

Forth Replacement Crossing

project update

June 2017



Tall, elegant and proud:

the Queensferry Crossing, one of the most important and striking bridges in the world, nears completion.



Project Directors' Update

Finishing the job: a brief round-up of the progress being made towards the completion of the Queensferry Crossing construction project this summer.

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Technical Focus

Power to the bridge: we take a look at the vital role electricity will play in the safe, day-to-day functioning of the new bridge for decades to come.

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Photo Update

Bringing you up to speed with all the latest developments, a selection of the latest photos from across the construction site.

Centre Pages



Almost there!

Viewed from any vantage point on land, sea or air, it is clear that the Queensferry Crossing is now nearing completion. It has been a challenging, fast-track construction programme lasting six years. Its construction has required some of the most advanced civil engineering ever seen.

In a few weeks' time, traffic will be flowing across this globally significant bridge. The air of anticipation we detect amongst members of the public is fully shared by all of us involved in designing and building this wonderful structure.

In the last issue, we reported on the lift and installation of the historic final road deck section which essentially marked the completion of the bridge's structure. Since then, the focus has been on completing a wide range of complex "finishing works" which have to be carried out before the bridge can open to traffic. Here's a brief look at recent progress.

Out in the open, perhaps the most obvious change has been the removal of the three yellow tower cranes. For the past four years and more, these have stood parallel to the bridge's three towers where they grew to an amazing final height of 235m, making them the tallest cranes anywhere in the UK. Dismantling such vast structures, section by section, was an operation requiring careful planning, thorough risk assessment and suitable weather conditions. The winter and early spring turned out to be fairly benign in some ways with generally mild weather and none of the extremes of bad weather sometimes experienced. However, they were also almost continuously windy and those above average windy conditions made the job of bringing the cranes down more difficult, leading to it taking somewhat longer than planned with a consequential knock-on effect on other related activities.

Once the cranes had been removed to below road deck level, work could be carried out on filling the gaps in the deck's cantilevered hard shoulder where they had previously stood. That work is now complete, as is the removal of the six triangular steel trestles, two either side of each tower, which had formerly supported the weight of the first deck sections to be installed and which provided platform areas for offices, welfare areas, storage and other work facilities during construction of the road deck. These huge temporary structures, known as "falsework" and weighing several hundred tonnes, made for a dramatic sight as they were lowered in one piece on to barges to be taken away for re-cycling. The removal of the tower cranes and trestles has left a series of small holes in the concrete where they had been attached to the walls of the towers. Filling these holes with concrete and ensuring the concrete surfaces are all perfect is another demanding task now in full swing.

All of the bridge's signature stay cables have now been fully installed. Further progress has been made on installing the transparent windshielding panels which will protect vehicles on the bridge from the effects of the famous – and, to us, all too familiar – Firth of Forth winds. In parallel with the windshielding, a total of 10.8km of vehicle restraint barriers (or "crash barriers") are being installed on either side of each carriageway on the bridge. Almost complete is the laying of a waterproofing membrane on top of the concrete road deck. This membrane protects the reinforced concrete deck from the adverse corrosive effects of rain water by promoting the flow of water into drains at the sides of the roadway. As sections of deck have been



David Climie & Michael Martin.

waterproofed, we have been able to start the process of laying the final road surface over which traffic will drive.

Inside the deck "tubs" many other operations are underway which come under the heading of "MEP works". These include things like the connection of electricity supplies and cabling, lighting (both internal and external) and the installation of monitoring systems which will ensure the smooth operation of the bridge for decades to come. (Turn to Technical Focus on the back page for more details.)

Following the final deck section lift in February and subsequent closure of the remaining gap between the South Tower road deck and the southern approach viaduct, the last significant concrete pour of the entire construction programme took place in late March when the final sections of road deck were laid on the southern approach viaduct. Throughout the Project, FCBC's batching plant in Rosyth Docks has produced a staggering total of around half a million tonnes of high quality concrete, a proud record. Road surface laying is continuing on both approach viaducts.

