

Concrete repair to pretensioned beam

Whittlesford Station Bridge, Cambridge

Client

Cambridgeshire County Council

Contractor

Skanska

Engineer

Arup

Works Commenced

March 2019



Whittlesford Station Bridge carries the A505 over the London to Kings Lynn railway west of Cambridge at Whittlesford Station. The bridge comprises 32 precast inverted-T beams and two precast rectangular edge beams spanning 16m between abutments on a skew of about 30 degrees. Earlier inspections had revealed the northern edge beam to be understrength following gradual corrosion of some of the pre-tensioning wires. Freyssinet was appointed to conduct investigations, post-tensioning, hydro-demolition, concrete repair, anti-carbonation coating and brickwork repair.

Northern Edge Beam Investigations

The investigation works to the northern edge beam consisted of removing the defective cover concrete using hydro-demolition to expose the lower level of pre-tensioning wires. This work was done on 31st October during a 27-hour possession. The access was via normal aluminium scaffold towers, these being robust enough to withstand the lateral thrust that you get when using hydro-demolition. The ballast was sheeted to prevent contamination and the area was enclosed with vertical sheeting to contain debris.

The wires were found to be corroded through and therefore contributing no structural strength. Two channels were cut across the beam at the third-span points using hydro-demolition in order to check the condition of the second layer of wires and these were found to be in good condition. This meant that the Engineer's provisional design was validated, and repair works could progress at the next available series of possessions.

Concrete repair works

The strengthening works involved fixing two new 15.7mm diameter post-tensioning strands to the outer face of the northern edge beam. The anchorage was the Freyssinet 1R15 system. This had a housing that accommodated the wedge anchor that grips the strand and a hole through which a 25.5mm diameter high tensile Freyssibar was inserted to fix the anchor to the structure.

The two strands were to be fixed to a deflected profile so two galvanised steel deviators had to be fixed at third-span points. Greased and plastic-coated strands were threaded through plastic ducts which, in turn, passed through the deviators. The ducts were grouted prior to stressing the strands, this ensured there were no hard points of support through the deviators and gave a total of four layers of corrosion protection.

Scaffolding was erected around the two abutments which allowed works to install the anchors to be done in normal day-shifts, rather than having to wait for a possession.

The soffit of the beam, previously removed to expose the corroded strands, was repaired using Renderoc HB30 applied by hand over several Saturday night RoR possessions.

Anti-carbonation coating was applied to the whole soffit of the bridge.

Brickwork repair

The abutment scaffolds were also extended up the embankments to allow access to the four wing walls to facilitate brickwork repairs.