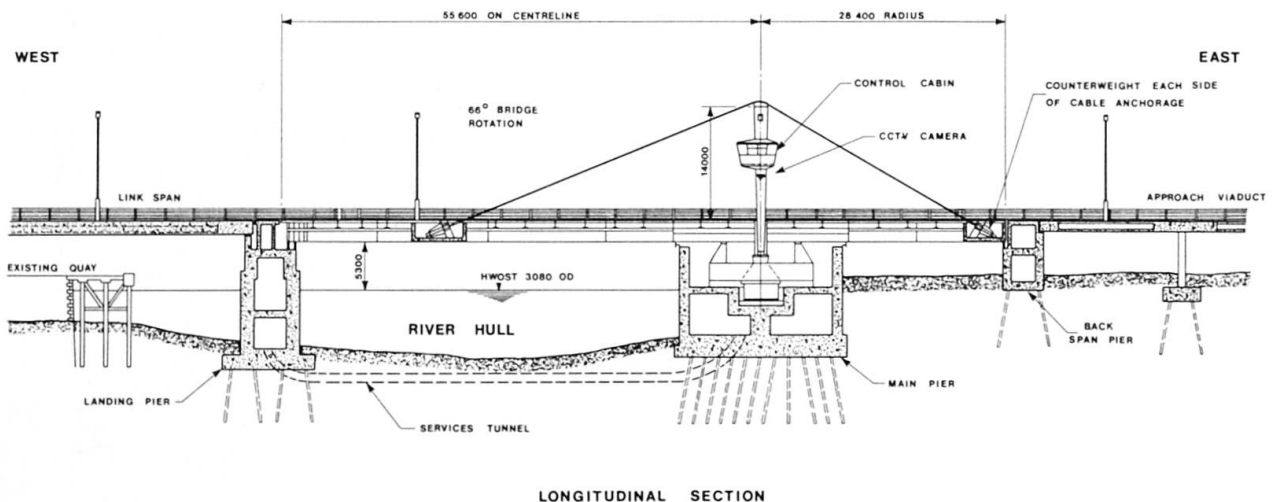
Spanning the River Hull approximately 350 m from its confluence with the River Humber, Myton Bridge will form part of the Hull South Orbital Road. Carrying dual three lane carriageways, together with footpaths and a central reservation, over a waterway whose configuration necessitated span arrangements which are both asymmetric and skew ended, Myton Bridge posed design problems which were very unusual in a moving bridge. The solution adopted, a counter-balanced, unequal span, cable stayed, box girder, swing bridge with a width $\frac{2}{3}$ of the navigation span length is possibly unique; whilst meeting the site constraints it adds the advantages of high torsional stiffness with a very shallow construction depth and also permits the controller an unusually clear view of road river traffic from his cabin positioned near the mid-height of the mast supporting the stays.



CROSS SECTION

Bridge superstructure

The structure comprises twin steel box girders interconnected by cross girders at 3.3 m centres and cross boxes at three positions. The roadway is an orthotropic steel deck, surfaced with hand laid mastic asphalt. Approximately 900 t of structural steel were used in the bridge, with a further 630 t of steel and concrete ballast in the shorter span to balance the structure.



LONGITUDINAL SECTION

The cable stay, consisting of six 84 mm diameter spiral wound strands laid side by side, each with a minimum breaking load of 600 t passes over a saddle on top of a hollow steel mast mounted above the main slewing bearing.

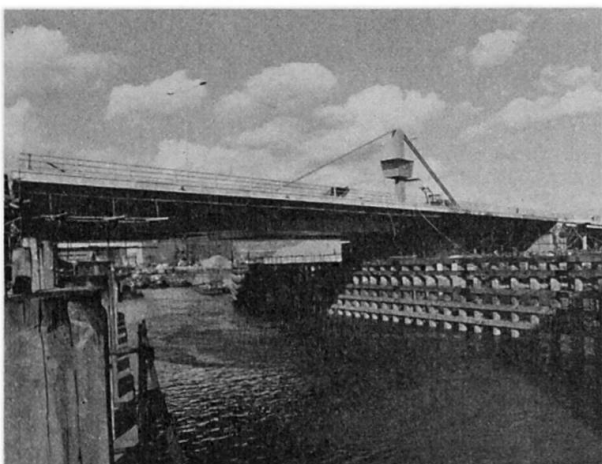
The steelwork was fabricated into major elements at the works of Cleveland Bridge & Engineering Co. Ltd., Darlington and was shipped to Alexandra Dock, completing the journey to site by road. Each longitudinal girder, comprising seven boxes weighing between 25 and 40 t, was erected and assembled on site. In addition there are 3 cross boxes, the major one underneath the tower on the axis of rotation and the remaining two forming the points of attachment for the stay cables. Finally the infill and cantilever panels were added before the bridge was lowered into position on the turntable box. Once the steel had been assembled, the cables were erected and stressed and the whole structure balanced with counterweight.

The bridge is mounted on a pivot bearing fixed in the centre of a turntable box girder which, in turn, is carried by a 4 m diameter roller bearing slewing ring fixed to a drum girder cast into the main pier. When the bridge is in the open-to-traffic position, additional support is given to it by two fixed bearings at the short end on the back span pier, two retractable wedge-type bearings either side of the turntable box on the main pier and two movable bearings at the nose on the landing pier.

Removal of the nose bearings and the centre wedge bearings allows the bridge to be swung into the open-to-shipping position by twin hydraulic cylinders connected to the turntable box and reacting against the main pier walls.

When the bridge is open to shipping a clear lane of approximately twice the beam of the largest ship entering the River Hull is provided; because of the busy nature of the shipping channel, taking craft up to 1500 t gross weight and 60 m in length, substantial protection is provided in the form of greenheart piling. The purpose of the fendering is two-fold: to protect the superstructure of the bridge when open to shipping and to protect craft from collision with the concrete structures in the river.

A "black box" recorder is installed in the operating cabin to provide evidence in the event of the occurrence of any accident involving shipping.



Bridge substructure

Main pier

The main pier is a circular hollow reinforced concrete structure 18.5 m in diameter located half in the river and half on the East side of the river bank. It is founded on one hundred and seven 80 t segmental pre-cast piles, and contains the plinth on which the pivot and turntable structure of the bridge is located, together with the drive mechanism and messing facilities.

The structure was constructed inside a cofferdam which was sealed by plug of concrete placed underwater by the tremie technique.

Landing pier

The landing pier is a rectangular cellular reinforced concrete structure with tapered ends approximately 47 m long and 6 m wide supported on 80 t segmental pre-cast piles, with the base slab located some 10 m below mean high water.

Situated fully in the river, the landing pier supports both the nose of the steel bridge in its traffic position and the end of the link span to the West approach viaduct.

A submerged 1 m diameter steel pipe beneath the river bed provides electrical connection between the main and landing piers.

Backspan pier

Located on the east bank and supported on 50 pre-cast concrete 80 t piles, the backspan pier is a curved cellular reinforced concrete structure supporting the short end of the bridge deck in the traffic position and the final span of the East approach viaduct.

(B. P. Wex)