Turning to the road connections, on the southside the new stretch of dual carriageway joining the Queensferry Crossing to the existing trunk road network at the Scotstoun junction is complete with only minor finishing works and landscaping to be completed. Similarly, on the north side the new M90 approach roads are as complete as they can be prior to bridge opening with north and southbound traffic now flowing on the permanent new alignment as far as the point where the road diverges towards the still-in-use Forth Road Bridge.

So, as you can see, we are entering the final phase of this major construction project. Over 1200 construction personnel have been inducted to work on the bridge in 2017 alone, so it is full steam ahead towards our primary goal of finishing this magnificent bridge safely and to the highest possible quality.

As announced recently, the bridge is now scheduled to be ready for opening to traffic in late July or August. Plans are being laid for the opening celebrations and these will be announced in due course. Members of the public will have a once-in-a-lifetime opportunity to walk across the bridge by applying for tickets in a "Queensferry Crossing" ballot which will be launched soon. For details of how to apply, watch out for adverts in the local press and media.

There is no doubt about it – the completion of the bridge and its official opening later this year will be cause for major celebration throughout the country and beyond, just as the openings of its illustrious neighbours in 1890 and 1964 were. We can't wait!

David Climie
Transport Scotland Project Director

Michael Martin
FCBC Project Director



Bridge of Kindness

Over the past few months, Queensferry Parish Church has been encouraging its members to share acts of kindness with other folk in the 'Ferry. This was initiated in recognition of the constant need for the church to reach out and build bridges with the people in the surrounding community. For obvious reasons, the idea of building bridges rang a bell with the church's Community Team and the idea of a "Bridge of Kindness" was born.

FCBC supplied a technical drawing of the Queensferry Crossing for them to use as a template to make a 3 metre long drawing of their Bridge of Kindness. After each act of kindness has been performed, members colour in one of 320 segments contained in the bridge's road deck, towers and viaducts. Children have been particularly enthusiastic to colour in the spaces and record what they did as an act of kindness. Many have gone out of their way to be kind in the home or among their friends, including those with fewer friends. Older members of the congregation have also played their part in giving lifts, cooking, baking, gardening for those in need, to name but a few. Others have engaged in activities to benefit the whole of the community such as litter picking.

Derek Hobson from Queensferry Parish Church said: "Our thanks go to FCBC for their support in this initiative and to members of the church for the many acts of kindness they have shared."

FCBC Site Good Housekeeping Awards

In recognition of "good housekeeping" across the construction site, and as a constant stimulus to improve standards, FCBC runs a Site Housekeeping Award scheme through which donations are made to charities chosen by the winning areas. Keeping the site tidy helps ensure everyone's safety and also provides a welcome boost to charities.

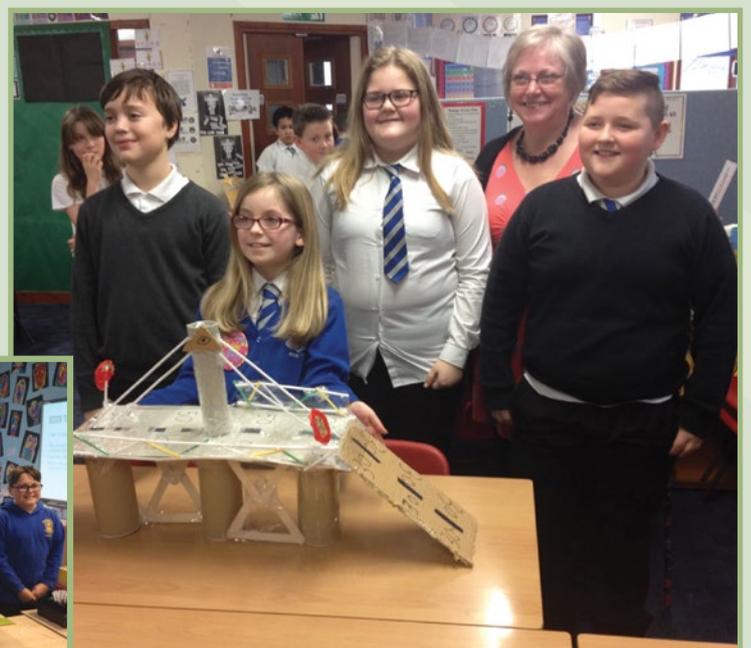
Pictured are representatives from FCBC's North Mainline Roadworks team handing over their donation to Glasgow Children's Hospital Charity.

