

## Restoration of Cleveland Bridge in Bath: Work Undertaken by Dorothea Restorations Limited

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### **Introduction**

Possibly close to the site of Bath's Roman bridge, Cleveland Bridge was opened as a toll bridge in 1827 to link the parishes of Walcot and Bathwick. It was built to the design of H.E. Goodridge as a single cast-iron span of 100 ft with iron work supplied by the Hazeldine foundry in Shropshire. Our illustration (p. 36) shows the structural details of the bridge and the iron balustrade which is the subject of this article. The Doric lodges, where tolls were collected, can also be seen. The bridge was freed from toll in 1929 after strengthening between the seven arches to accommodate modern traffic<sup>1</sup>.

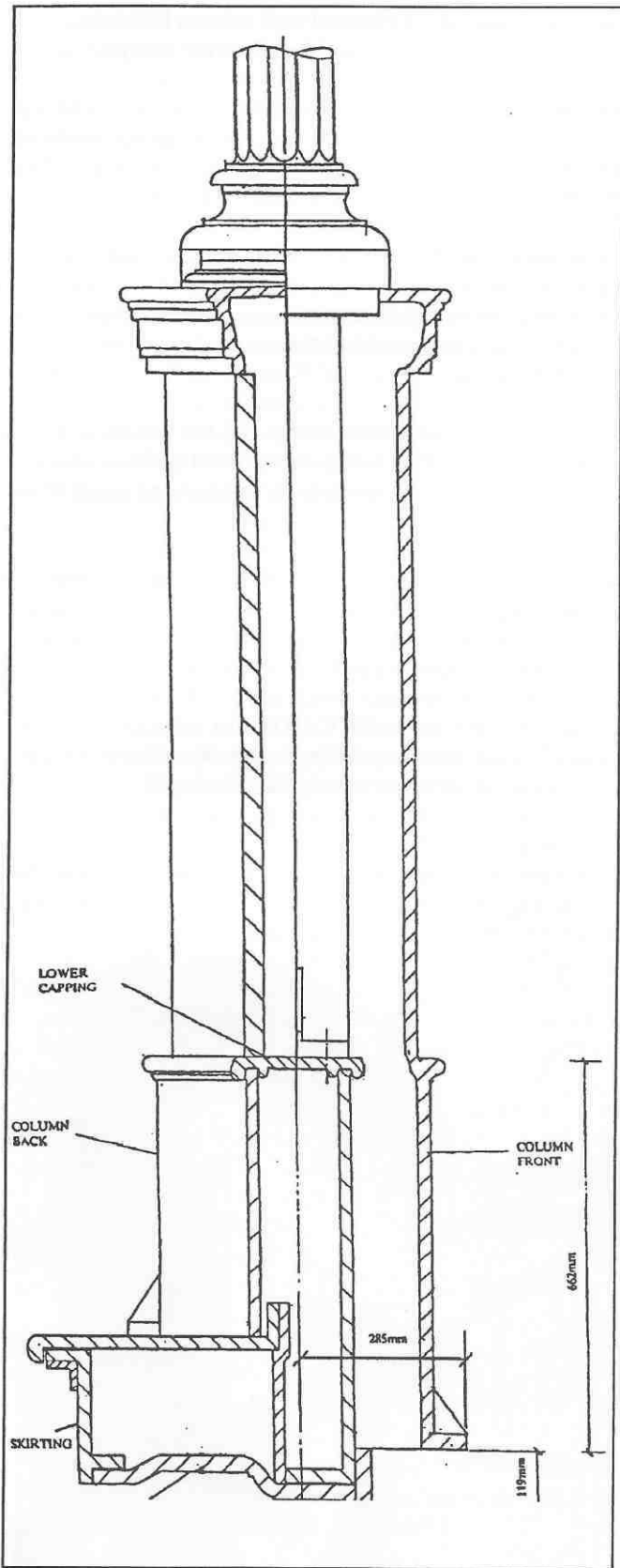
During 1991 Dorothea Restorations Limited was consulted to recommend how the original cast iron balustrade could be upgraded to provide for improved vehicle containment. It became clear that full upgrading would result in wholesale replacement of original material, so kerb-side deflectors were proposed as a means of protecting the decorative balustrade. This allowed all original ironwork to be retained and strengthened.

