INJECTION FOR MASONRY STRENGTHENING

Grout injection for masonry strengthening is Tempo-PCE's key area of expertise. Historic structures that have deteriorated over time, maybe through lack of maintenance or excessive water ingress, can be brought back to full load capacity with strengthening injection, using a PU resin, or a cementitious grout. Works can be completed from below, minimising disruption to traffic. Strengthening injection can be carried out in conjunction with waterproofing injection, or in its own right.

BENEFITS OF STRENGTHENING INJECTION

The key advantage of grout injection for strengthening is that the structure's inherent flexibility is retained: the strength of the injected material is specified to suit to existing mortar, avoiding overstiffening. Alternatively, where a structure has been weakened by a lower strength mortar, e.g. lime being washed out, this can be replaced by injecting a higher strength material blend.

The process is similar as waterproofing injection, with a grid drilled, flushed, and injected from the bottom up, then cleared and sealed. Strengthening injection has the same benefits, being able to be applied from beneath the structure, allowing works to be carried out while the structure remains operational.

TYPICAL APPLICATIONS

- Pipe subway Tunnels
- Brick arch barrel bridges
- Brick vaults
- Brick culvert

EQUIPMENT & GROUT SPECIFICATION

There are three options for strengthening grouts: PU resin, a latex-cement blend, or lime. A PU resin is indicated where the structure is relatively open, and does not have to meet historic stipulations. PUs have excellent adhesion, come in different strengths and expansion rates, and can be specified to meet specific client requirements [eg...?]. Shear test show that structures haven been brought back to full load capacity with our PU injection. PU resins are injected using easily portable 110-volt electric pump, which is small enough to fit through a standard manhole.

The latex-cement blend is applied with a very low-pressure via an air-driven diaphragm pump. It can link delaminated brick rings, increase brick strength, and thicken arch barrels by penetrating the backfill. It is injected. For strengthening injection with lime, please refer to Lime Grouting. All strengthening injection grouts can be used on their own, or in conjunction with a waterproofing injection beforehand.

Core sample showing evidence of successful latex-cement injection (white)

KEY BENEFITS

- Linking of masonry/ brick rings
- Linking to existing concrete saddle
- Filling of voids
- Reinforcing of backfill
- Good saturation of structure
- Non-jacking
- Good resistance to road salts
- Appearance is retained
- Quantities can be measured and recorded
- Injection can be completed from below
- Equipment can fit through manhole
- Resin can be potable water safe/ WRAS approved

EXAMPLE MASONRY STRENGTHENING PROJECTS

- Summersbury Road Bridge, Surrey Council
- Kingsway Service Pipe Subway, Camden Council
- Alconbury Weston Bridge
- Baynards Road Bridge, Surrey Council
- Waverley Road bridge, Barnet Council
- Hale Lane Bridge, Barnet Council
- Northumberland Avenue Service Pipe Tunnel, FM Conway/ Westminster Council
- Strand & Aldwych Service Pipe Tunnels, FM Conway/ Westminster Council
- Ickleton Road Bridge, Cambridge Council
- Cotterstock Road Bridge, Kier Group/ Northamptonshire Council
- Byegrove Road Bridge, Merton Council

APPLICATION CONDITIONS & LIMITATIONS

- Structures that show flowing water will require waterproofing injection before a strengthening grout is applied. In this case, the waterproofing resin must be limited to srategic locations and quantities, to prevent filling space needed for the strengthening material. On a typical masonry structure, localised injection of the waterproofing grout into the backfill will give sufficient temporary relief from flowing water to enable effective cementitious injection.
- Any substantial brick repairs required should be completed before strengthening injection is carried out, to allow new brickwork to be fully bonded with the existing structure.
- Any missing pointing should be replaced before injection commences to minimise loss of injection material.
- Strengthening injection must not be limited to weakened areas, as the creation of strong spots can result in reflective cracking

Temporary works: radial propping to damaged brick tunnel

Bridge located at geographical low point, with a notorious wet spot drawing through the structure

Strengthening injection

PU strengthening injection to a flood defence structure