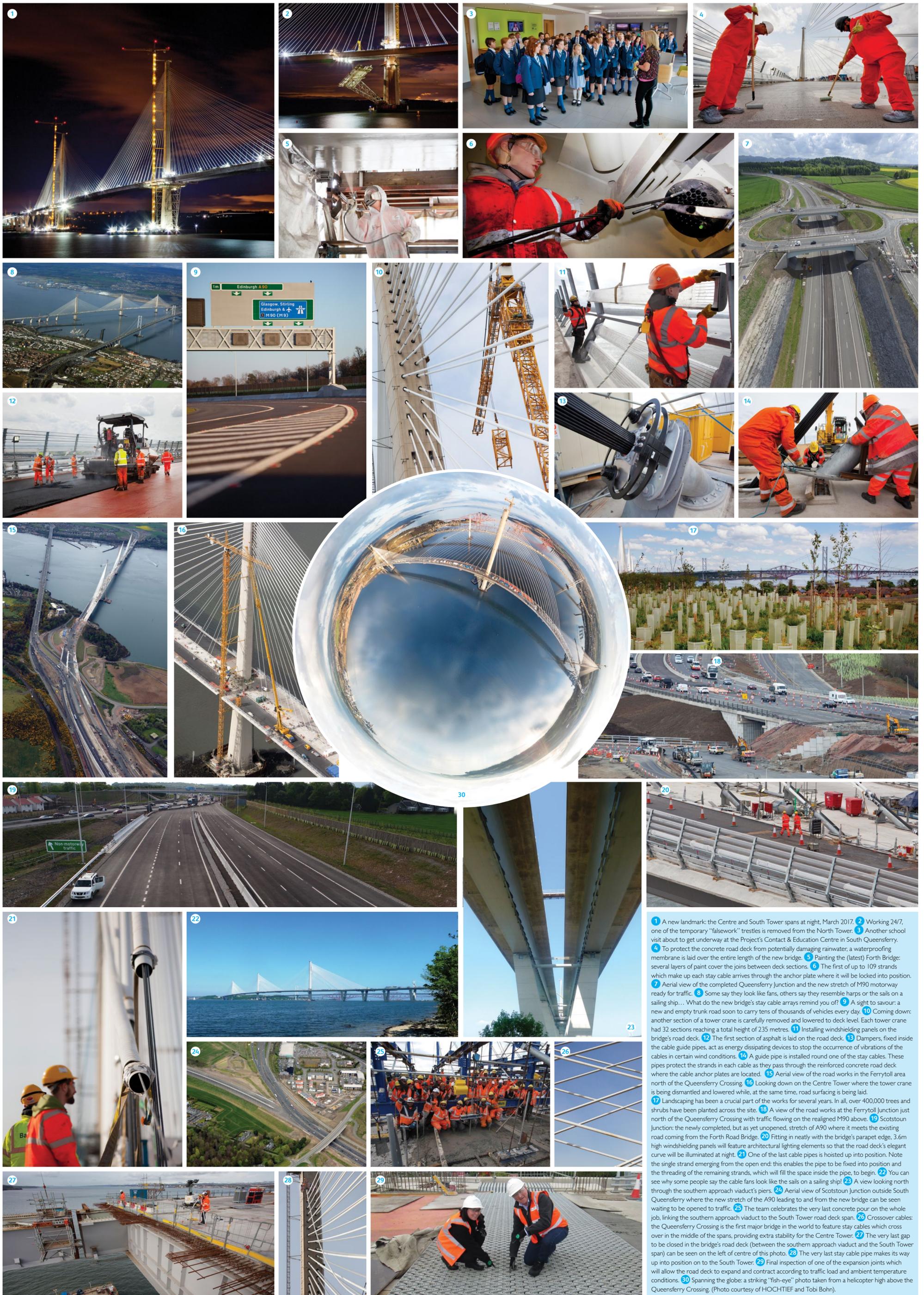


Building up a head of STEAM

Earlier this year, "Crossing the Black Water", a series of Science, Technology, Engineering, Arts and Mathematics (STEAM) workshops for Primary 7 pupils in Fife, was created in a partnership between Fife Council Economic Development, CCD Training, Fife Tourism Partnership and FCBC. The aim of the workshops was to inform young people about the history and construction of the famous Forth bridges and to highlight the wide range of different careers and disciplines involved in constructing the bridges.

Team working activities involved investigating the complex design of each bridge and the engineering technologies behind their construction. The workshops culminated in the pupils building their own bridge models.





1 A new landmark: the Centre and South Tower spans at night, March 2017. **2** Working 24/7, one of the temporary "falsework" trestles is removed from the North Tower. **3** Another school visit about to get underway at the Project's Contact & Education Centre in South Queensferry. **4** To protect the concrete road deck from potentially damaging rainwater, a waterproofing membrane is laid over the entire length of the new bridge. **5** Painting the (latest) Forth Bridge: several layers of paint cover the joints between deck sections. **6** The first of up to 109 strands which make up each stay cable arrives through the anchor plate where it will be locked into position. **7** Aerial view of the completed Queensferry Junction and the new stretch of M90 motorway ready for traffic. **8** Some say they look like fans, others say they resemble harps or the sails on a sailing ship... What do the new bridge's stay cable arrays remind you of? **9** A sight to savour: a new and empty trunk road soon to carry tens of thousands of vehicles every day. **10** Coming down: another section of a tower crane is carefully removed and lowered to deck level. Each tower crane had 32 sections reaching a total height of 235 metres. **11** Installing windshielding panels on the bridge's road deck. **12** The first section of asphalt is laid on the road deck. **13** Dampers, fixed inside the cable guide pipes, act as energy dissipating devices to stop the occurrence of vibrations of the cables in certain wind conditions. **14** A guide pipe is installed round one of the stay cables. These pipes protect the strands in each cable as they pass through the reinforced concrete road deck where