Atlantic Road Bridge Brixton

For: British Rail Board

The original bridge carried the Atlantic Lines over Atlantic Road, Pope's Road, and the main railway line from London to Dover. It was of wrought iron construction, dating from 1865. Although visually attractive with its tall lattice girders, it was becoming an increasing maintenance liability. Because of corrosion and fatigue damage, it had for some years been restricted to carrying light multiple-unit trains. With the coming of the Channel Tunnel rail traffic, the Atlantic Lines will have to carry many more domestic and Channel Tunnel trains, including heavy freight, to relieve other congested routes. It was therefore decided that there was no reasonable alternative to the reconstruction of the bridge.

Sensitivity to both the architectural requirement for the replacement to blend with its surroundings and the need for minimum disruption to rail traffic during removal and installation were key features of the project. The final solution satisfying onerous requirements took British Railway's standard box girder bridge design to unprecedented limits with unique "curved" spliced multispan continuous edge beams and the shallowest double track deck yet - features only possible by exploiting the upper realms of the strength of steel.

It was quickly realised that the design would have to address three main difficulties.

First, the layout of the crossing is very awkward. The Atlantic Lines are on a tight 400m radius curve. The span arrangements are peculiar, with abutments that are heavily skewed in opposite senses, two intermediate supports under the northern side of the 73m long bridge, and one under the southern side.

Second, the construction depth is severely limited. The old bridge, like many others, carried the rails fastened directly to longitudinal timber bearers, but this arrangement makes the track difficult to maintain. Modern practice is to lay standard ballasted track across bridges wherever possible. This, however, increases the depth required from rail level to the underside of the structure. The Atlantic Lines could not be lifted by more than a small amount, and the headroom to the main lines underneath was, in any case, substandard. The thickness of the bridge deck therefore needed to be the minimum achievable.

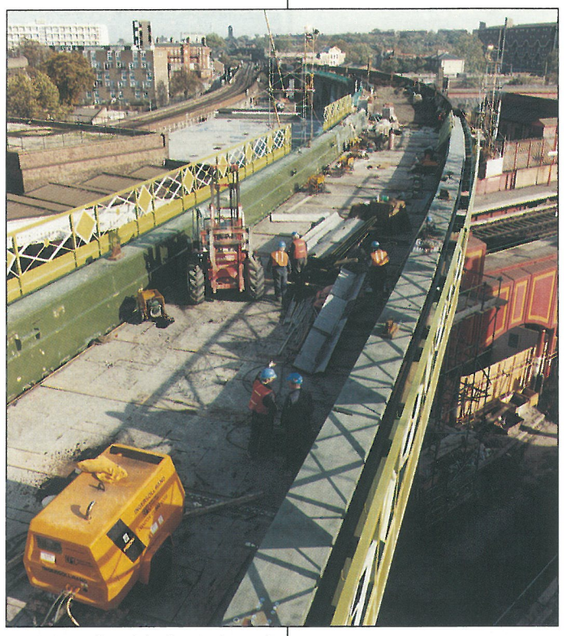
Third, the site is tightly constricted. It was not possible to close either of the railway routes for the extended period necessary to build a new bridge in situ, nor was there room to construct one beside the line and roll or slide it into position.

It became evident that the only bridge capable of satisfying all these requirements would be an all-steel 'half through' construction, with components brought to site as large as could be transported and lifted, and assembled as rapidly as possible under possession of the railway.

The resulting design consists of two continuous box girders, each fabricated with a 'kink' every 10m to follow the curve of the railway, and an orthotropic deck formed from a plate welded to inverted T cross-ribs. This is essentially a standard type of bridge often used by British Rail, but significant modifications were required. Advantages of the box girder configuration are its inherent torsional stiffness. With no danger of lateral instability of the top flange, wider flanges can be used than with a plate girder, thus reducing the depth for a given span. By limiting the depth of the girders to 1800mm (maximum span 34.5m), it was possible to 'tuck them under' the British Rail loading gauge into the space allowed for station platforms, bring them closer together (6750 mm apart) and thus minimise the span and hence the depth of the deck.

The stable nature of the box girders means that the need for U-frame action with the deck is avoided. The cross-rib to girder connections were therefore designed as pinned so as to minimise transverse bending stresses in the girder webs. The deck units themselves utilise a thick floor plate and heavy cut-down T sections - an uneconomic use of material, but necessary for minimum depth. The 325mm achieved is the shallowest yet on British Rail for a double-track bridge.

Atlantic Road Bridge lies within the Brixton Conservation Area. Its appearance was therefore considered very important. The London Borough of Lambeth Urban Design Department was consulted, as was English Heritage, before finalising the design. In particular, the form of the columns, the colour scheme and the details of the handrailing have been carefully chosen to complement their Victorian surroundings. The bridge's prominent position ensures that this dramatic and elegant steel structure will continue to be noticed by travellers at all levels.



AWARD

Structural Engineers:
Network Civil Engineer
British Rail (Croydon)

Steelwork Contractor:
Butterley Engineering Ltd

Main Contractor:
Beazer Construction
London Ltd

Judges' Comments:

Outstanding engineering stretches an existing standard steel box girder solution to deal with physical constraints of skew, curvature in plan, eccentric column supports and severe limitations in construction depth to provide Brixton with a very economic rail bridge which blends well with the unique character of the area, and whose construction was carried out with the minimum disruption to local life.