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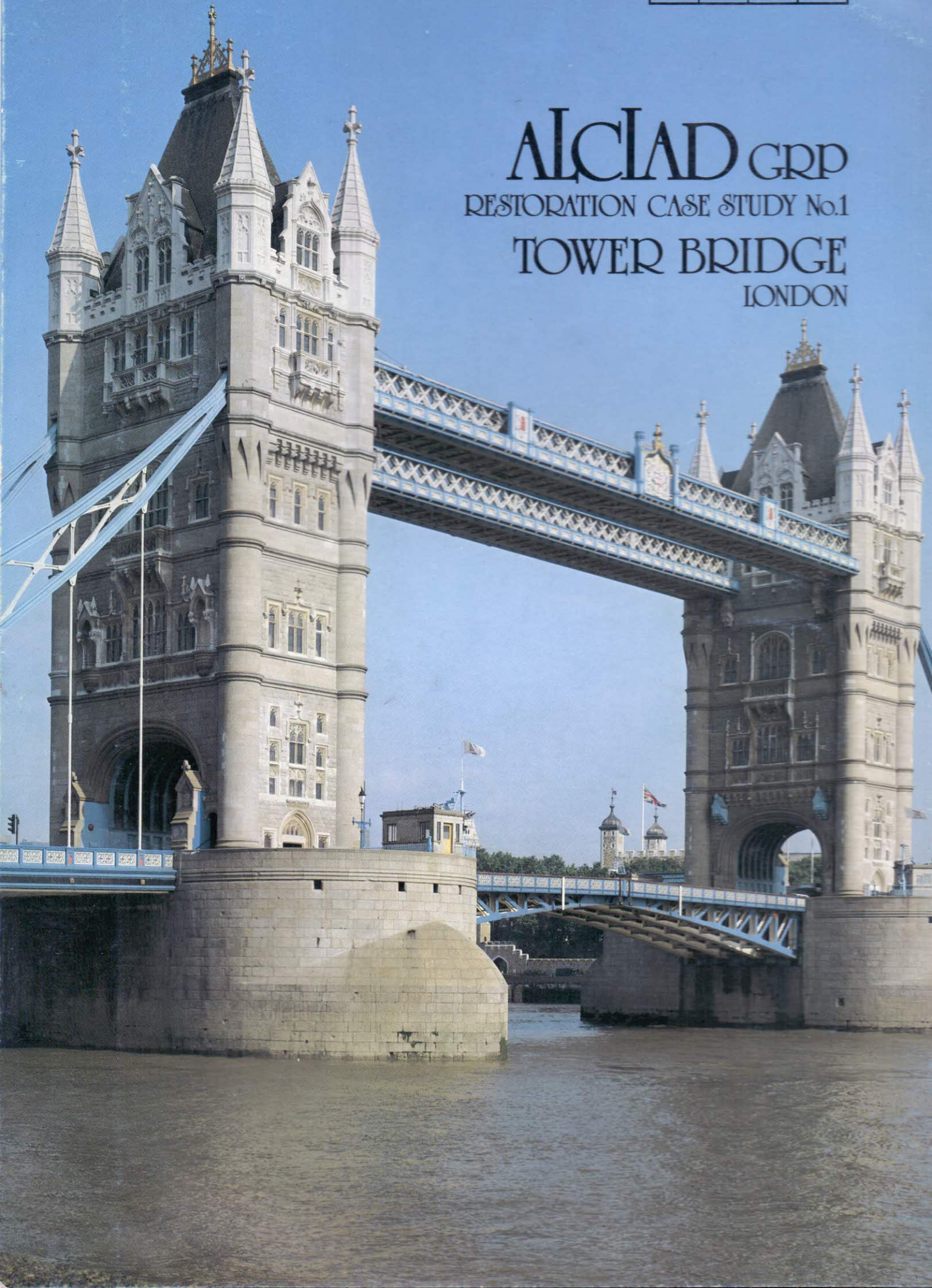
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ALCLAD GRP

RESTORATION CASE STUDY No.1

TOWER BRIDGE

LONDON



A major restoration contract undertaken by Alan Butcher Associates Limited on one of the world's most famous landmarks involved manufacturing, supplying and installing Alclad glass reinforced plastic (GRP) walkway balcony panels, Coats of Arms and finials expertly reproduced to the highest standards for the Corporation of London's Tower Bridge modernisation and restoration scheme.

