

THE MAGAZINE OF THE CONCRETE SOCIETY

CONCRETE

Volume 60, Issue 5 June 2026

TIME AND SPACE TRAVELLERS

Just one of the winners in the GCCA's 2025/26 'Concrete in Life' photo competition



REPAIR AND STRENGTHENING

Restoring the base of a national landmark in Azerbaijan

A PERFECT MATCH?

Under scrutiny - three arguments about graphene and concrete



(Photo: magnific.com/eremeeve.)

STATE FLAG SQUARE, AZERBAIJAN

Steve Davies of **Beton Bauen** reports on a demanding overseas project – involving environmental extremes, international logistics and a tight schedule – to repair the concrete base of a national landmark in Azerbaijan.

The State Flag Square is a large city square in Baku, Azerbaijan. When it was built in 2010, the 20,000m² square was home to (officially) the tallest flagpole in the world. At a height of 162m, the erected flag support sat on a large concrete pedestal base, with a foundation diameter of 3.2m. The flagpole and square project reportedly cost US\$30 million (£22m) to complete. Azerbaijan lost the record to Tajikistan in 2011, where a 165m flagpole was erected, itself superseded by a later construction in Saudi Arabia.

In 2017, the national flag was taken down from the pole after repeatedly being torn by the wind and the pole was disassembled and removed. The State Flag Square and the State Flag Museum were closed for repairs due to the reconstruction and restoration works. In 2021, Turkish construction giant ENKA announced its subsidiary company Cimtas would be working on the world's new tallest flagpole, again set for location in State Flag Square. At a proposed height of 192m, the

new mast consists of nine steel conical tube segments with a diameter of 2–5.7m and with vastly different weights between 13,000 and 270,000kg.

Concrete in the base pedestal construction into which the flagpole would find its foundation had deteriorated since its original construction, next to the testing environment of the Caspian Sea shoreline. The pedestal was also due to house a State Flag Museum and required structural waterproofing.

PROJECT DESCRIPTION

At the request of the vice-president of Azerbaijan, Beton Bauen project managers were processed with 'fast-track' visas and invited to inspect the reinforced concrete base in Baku. During the six-month project, the company delivered consultancy, application and on-site training.

A successful solution would be dependent on a multi-system integration including epoxy resin injection, grout reinstatement, waterproofing and protective coatings; all would have to adhere to strict QA/QC Standards, with

INSET ABOVE:
Night view of State Flag Square.

MAIN IMAGE:
Repaired and protected concrete base in State Flag Square, Baku.



compliance to BS EN 1504 Parts 2⁽¹⁾, 3⁽²⁾ and 5⁽³⁾. Overall, the aim was to protect the integrity of a structure of immense symbolic importance.

SOLUTION METHODS

Beton Bauen was engaged to inspect, repair, inject, grout and protect the exposed concrete base, delivering a full package of specialist works including crack injection, waterproofing, gap filling and protective coatings. The project would have to be delivered over a concentrated programme, co-ordinated to minimise disruption and align with national events.

The works combined structural crack injection, large-scale void grouting, crystalline waterproofing and protective mortars/ coatings. This holistic integration of advanced BS EN 1504-compliant systems ensured long-term resilience in a severe marine environment:

- Epoxy injection resin: low-viscosity system capable of force-filling cracks down to 0.2mm in dry, damp, or water-bearing conditions. Provided >2.0MPa bond strength and monolithic performance.
- Grout: high-flow, non-shrink cementitious grout (BS EN 1504-3 Class R4) for gap thicknesses 75–500mm, achieving 60MPa at 28 days. Selected to reinstate large voids without segregation or cracking.
- Crystalline waterproofing: applied in slurry form to provide long-term resistance to water ingress, enhancing the durability of the concrete base.
- Mortars and coatings: used for precision finishing, colour-matching and protection against carbonation and chlorides.

These systems were chosen to provide long-term durability and to ensure both technical and aesthetic excellence, avoiding future invasive interventions.

