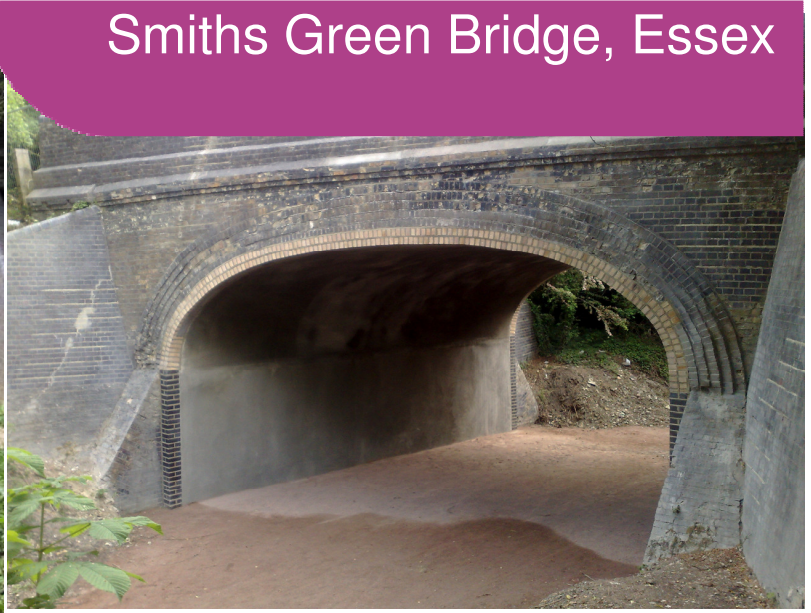




Smiths Green Bridge with 3-tonne vehicular load capacity.



Smiths Green Bridge with 40-tonne vehicular load capacity.

Strengthening of Smiths Green Bridge

Client:	Essex County Council
Value:	£300,000
Date:	March 2010 to May 2010
Services:	Design, Project Management, CDM and Site Supervision

The challenge

Smiths Green Bridge carries an unclassified road over a disused rail line, now a linear County Park called Flitch Way, to the south of Takeley, Essex. The bridge was constructed in circa 1880, it is a single span masonry arch structure. The structure comprises an arch barrel of 600mm thick, skew angle of approximately 20°, clear span of 7.65m/8.15m, and headroom of 4.47m. The width of the bridge is 8.36m.

In November 2001 the original assessment was reviewed and the structure reassessed by the University of Sheffield. The reassessment, using RING, the Masonry arch bridge analysis software, gave the structure an allowable axle loading capacity of 3.2 Tonnes.

The present condition of the bridge with its 3-tonne vehicular load capacity necessitates the strengthening of the structure.

“The design solution has maintained the shape and appearance of this historic 19th century brick arch bridge whilst strengthening it for full highway loading”

Danny Jennings – Essex County Council



The solution

A number of options had been prepared and presented to Essex County Council. It was decided that a Sprayed Reinforced Concrete Lining would be used as it would be able to increase the capacity back to the required 40-tonne vehicular loading and meeting the clearance envelope requirements from the Country Parks Rangers, whilst having the least aesthetic impact to the structure. The works comprised of strengthening of the masonry arch structure by constructing a stainless steel reinforced sprayed concrete lining against the intrados of the existing masonry arch and continuing along the front face of the abutments.



225mm deep two-ring brick arch masking will be added to the ends of the proposed reinforced concrete arch for aesthetic purposes only and situated in place with stainless steel support brackets and plates.



Due to the condition of the existing arch barrel the proposed structure will be designed to carry all loading with the loading being transferred to the subgrade through the existing abutments and foundations by means of dowels. The existing structure will therefore only act as permanent formwork for the new sprayed concrete arch and will not be considered to contribute to the overall strength of the structure. Dowels will be provided to support the additional reinforcement in place during the spray concrete operation. These will be designed to carry purely the dead load of the reinforcement and the wet concrete.

Vertical cracks to the parapets, spandrels, arch faces and wing walls are to be repaired with stainless steel reinforcement stitching and repointing, suspect copings are to be re-bedded and re-jointed. Spalled brickwork to the outside face of the spandrel walls and both arch faces are to be cut out and replaced.

The outcomes

Smiths Green Bridge with 40-tonne vehicular load capacity.