Alan Butcher Associates advised on all the technical aspects of specification which included producing detailed working drawings based on the reconstruction by Holford Associates, architects, of the original appearance of the bridge.



1 WALKWAY BALCONY PANELS

Restoration of all four sides of both high level walkway balconies was a major part of the £3.4m modernisation contract and Alclad GRP was used to reproduce the original cast iron balcony panels which had been removed in 1947.

Originally the cast iron dado panelling was bolted to the outer face of the lattice walkway girders. Cast iron grilles above provided light and ventilation to the interior of the walkway. Over the years rainwater penetrating the joints in the panelling caused serious rusting to the lower members of the lattice girders which, because of the walkway balcony panels, proved inaccessible for carrying out maintenance work of any kind. Removal of the cast iron panelling relieved the bridge of 400 tons of dead weight.

The best way of restoring the external appearance of the walkways without recreating the constructional problems was to fix the Alclad GRP cladding clear of the structure by forming a maintenance walkway between it and the outer face of the lattice.

For architectural reasons the glazing, which provides security and weather protection to the walkways, has been fixed on the inner face of the lattice girders.

Over 160 repeat Alclad GRP panels were reproduced with integral colours of white, blue, and black incorporated into the polyester resin during the manufacturing process. Each outer and inner moulded face incorporates a cornice to the bottom leading edge into which large rosettes, moulded with colourfast gold flake powder, were fixed at junctions of each repeat panel.

The jointing system of each unit consists of rebated male and female intersection to ensure constant alignment with self draining joints.

All the balcony panels have integral steel brackets, bolted to stub beams which are in turn connected to plates welded to the superstructure of the bridge. Open steel mesh flooring was laid between the Alclad GRP walkway balcony panels and the superstructure to provide access for cleaning the diamond shaped glazing panels. In addition, 12 special walkway panels were produced to accommodate the expansion joints of the bridge.

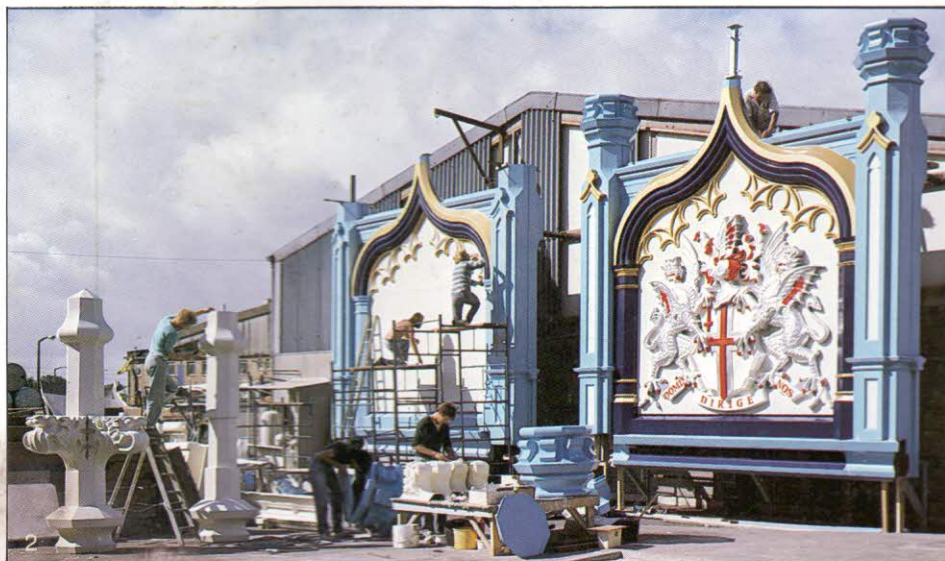
2 CENTRAL ARMORIAL COATS OF ARMS

Two main central Coats of Arms, each 6500mm wide x 6750mm high x 500mm thick, were manufactured in Alclad GRP and assembled in 16 component parts at our factory. The Coats of Arms are amongst the largest one-piece GRP mouldings ever to be transported by road.