The upstream parapet was dismantled in June and re-erected in October/November 1992. The downstream side was dismantled in January and re-erected in April/May 1993. Before dismantling took place a full inventory of parts was made, and defects added to it as work progressed. Every component was tagged and uniquely coded on dismantling. Although in apparently good order externally, on dismantling a large number of components was found to be either cracked or broken. Very little damage resulted from the dismantling process itself.

The most serious deterioration was found to be to the cast iron columns, one upstream and one downstream, which had cracked at the top end of the lower tube over the years. A thick-walled steel tube was fitted to each column, the broken pieces re-aligned, and at four locations along the column four holes were drilled and tapped at 90° to each other. Set bolts were entered through the tapped holes to centralise the tube in the bore. The column was then stood upright and the gap between the bore and the tube was shuttered and filled with an epoxy resin. Once the resin had fully set, the bolts were ground off, and the shuttering removed.

A number of top and bottom cappings were found to be beyond repair, so originals were prepared as patterns for each item and lengthened slightly to allow for the shrinkage during casting.

Castings were generally repaired by mild steel plates bolted onto the inside face of the assembly, making repairs undetectable from the outside. Plates were painted and bed-



Section through part of bridge parapet, Dorothea Restorations Ltd., April 1992.

ded onto broken castings with epoxy resin filler to prevent future water ingress.

All metalwork was blast cleaned using non-metallic grit and four coats of 2-pack epoxy paint applied to a minimum dry film thickness of 250 microns.

On the decorative balustrade-castings additional structural fixings were provided to upgrade strength to modern requirements.

A trial section of parapet was assembled in Dorothea's works to prove that the new design would work. Whilst the design was effective and unobtrusive, it was clearly going to make re-erection on site more difficult owing to limited space inside the cast iron parapet.

Reconstruction then started on site. First large inner backplates and ribplates were mounted onto a previously erected stainless steel angle. Once they were all in place, holes were drilled through the steel, and tapered washers, nuts and bolts fitted. Contact between the original iron and the stainless steel was avoided by use of rubber shims to preclude dissimilar-metal corrosion. All bolts were zinc plated.

Once the inner backplates were fixed to the stainless steel angle and a pleasing 'line' achieved on the top edge, horizontal holes were drilled into the newly cast reinforced concrete pavement. Inevitable difficulties occurred in avoiding reinforcement bars but once holes were drilled, studs were fixed with chemical anchors.

The next component to be fixed was the lower capping which was suspended with temporary steel straps, doubling back onto the pavement. This was necessary so as to leave open the area

underneath to give access for subsequent work. Once lower cappings were in place the balustrades were craned into position and secured.

Next the repaired columns were craned in, and their supporting plates installed. The base of each column had to be shortened to allow for the increased height of the new pavement.

Several items could now be progressed in parallel. The top rail and cappings were fitted with their new zinc-plated bolts and the skirting, lower sills and backplates all offered in. The majority of the original holes were found to align.