the cable anchor plates are located. **15** Aerial view of the road works in the Ferrytoll area north of the Queensferry Crossing. **16** Looking down on the Centre Tower where the tower crane is being dismantled and lowered while, at the same time, road surfacing is being laid. **17** Landscaping has been a crucial part of the works for several years. In all, over 400,000 trees and shrubs have been planted across the site. **18** A view of the road works at the Ferrytoll Junction just north of the Queensferry Crossing with traffic flowing on the realigned M90 above. **19** Scotstoun Junction: the newly completed, but as yet unopened, stretch of A90 where it meets the existing road coming from the Forth Road Bridge. **20** Fitting in neatly with the bridge's parapet edge, 3.6m high windshielding panels will feature architectural lighting elements so that the road deck's elegant curve will be illuminated at night. **21** One of the last cable pipes is hoisted up into position. Note the single strand emerging from the open end: this enables the pipe to be fixed into position and the threading of the remaining strands, which will fill the space inside the pipe, to begin. **22** You can see why some people say the cable fans look like the sails on a sailing ship! **23** A view looking north through the southern approach viaduct's piers. **24** Aerial view of Scotstoun Junction outside South Queensferry where the new stretch of the A90 leading to and from the new bridge can be seen waiting to be opened to traffic. **25** The team celebrates the very last concrete pour on the whole job, linking the southern approach viaduct to the South Tower road deck span. **26** Cross-over cables: the Queensferry Crossing is the first major bridge in the world to feature stay cables which cross over in the middle of the spans, providing extra stability for the Centre Tower. **27** The very last gap to be closed in the bridge's road deck (between the southern approach viaduct and the South Tower span) can be seen on the left of centre of this photo. **28** The very last stay cable pipe makes its way up into position on to the South Tower. **29** Final inspection of one of the expansion joints which will allow the road deck to expand and contract according to traffic load and ambient temperature conditions. **30** Spanning the globe: a striking "fish-eye" photo taken from a helicopter high above the Queensferry Crossing. (Photo courtesy of HOCHTIEF and Tobi Bohn).