The rear of each Coat of Arms is clad with moulded panels and came complete with matching balcony panels below. Inside both Coats of Arms is a steel frame fabricated from 150mm steel joists encapsulated in GRP. Steel rails were fastened to this main frame and dressed with highly decorative and moulded Alclad GRP sections, each incorporating integral colours of white, blue, black, and gold.

The work of origination and sculpting carried out by Alan Butcher Associates represented a major part of the cost of the Coats of Arms which are one of the finest features of Tower Bridge.

In 1947 the original cast iron Coats of Arms were removed from the bridge at the same time as the cast iron walkway balcony panels. The Coats of Arms and panels, which had suffered general deterioration, were preventing maintenance being carried out on the rusting bridge structure behind and, therefore, had to be taken down.



3 BRIDGE HOUSE ESTATES BADGES

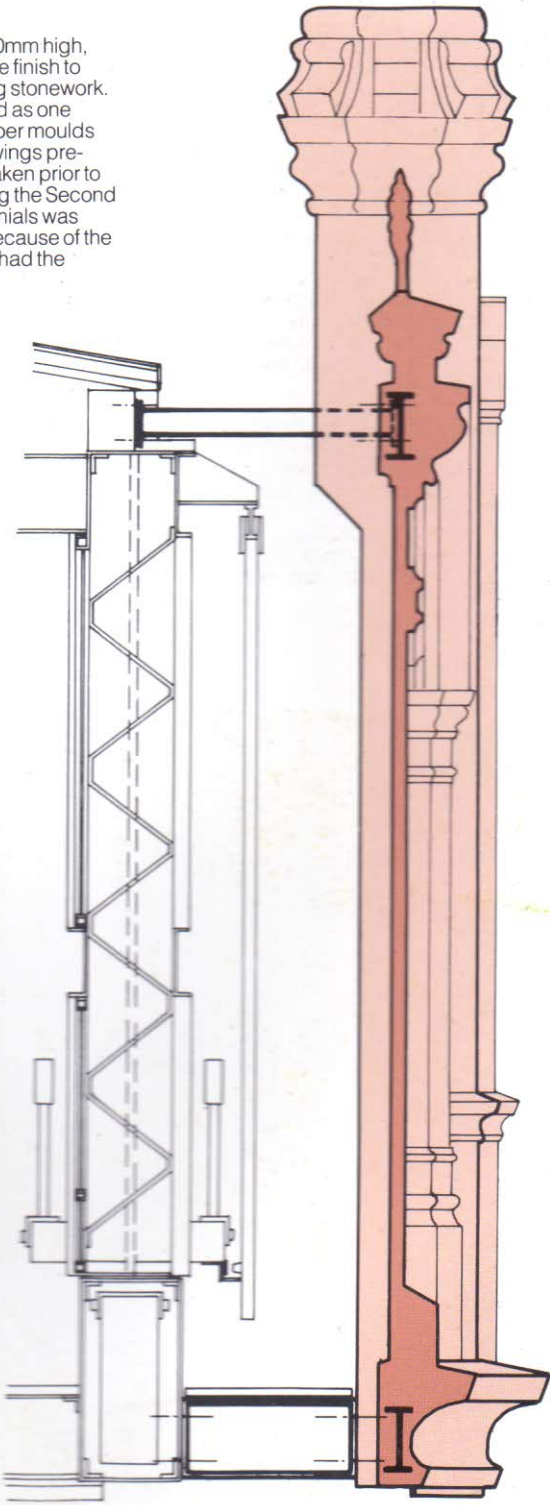
A total of four Bridge House Estates badges each 3690mm high x 2150mm wide were manufactured with a structural GRP supporting framework to the interior. Each unit is located over the main 50mm expansion joint of the bridge walkways. The design of the structural GRP had to allow for this movement to take place within the void of the badges which were subjected to rigorous testing prior to delivery.

