

**Project:** Kyle of Tongue Bridge Refurbishment**Client:** The Highland Council**Contractor:** Concrete Repairs Limited (CRL)

**Project Description:** The Kyle of Tongue Bridge is a 180m long, 18 span structure over tidal water in North Sutherland. The works comprised of concrete repairs to reinforced and prestressed concrete, cathodic protection of prestressed concrete beams and reinforced concrete pile caps, replacement of bridge-deck waterproofing and surfacing, replacement of parapets and cleaning and re-painting of steel piles and refurbishment of the existing impressed current cathodic protection system to the piles.

**Technical Details:** The pile caps, steel piles and pre-stressed beams exhibited severe corrosion damage due to chloride induced corrosion. A large number of previous cementitious patch repairs undertaken during the refurbishment contract of 1990 have also reached their service life and they illustrated corrosion induced deterioration. Galvanic anodes were installed around the perimeter of each repair in accordance with the construction details. The anodes were installed in pre-drilled cavities and connected to the reinforcement with integrated titanium wires. The galvanic anodes will provide corrosion protection around the perimeter of the patch repair against future corrosion damage.

The ICCP system on the steel piles was fully refurbished with a new set of Mixed Metal Oxide (MMO)/Titanium (Ti) anodes surrounded in a metallurgical coke backfill installed below lowest water level on the beach. A trench was excavated parallel to the water front and the anodes were installed in a "sausage type roll" made out of hessian which contained the conductive backfill and the anodes. Hybrid galvanic anodes were installed at the edge of the beams and in between the prestressing tendons in pre-drilled cavities. All the anodes within each beam were connected together and the cable terminated within a junction box located on the soffit of each span. Following installation of all the wiring, the repairs were back filled with the dry spray concrete. Following reinstatement of the concrete, the anodes received an 8-week temporary charge in order to arrest ongoing corrosion of the unexposed prestressing tendons. The temporary wires were then removed and the anodes connected directly to the steel to run in a self-powered galvanic mode.