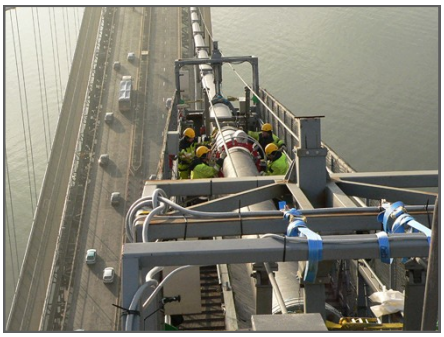
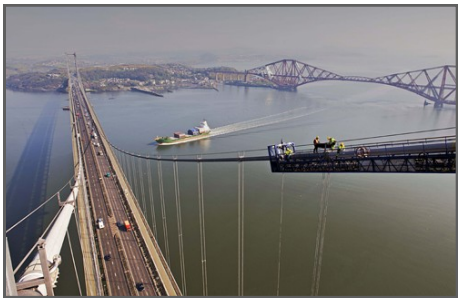
Forth Road Bridge
Main Cable Dehumidification



Following the inspection and discovery of severe internal cable corrosion on the main suspension cables of the Forth Road Bridge, C. Spencer Ltd, in partnership with Bennett Associates won the two year contract to retrofit a dehumidification system to the bridge. The value of the main contract is £7.8m.

Bennett Associates were responsible for the following aspects of the project:

- Design of 28m long high level, travelling, working platform.
- Design of dehumidification plant supporting structural steelwork.
- Design of pipe and cable support systems.
- Design of air injection and exhaust points.
- Management of the overall design of the dehumidification system.
- Complete electrical design for the dehumidification system.
- Design of SCADA air condition monitoring and control system.



The aim of the project is to install a system that will dry out the thousands of steel cables that make up the main cables and keep them at a humidity level below 40%, which will prevent further corrosion. The same type of systems are installed on new bridges in Japan and Sweden as a preventative measure but this is the first time it has been tried on an existing bridge. A similar project is planned in the near future for the M48 Severn Bridge and it is expected that others will follow.

Without the project it is estimated that traffic weight restrictions on the bridge will have to be introduced as early as 2013. To enable access for work on the main cables to take place Bennett Associates have designed a 28m long lightweight, steel gantry. Two gantries have been made which will travel along and up the main cables to the top of the towers, 100m above deck level. Linear elastic analysis software was used to design the structure for a variety of different support configurations and harsh loading conditions.

The platform moves along the cable from one set of hangers, which the bridge deck is suspended from, to the next. At this point the platform is secured to the main cable ready for work to commence on that section. Access is via a small man rider cradle, which suspends off the side of the platform and hoists the men and equipment up and down as necessary to carryout the works. The work from the platform involves wrapping the whole cable with a plastic wrap, which is heat sealed to form an impermeable coating. The cable bands, which support the deck hangers, are sealed using various polymers to ensure there is no way for air to escape.

At several locations along the cables, air injection sleeves, designed by Bennett Associates, are installed along with the necessary pipework and air condition sensors to carryout the dehumidifying task. Similarly exhaust sleeves and sensors are fitted at the ends of the cables to allow the air to leave the system.

The dehumidified air is supplied to the cables from one of the three Dehumidification Plant Rooms. The plant rooms are mounted on the steelwork structure of the bridge on steelwork supports designed by Bennett Associates. The plant rooms contain specialist equipment to take moist air from the atmosphere and dry it out before pumping it through a system of pipework spanning throughout the bridge. Bennett Associates designed the extensive pipe and electric cable support system throughout the bridge.

The condition of the air is continually monitored as it enters the plantroom, then again as it leaves the plantroom. In addition, it is monitored at the cable injection points, at intermediate locations along the cable, and as it leaves the cable at the exhaust points. All the data is fed back to the plantrooms and then fed back by fibre optic link to a PC in the bridge control building.

Customised SCADA software has been produced by Bennett Associates to monitor and log the data collected throughout the dehumidification system. The system allows for an authorised person to access, monitor and control all of the system parameters from any internet connection worldwide.

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