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Bishopsgate Suburban Lines Tunnel (SLT)

Intermediate Deck Strengthening

The intermediate deck comprises a grillage of wrought iron girders supporting jack arches. In former years, the deck was part of the broader Bishopsgate Goods yard complex, and was loaded by rail and road vehicles. Since the closure of the goods yard in 1964 the structure has been largely unused and unloaded. The proposals to redevelop the site meant that the Intermediate Deck would become public realm space. Assessment of the structure against pedestrian loading had identified 36 No of the primary girders as requiring strengthening work.



Above: View looking down the tunnel.

The main way in which the girders would fail was in shear, or combined shear and bending at their ends. The proposed brackets, to be installed at both ends of the girder, were designed for when the existing girder fails in one mode, which would eventually, if corrosion and overstress continued, develop into the second.

Onset of shear failure in the end panel of the girder would be accompanied by some initial deflection. This would be sufficient that the end of the gallows bracket would attract the majority of the end reaction from the outer secondary girder. This point on the girder is at the end of the bracket. When behaving in this way, the tension force pulling the top of each bracket away from the masonry would be circa 500kN.

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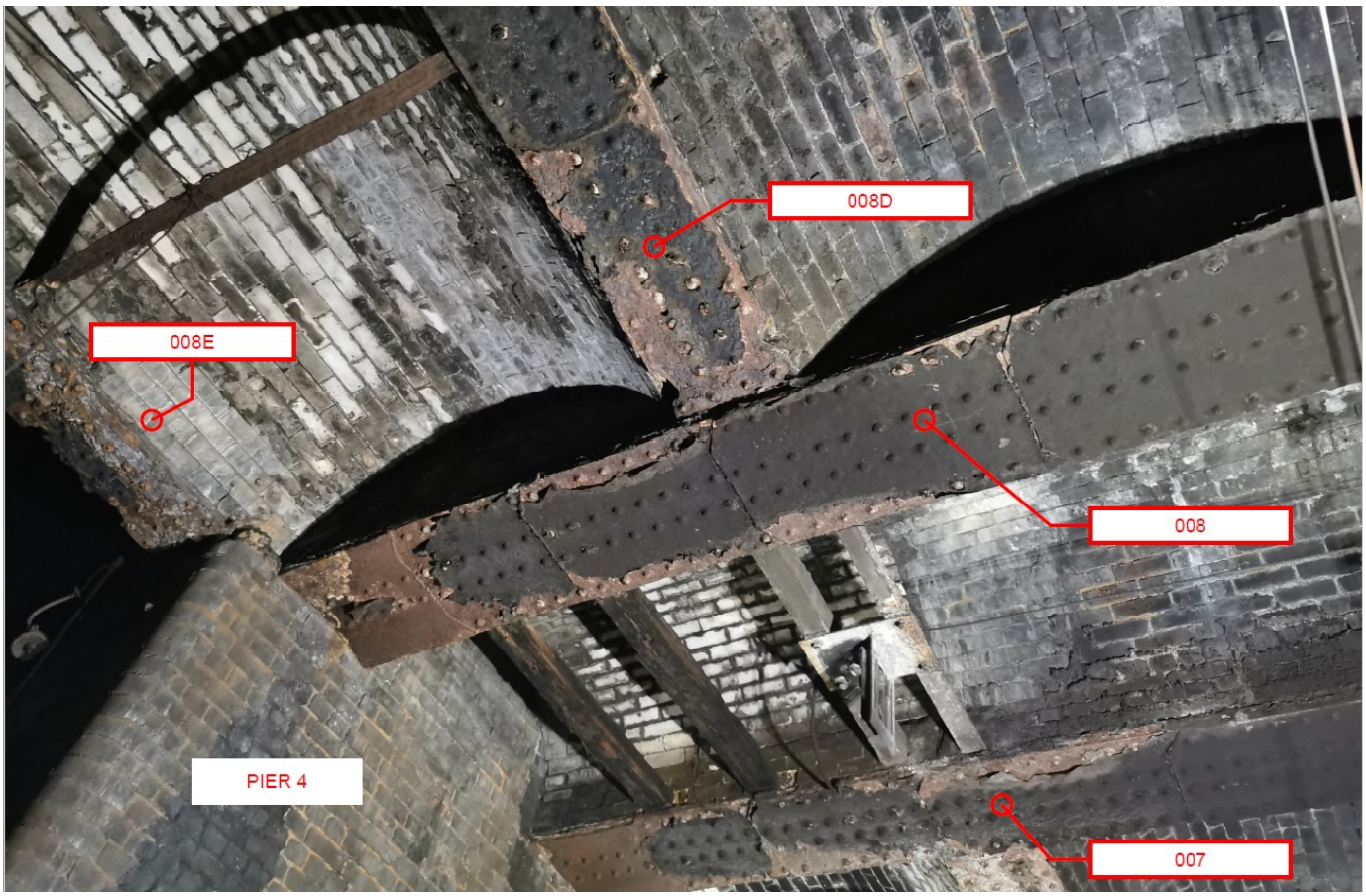
Bishopsgate Suburban Lines Tunnel (SLT)