Powering the Bridge

One of the current areas of focus is on installing the electricity supply needed to power the various systems which will control the functioning of the bridge and monitor its performance for decades to come.

Graeme Sharp, one of FCBC's Mechanical, Electrical & Plumbing (MEP) Engineers, explains the importance of electricity to the new bridge.

The Queensferry Crossing will provide a vital link in our trunk road network and fulfil an important role in the economy for decades to come. In order to function properly and safely in all weather conditions night and day, it has many installations which require a reliable electricity supply.

We are currently installing a variety of lighting systems on the bridge structure and its immediate approaches. These include road lighting which will be placed between the nearest trunk road interchanges and the bridge to improve safety. This lighting is provided by modern, low level lighting bollards which illuminate the carriageways whilst reducing light pollution.

There is also an architectural lighting system built into the windshield structure as well as floodlights to illuminate the three towers which will ensure the distinctive shape of the

bridge is highlighted at night. Finally, in order to comply with safety regulations, we are installing high intensity LED marine navigation and aircraft warning lighting systems at the top and bottom of each tower.

The latest traffic management technology, called ITS (Intelligent Transport Systems), will feature on all the trunk roads approaching the Queensferry Crossing using overhead sign gantries to give drivers live travel information relating to journey times, incidents and diversions as well as mandatory variable speed limits. ITS will extend on to the bridge itself via cantilevered sign gantries attached to the towers. These, too, require electricity to operate.

However, it is below road level inside the deck "tubs" that the bulk of the systems requiring electricity are to be found. The bridge's interior needs an effective lighting system from end to end to enable maintenance crews to see what they are doing. Other installations which rely on electricity include:

- dehumidification systems to control humidity and inhibit possible corrosion
- elevators to transport maintenance crews up and down the towers
- maintenance monorail shuttles
- 1,500 structural health sensors which monitor and record "real time" information on how the bridge is coping with the various loads it has to handle



CAD image of how the architectural lighting will illuminate the Queensferry Crossing at night.

under different conditions, such as wind and temperature

- CCTV, access control and fire detection systems

These systems will enable the bridge operators – AMEY – to put in place reliable, evidence-based control and future maintenance programmes using accurate and comprehensive historical data. Obviously, a dependable source of electricity is absolutely vital, so we are installing emergency back-up generators which will automatically spring into action during any unplanned cuts in supply.

Installing, testing and commissioning all these electrical systems on the bridge and its approaches is a complex operation involving the laying of several hundred kilometres of electricity and fibre-optic cables. Electricity will lie at the heart of the successful, day-to-day operation of the Queensferry Crossing.



One of two main switchboards which control and distribute the power supplies to the many installations on the bridge requiring electricity.



Contacting the FRC team

There are a number of ways you can contact us to ask questions, provide comments, make a complaint or find out more about the Forth Replacement Crossing project:

Call the dedicated 24 hour Project Hotline **0800 078 6910**

Email the team **enquiries@forthereplacementcrossing.info**

Look for us online:

www.forthereplacementcrossing.info

www.queensferrycrossing.co.uk

www.queensferrycrossingarc.co.uk

@FRC_Queensferry

Or go to the Queensferry Crossing YouTube channel

Or drop into the **Contact & Education Centre**

Adjacent Forth Road Bridge Administration Office,
South Queensferry, Edinburgh EH30 9SF

Opening times

Mon-Thu: 0900-1700, Fri: 0900-1600, Sat: 1000-1600

