Discussion

The strengthening of Brunel's Thames Tunnel

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Did the author and his colleagues consider the long-term implications of the original undrained proposal, which would have removed the compression to which Brunel's brickwork had been accustomed? Is it possible that this removal of the pressure holding the brickwork together could have resulted in cracking, which would perhaps have been exacerbated by the water pumping from bottom to top and back again as trains passed through the new tunnels leading possibly to the ultimate destruction of the original tunnel or is this scenario all too pessimistic?

Author's reply

The original 'undrained' proposal involved a fully-waterproofed system that removed the existing internal tiled cladding and trimmed back the brickwork sufficiently to enable the new reinforced concrete lining to be installed to allow for the required internal clearance envelope. In addition, the collector drains around the connecting arches were to be removed prior to the arches being infilled by structural blockwork. Drainage channels exposed by this process, together with all the other irregularities in the trimmed brickwork and structural block-

work, were to be coated by a regulated layer of sprayed concrete prior to a geotextile-backed, fully-welded plastic waterproofing membrane being attached to the entire periphery of each tunnel bore. A final internal steel-reinforced sprayed concrete or cast in-situ concrete inner lining (the choice to be left to the contractor) would then be installed.

The design assumed that the existing brick lining would take no further part in the structural support of the tunnel and would degrade (over considerable time) to clay. It is likely that the brickwork would become fully saturated and water movement through it (as had occurred since its construction) would cease. It would be very unlikely that any 'pumping action' of water from the bottom to the top and back again, as trains passed through the new tunnels, would be significant, as the new lining would essentially comprise a monolithic structure with a thick concrete track slab base that would evenly distribute the intermittent live loading. The new sprayed concrete linings (separate structures for each tunnel bore) were to be designed to withstand full hydrostatic and ground pressure for a projected lifetime of 120 years.