Intermediate Deck Strengthening

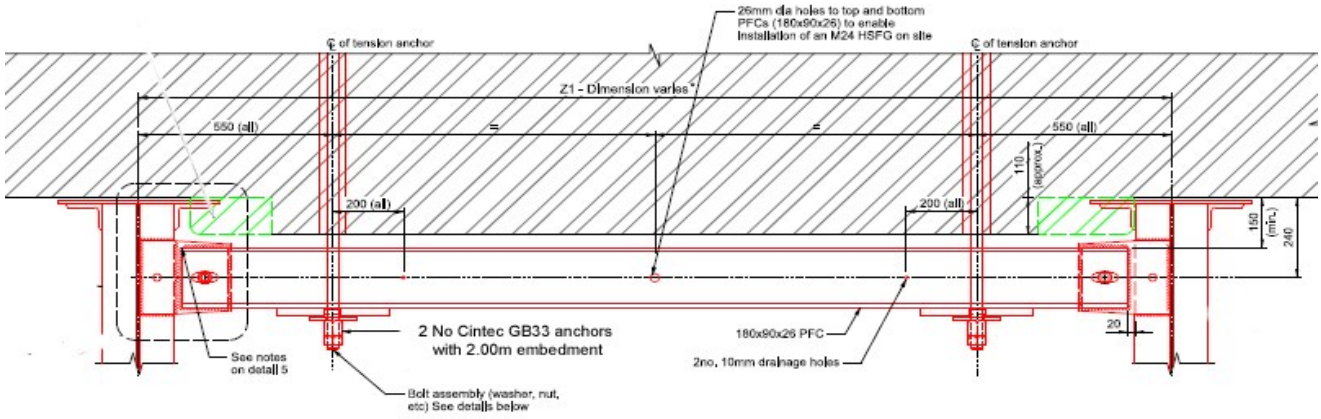
Structural Engineers Arcadis from York asked if Cintec could provisionally propose a tension anchor arrangement to sustain the nominal 500kN per bracket, acting in tension at the top of each bracket upright. As the quality and strength of the brickwork was unknown it was necessary to install and test anchors at this stage before the design could be confirmed.

Accordingly test anchors were installed over night-time track possessions at one weekend and the load tests carried out on a later weekend possession.

The Cintec GB33 anchors in a 76mm diameter hole with a 2.00m embedment returned a tensile capacity of 275kN which was satisfactory for the design of the bracket.



It had been decided, in view of the difficulty of implementing conventional web iron-work repairs to relieve the loading on these girders by propping them from beneath. Girders 8 and 7, shown in the images above are examples of these primary girders.

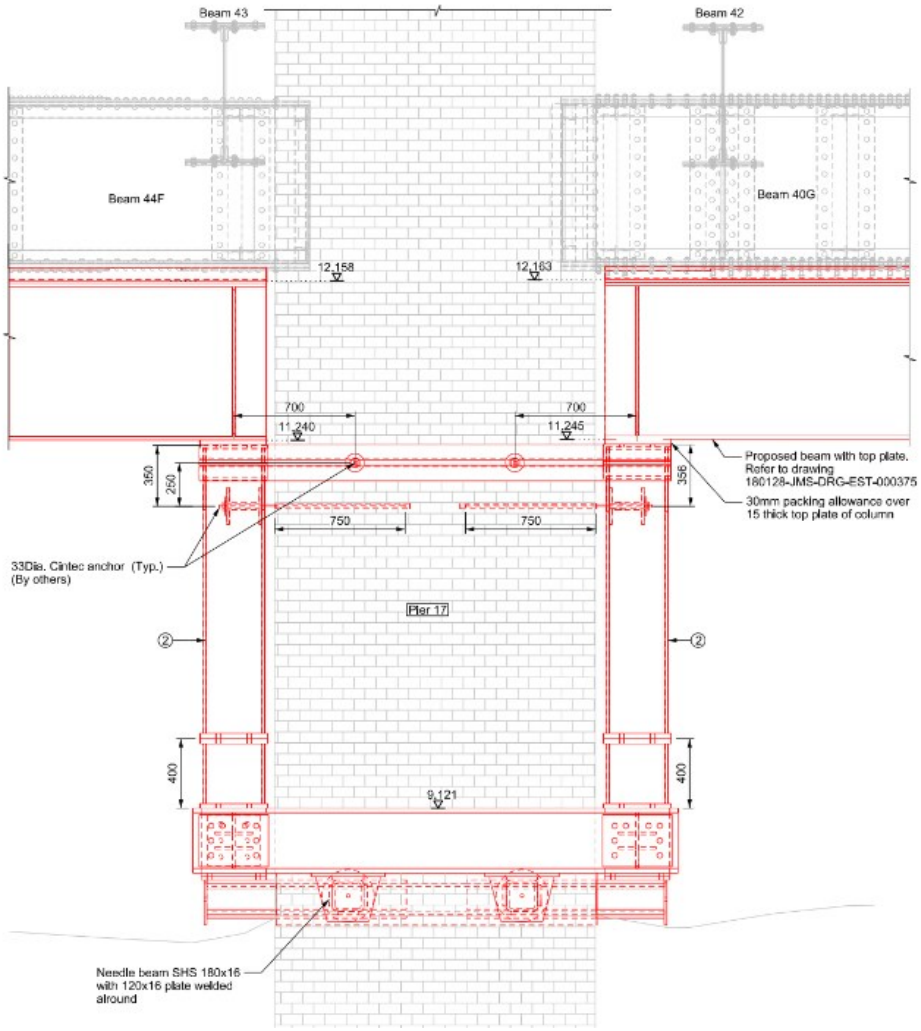


PLAN ON WALING BEAM

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Intermediate Deck Strengthening



Left: illustration of the basic design concept of support for the existing girders.

2 No Cintec GB33 anchors installed at the top of each of the gallows brackets.



Above: Brick cores as removed.

Below: Left overall view of brackets.

Centre: Anchor installed.

Right: Bracket installed.





