

Merchants Bridge, Bridgewater, Castlefield

Completion: 1995

Client: Central Manchester Development Corporation

Architect: RHWL Partnership

Structural Engineer: Whitby & Bird

Steelwork Contractor: Watson Steel Limited

Main Contractor: The Angle Ring Co Limited

Castlefield was at the hub of canal and rail communications supplying raw materials such as coal to help fuel Manchester's Industrial 'Revolution' of the 18th and 19th centuries. Manchester City Council designated Castlefield a conservation area in 1979 and the area became Britain's first urban heritage park in 1982.



Merchants Bridge

Regeneration of the Castlefield area necessitated building a 67 m long footbridge to link the new Slate Wharf on the southwest side of the Bridgewater Canal with the old Catalan Square, on the northeast side. A design competition for this bridge, Merchants Bridge, stipulated a striking structure which would offer the best of 20th century design and engineering while complementing the seven established bridges at the site which cover 200 years of history.

Bridge Concept and Design

Consulting engineers Whitby & Bird won the competition with a tubular steel design which demonstrated technological advance but used a curving form to empathise with the established bridges. Architectural and engineering criteria were met with a sickle arch solution in which deck and support arch curve in opposite directions, each balancing and reacting with the other. This solution confers greater resistance to the bridge deck in resisting out-of-plane loads. Vertical loads on the deck are transmitted into the plane of the arch by the horizontal stiffness of the deck, and the arms acting as ties. The arch is restrained against buckling by the torsional stiffness of the aerofoil deck. The 85 tonne structure was designed principally in CHS and plate

A 3.5m depth between the water and the soffit at the cut lines was allowed, with 4.1m over the 5m long central section. By minimising the depth of the bridge deck, the length approaches could be reduced. The 375mm thickness of the deck structure is unusually slender for a bridge of this span; it allowed gradients to be kept to a minimum while maintaining clearance for boats. The deck is 2m wide at its ends but widens to 3m at the centre, where it was anticipated that pedestrians would want to pause to admire the views.

Bridge Fabrication and Erection

Steelwork contractor Watson Steel input the Whitby & Bird design into their 3D CAD facility to detail the steelwork. Jigs were built to achieve a high degree of accuracy in cutting and welding, and the sections were trial erected at Watson's Bolton works prior to delivery to site in assemblies each comprising four deck pieces, three arch pieces and 13 hanger arms

Final bolting and welding were carried out on the bank of the canal and the bridge was lifted into position using an 800 tonne crane. This crane capacity was required because of site restrictions and ensuing demands on reach. The 50m main bridge span was lifted and swung, in 40 minutes, onto its fixed bearing on the northeast bank, ready for positioning on the two sliding bearings on the southwest bank. The completed bridge was handed over to the client in June 1995.