High winds on the shoreline of the Caspian Sea threatened to undermine the specialist grout and resins. Applied materials needed to be given protection from the wind (yet kept moist) to gain in strength and prevent premature curing. To combat these issues, temporary working shelters were constructed.

The base of the flagpole is a highly visible, symbolic feature, meaning visual quality and cosmetics were critical. Repairs had to be

indistinguishable from the original construction while ensuring structural durability. Challenges included colour variation from weathering, risk of patchwork finishes and the need to balance aesthetic expectations with technical coating performance. Solutions included careful colour matching of mortars, use of epoxy pastes to seal injection points cleanly and phased coating applications to avoid differences in shade. Protective coatings served both a technical and aesthetic function, producing a uniform, durable and visually clean finish. The outcome was a seamless and high-quality surface that enhanced the monument's presentation, while providing robust, long-term protection.

ENVIRONMENTAL AND SUSTAINABILITY

Sustainability was embedded into every stage of the project, including:

- Material efficiency: use of Conbextra TS grout reduced waste by controlled mixing ratios (3.3L water/25kg bag).
- Durability as sustainability: crystalline waterproofing extends life expectancy, reducing future interventions and whole-life carbon.
- Reduced carbon impact: repairs extend service life instead of replacing the base, avoiding demolition and reconstruction.
- Low waste practices: careful batching of materials minimised surplus; packaging was segregated and recycled.
- Local engagement: where possible, local labour and logistics partners were used to minimise environmental footprint.
- ISO 14001⁽⁴⁾ compliance: all practices aligned with the certified environmental management system.

TOP RIGHT:

Configuration/plan for resin injection (to slab).

BELOW TOP RIGHT:

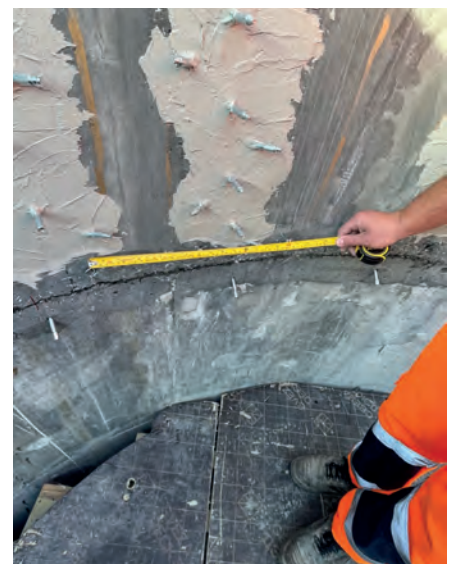
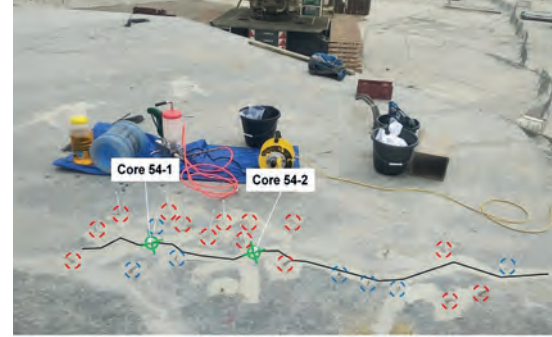
Testing. Coring of the repair area (slab) to test if the resin injection process is successful.

ABOVE RIGHT:

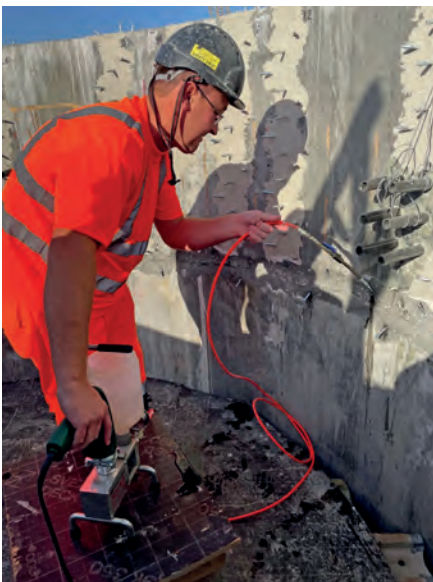
Installed packers, prior to resin injection (to inner core wall).

