Trent Bridge, Nottingham. Survey of Masonry Condition

The overall condition of the masonry of the bridge is good, with some localised areas of concern, none of these structural, as yet. The masonry generally displays normal weathering patterns consistent with the age and location of the monument.

Surveying was visual only, from both banks of the river and from the bridge itself. Masonry rising from the river itself was examined with binoculars from both banks and from above. Light conditions were good.

The style of the masonry is Gothic Revival, rendered in a combination of pale red and fawn coloured sandstone, the latter having been used for the more exposed elements, such as copings. Columns to the decorative stonework of the cutwaters are of a black granite. Attached shafts of the decorative blind arcades would appear to be of Purbeck Marble.

The mortars of construction may be anticipated to display variable hydraulicity according to situation, with underwater mortars and those close to the normal river level being particularly hydraulic; those to the brick vaulting of the arches moderately hydraulic and those to the superstructure somewhat less hydraulic and richer in free lime. Repointing over the years has been executed in cementitious or Natural Hydraulic lime mortar.

There have been two primary phases of construction, the original 1871 bridge having been widened in 1929. The mortars used in each phase are likely to

have been different with mortars from the latter phase likely to contain variable volumes of Portland cement and air lime depending upon location.

The original masonry to the west side of the bridge was dismantled before the widening and reassembled after widening. Original mortars to the east and west sides are likely, therefore, to be different to one another. The hydraulicity of the earlier mortars may have been via natural hydraulic lime (most likely Blue Lias); those from the 1929 period, Portland cement, although the use of pozzolanic hot mixes should not be ruled out.

In both cases, modern versions of these respective materials bear only passing resemblance to their 1871 and 1929 equivalents. Modern Portland cement is very much harder and more dense than it was in 1929 – with up to 3 times less compressive strength. Blue Lias natural hydraulic lime, considered to be the 'strongest of all water limes' available in England during the 19th and earlier 20th centuries typically had significantly less compressive strength and significantly more free lime than modern equivalents, and for underwater use was frequently gauged with a pozzolanic additive to reduce or eliminate the free lime content, it being of no usefulness underwater. The addition of pozzolan would likely diminish as the burden of water became less and less frequent and pozzolanic air lime mortars were considered more reliable in situations of regular wetting and drying, as opposed to permanent immersion. In both periods, the underwater mortars may have been of natural cement – an eminently hydraulic lime with no residue of free lime, which was very fast-setting and more so than Portland cement.

Care must be taken, therefore, to design a palette of compatible repair mortars to be used upon this structure. Modern Portland cement and modern NHL are unlikely to deliver the necessary compatibility and would be unlikely 'like-for-like'. An equivalent natural cement is currently available, and might be used for underwater or 'close-to-water' works. Repair mortars to the superstructure will be designed around hot mixed air lime mortars with appropriate pozzolanic addition. Visible historic mortars to the upper masonry – whilst tough – display residual lime lumps and lime richness consistent with their having been hot mixed.

There has been a general loss of mortar from the joints of copings. This has allowed an extensive infiltration of herbaceous weeds, with the occasional shrub also taking root. Loss of pointing, or repointing mortars is otherwise localised, although extensive in some of these localised areas.

There has been a general soiling of the masonry associated with vehicle exhaust pollution. This is most pronounced in sheltered areas that receive little direct rainfall, such as the carved embellishment of pier copings. The pattern of the soiling in these areas might suggest a calcium carbonate content in the fawn-coloured gritstone. It would seem that the masonry has been cleaned in the past, using an abrasive technique.