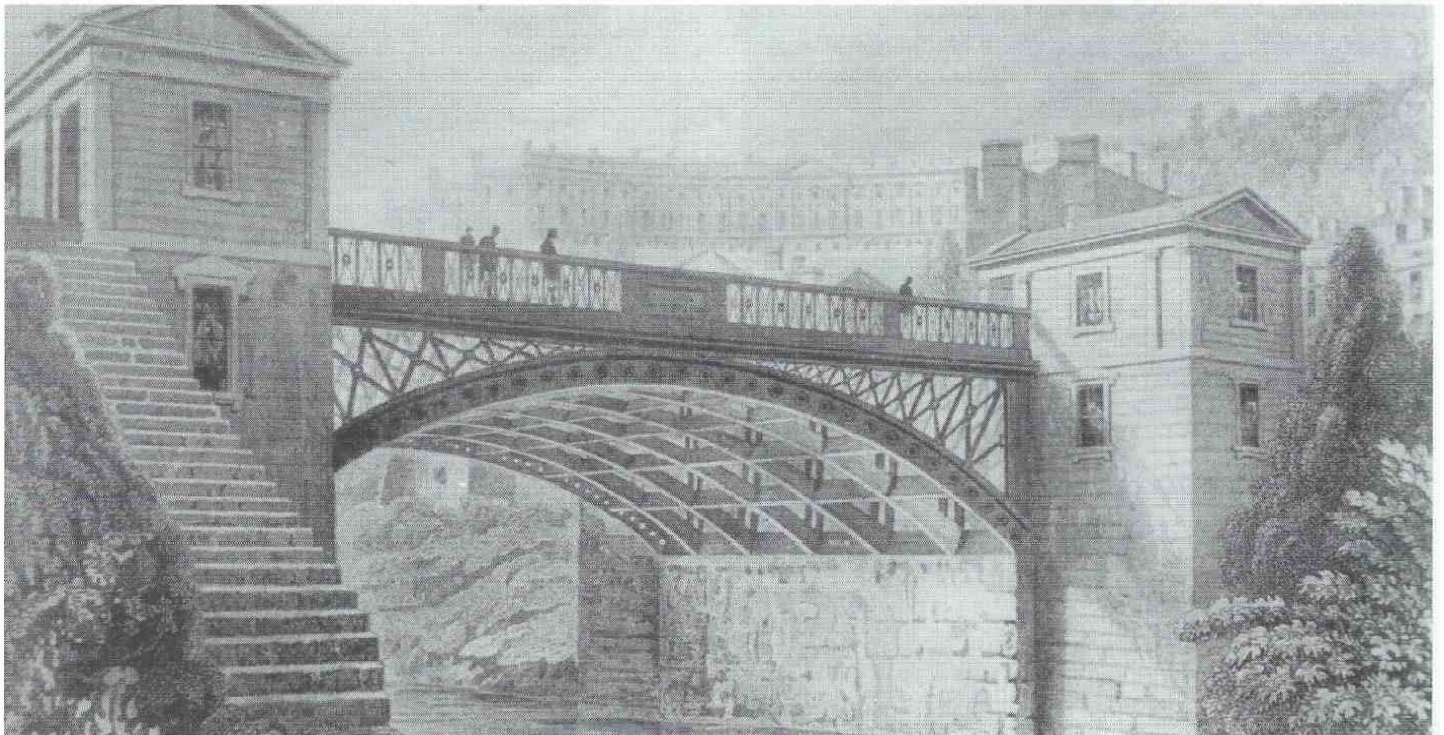
Finally Dorothea Restorations Ltd filled joints and gaps using traditional materials where possible i.e. lead wool, and the finish paint was applied, including polychromatic finishes to the two large ornate coats of arms on the centres of each run of balustrade.

The bridge now looks resplendent, and has enhanced load-carrying capacity. This has been achieved without altering the structure's external appearance, or renewing much of its original material.

On completion, the Project received an Award for Environmental Design by the Conservation Area Advisory Committee of Bath City Council in which Dorothea Restorations's work was duly acknowledged. The Company is proud to have been involved in the work which proved that the severe demands of modern city traffic CAN be met satisfactorily without significantly changing the appearance of an historic bridge, or wholesale replacement of original metalwork.

#### Reference

- 1 Buchanan, R.A., 'The Bridges of Bath', *Bath History*, III (1990), 7-8



Cleveland Bridge, a print from the 1830s