RIGHT:

Surface sealer (Sikadur), applied near packers (to inner core wall).



(Photos: Beton Bauen Limited)



HEALTH AND SAFETY

Health and safety would also include its own challenges and outcomes, but was critical due to the international setting, exposed location and the monument's national importance:

- Environmental hazards: coastal winds, reflective surfaces and high heat were managed with shaded rest areas, hydration breaks and weather monitoring.

- Resin safety: controlled handling of solvents, safe disposal of waste and ventilation within mixing tents.
- Access safety: bespoke edge protection, fall-arrest systems and controlled entry zones around confined areas.
- High-security environment: all works were delivered under additional access checks and restricted movement.
- Training and communication: daily briefings and toolbox talks (translated for local operatives) ensured full understanding of site risks.

ISSUES ENCOUNTERED

There were a number of obvious 'hurdles' to overcome, including international logistics, customs, language barriers and security restrictions. The transportation and level of paperwork required for specialist resin pumps, core rigs, spray equipment and potentially hazardous materials, via London Heathrow, would prove especially difficult. Logistical delays with customs became familiar and safe storage on-site in Baku would also need to be considered. With the assistance of a logistics partner, and provided with Azerbaijani interpreters, Beton Bauen managed to avoid these issues escalating.

Physically, conditions in the seaside area of Baku were challenging. High temperatures would also cause an issue. Resin systems had to be mixed and injected under ambient 35–40°C conditions, managed with climate-controlled tents and adjusted working times. This also meant it was best to employ local operatives who were familiar with these conditions, while using senior managers and concrete technicians from the UK.

The strong coastal winds also caused movement at the base, requiring reinforcement and careful scheduling to avoid de-bonding or cracking.

The site also had restricted access. Confined work zones required bespoke access platforms and strict entry control systems. Similarly, as a national landmark, access was tightly controlled with strict security protocols, requiring additional planning to maintain productivity within restricted working hours.

PROJECT SUMMARY

The Azerbaijan National Flagpole project highlights expertise in delivering multi-faceted concrete rehabilitation on one of the world's

most recognisable landmarks. By combining structural crack injection, large void grouting, crystalline waterproofing and protective coatings, the company delivered a complete and durable repair strategy.

Operating overseas demanded adaptability to local regulations and cultural expectations. Careful planning and proactive co-ordination allowed the team to navigate complex logistics, extreme climate and stringent security while maintaining uncompromising safety standards.

The project demonstrated technical competence in applying products compliant with BS EN 1504 Parts 2, 3 and 5. Rigorous inspection and quality assurance, supported by manufacturer guidance, ensured both performance and visual excellence. Through proactive planning, innovative access design, climate-controlled storage and close liaison with authorities, Beton Bauen delivered a safe, uninterrupted programme to the highest technical standard.

Equally, the project demonstrated commitment to sustainability and workforce development. By repairing and extending the structure's life, significant carbon and waste reductions were achieved. At the same time, staff gained invaluable mentoring and international experience, strengthening company-wide capability for future projects. **G**

References:

1. BRITISH STANDARDS INSTITUTION, BS EN 1504. *Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 2 – Surface protection systems for concrete.* BSI, London, 2004.
2. BRITISH STANDARDS INSTITUTION, BS EN 1504. *Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 3 – Structural and non-structural repair.* BSI, London, 2005.
3. BRITISH STANDARDS INSTITUTION, BS EN 1504. *Products and systems for the protection and repair of concrete structures. Definitions, requirements, quality control and evaluation of conformity. Part 5 – Concrete injection.* BSI, London, 2013.
4. BRITISH STANDARDS INSTITUTION, BS EN ISO 14001. *Environmental management systems. Requirements with guidance for use.* BSI, London, 2015+A1:2024, superseded.

TOP LEFT:

Setup for protection from elements.

MIDDLE:

Concrete infill.

BOTTOM:

Resin injection application process.