The Alclad GRP components for the Estates badges were produced from moulds of glass fibre and silicone rubber reproduced from sculptured patterns of plaster and wood to exacting details. Each Estates badge is in a distinctive aluminium silver leaf, red and blue colour.

4 FINIALS TO TOWERS

Eight Alclad GRP finials, each 2700mm high, were produced in a simulated stone finish to match the colour of the surrounding stonework.

The finials were manufactured as one piece mouldings from silicone rubber moulds reproduced from our detailed drawings prepared from original photographs taken prior to their removal from the bridge during the Second World War. At that time one of the finials was damaged by a flying bomb and, because of the obvious danger, the City Engineer had the others removed.



SECTION THROUGH
ARMORIAL COAT OF ARMS



SITE INSTALLATION

During the course of preparing design drawings of all the Alclad GRP embellishments, Alan Butcher Associates had to give special consideration to the best method of site assembly. The two central armorial features presented special problems to overcome. Access to the walkways was limited and, therefore, a number of spectacular methods were used to manoeuvre the GRP units into position.

The 160 walkway balcony panels presented little problem other than moving them from street level up onto the walkways which have a 750mm wide access. Careful design and development in the initial stages allowed quick and comparatively simple installation of the walkway panels which are bolted to stub beams. Special attention had to be paid to the walkway panels which cross the main expansion and movement joints of the bridge.

Due to their unusual size, the central armorial features could not be assembled on site. They were fabricated in our factory as one-piece units and transported to site by road. A team of erectors supervised the careful removal of the two units from an open flat-bed lorry fitted with hydraulic rams. Each shield was carefully hoisted, levelled and winched to the high level walkways and positioned onto the supporting stub beams, some 45 metres above road level.

During hoisting it was necessary to have direct communication between our team of specialist erectors on the bridge and those at street level.

Accurate templates were taken of the final fixing positions on the bridge and of those contained within the main Coats of Arms to ensure accurate fitting when winched into their final positions.

The Estates badges being smaller and lighter than the main Coat of Arms, were lifted by helicopter to a point where the erectors could seize the ropes attached to each badge and guide it safely into position.

The finials, which were also lifted by helicopter, were put down onto a scaffolding platform where erectors later moved them by hand onto their connecting base plates. Each finial, complete with steel core, was manufactured within a jig to ensure their correct vertical position when the "holding down" bolts were tightened.

The whole operation, which entailed closing the bridge to traffic, was carried out over a weekend, and was a splendid example of close liaison and co-operation between the main contractor, engineers, and local authorities, all working within a tight time schedule.

TOWER BRIDGE

In 1885 the Tower Bridge Act was passed by Parliament and work began in 1886. Tower Bridge was officially opened on 30th June 1894 by the Prince of Wales (later King Edward VII).

Over 12,000 tons of steelwork, manufactured by Sir William Arrol of Glasgow, was used in its construction which took eight years to build.

The concept of building a bascule bridge was based on proposals by the then city Architect Horace Jones, with John Wolfe Barry, as Civil Engineer.

In 1910 the high level walkways were closed to the public. They were little used and, it is thought, difficult to police. Some of the machinery operating Tower Bridge was modernised in 1977. Originally 110 people were employed to operate the bridge on a 24-hour basis. Today, the bridge has fewer than 12 operating staff.

The contract for the renovation and provision of tourist facilities was started on 29th September 1980. The Corporation of London appreciated that Tower Bridge provided spectacular views over London and that the interior of the bridge and the machinery housed in the vaults below the southern approach could become a significant tourist attraction.

As a result, the contract was carried out to allow the interior of the bridge to be opened to the public as a tourist attraction.

On 30th June 1982 Tower Bridge and the south shore museum were officially opened to the public by the Lord Mayor Sir Christopher Lever.

Client: Corporation of London

Architects: Holford Associates

Quantity Surveyor: Kenneth R. Kensall & Partners

Main Contractor: Cubitts Ltd.

Consulting Structural Engineers: Mott Hay and Anderson



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