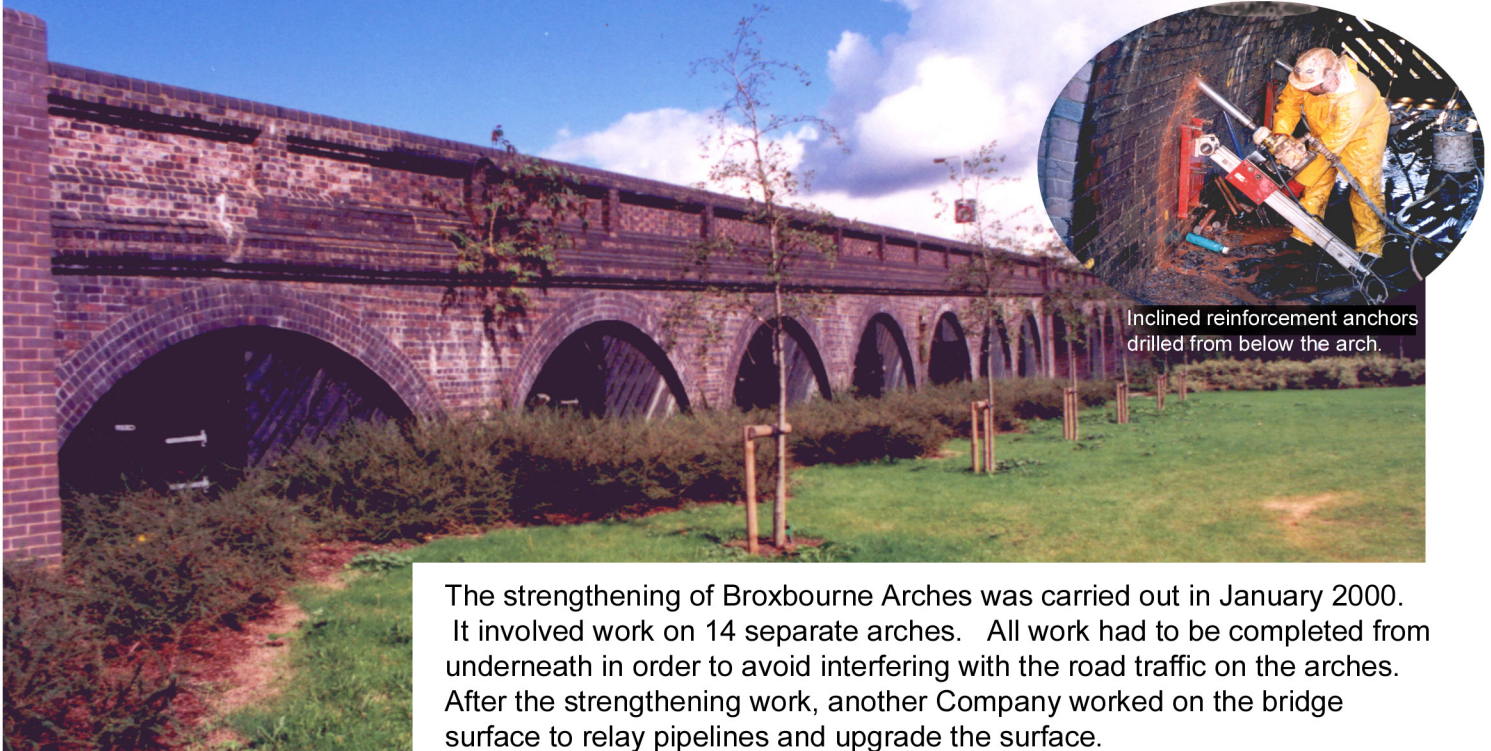


THE STRENGTHENING OF BROXBOURNE ARCHES FOR HERTFORDSHIRE COUNTY COUNCIL, UK



The strengthening of Broxbourne Arches was carried out in January 2000. It involved work on 14 separate arches. All work had to be completed from underneath in order to avoid interfering with the road traffic on the arches. After the strengthening work, another Company worked on the bridge surface to relay pipelines and upgrade the surface.

The strengthening method was designed by Gifford and Partners against the assessment that the crack pattern observed in the Arches was not indicative of live load effects and indicated a progressive type of failure. A live load assessment had shown that the structure had sufficient capacity to carry the required live loading (40 tonnes gross vehicle weight), and the foundations also showed no signs of distress. Records indicated that the arches had, at some stage, been back-filled with mass concrete. Whilst providing the arches with a substantial increase in live load capacity, the issue of thermal expansion had been overlooked. Analysis was carried out to understand the behaviour of the structure under thermal loading, and this confirmed the crack pattern observed on-site. Thermal expansion of the concrete had taken place pushing the arches laterally and producing a domino-like effect. Cracks had appeared where hinges had developed as a result of the lateral forces. Design work was then carried out to stabilise the damaged structure and provide additional capacity across the hinge positions.

The project involved the excavation of some of the ground in the immediate area of drilling to provide the angle for the insertion of the main anchors. A total of 75 x S25 Stainless Steel Type 2 Ribbed Reinforcement (Grade 460 to BS 6744) strengthening anchors 3.2 metres long were installed each in a 65 mm diamond drilled hole between 4.5 and 4.7 metres in depth. There were also 12 transverse anchors (S25 in a 65 mm hole) each 5.2 metres long installed in the "Lido Arches", and 420 Remedial Anchors (Circular).

The project was completed in five weeks - the contracted period

Lateral drilling and anchor installation to stabilise and consolidate cracking within arch rings.

