

Forth Replacement Crossing

# project update

February 2017



**History in the making:** the last of 122 deck segments is lifted up into position on 3rd February, achieving the final and historic “closure” of the Queensferry Crossing, the tallest bridge in the UK and the longest, three-towered, cable-stayed bridge in the world.

## Project Directors' Update

Into the final year: a brief round up of the latest progress on the Queensferry Crossing construction project.

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## Technical Focus

Finishing the job: with the main bridge structure virtually complete, we take a look at the many tasks now facing the team before the Queensferry Crossing can be declared open.

**Centre Pages**

## Photo Update

A selection of the latest photos from across the construction site will bring you up to speed with all the latest developments on this once-in-a-lifetime infrastructure project.

**Centre Pages & Back Page**



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## Bridge structure complete!

Welcome to the first edition of the Queensferry Crossing's "Project Update" newsletter for 2017. It's going to be an unforgettable year for everyone involved in this once-in-a-lifetime construction project – the culmination of all our hard work over the past six years and more with the completion of the new bridge and its much anticipated opening to traffic.



Michael Martin & David Climie.

2017 got off to an exciting start with the preparations for the installation of the very last deck section, known to us as SS25. Earlier this month, this "last piece of the jigsaw" was successfully lifted up into place, completing a pioneering deck installation process which began in September 2015. On any bridge project, the closure of the final gap represents a major milestone – perhaps the most significant of all. In civil engineering terms, the creation of the Queensferry Crossing's 2.7km road deck (with a total of 122 sections, weighing an average of 750 tonnes each, lifted up into position 60 metres above the Forth estuary and weighing an incredible combined total of approximately 85,000 tonnes) has been a massive undertaking. It is 21<sup>st</sup> century, leading edge civil engineering at its best and it is a pleasure to congratulate everybody in the team on this outstanding achievement.

The Project is now 95% complete and we are fully focussed on tackling the wide range of complex, technical "finishing works" which make up the remaining 5%. These all have to be completed before the first vehicles are allowed to make the crossing later this year. With the completion of the bridge structure itself, we now find we can open up a number of work fronts where activities can proceed simultaneously. Some things, like laying the road surface and installing the vehicle restraint system ("crash barriers") and windshielding panels, are obvious but the team is also facing a great variety of other, behind-the-scenes tasks, often inside the deck structure, which are no less critical to the completion, maintenance and long term viability of the Queensferry Crossing. Turn to "Technical Focus" on the Centre Pages for more details.

Good progress continues to be made right across the construction works. On the south approach viaduct, the casting of the final reinforced concrete deck section is all but complete and operations are underway to lay the vital waterproofing membrane and the final "black top" road surface as well as to install the windshielding panels. Waterproofing has also started along the length of the main bridge deck. Also at deck level, we have started to install four massive expansion joints, one at each end of the north and southbound carriageways, which allow for the constant movement in the deck structure created by traffic volume, wind load and ambient temperature.

Beneath road deck level, we have started the complex operation to remove the temporary steel structures at each tower, known as the tower trestles. Their main function was to support the first deck sections positioned around the towers but they have remained in place providing a platform for office units and workshop accommodation which have now been moved up on to the deck.

At the same time, the decommissioning and dismantling of the three yellow tower cranes – the tallest cranes in the UK – has begun, starting at the North Tower. Look out for them coming down, section by section, over the coming months. Once the cranes and falsework have been removed, we can then start to remove the

steel caissons at the foot of the North and South Towers and the cofferdam at the foot of the Centre Tower, allowing us for the first time to see the final, slender profile of the finished structure.

At the time of writing, only six pairs of stay cables remain to be installed. There are a total of 288 cables on the Queensferry Crossing containing approximately 23,000 miles of high tensile steel wire, almost enough to stretch right round the world. The signature feature of the bridge is where the cables cross over with each other mid-span in what is believed to be a world first in cable-stayed bridge design.

Construction of the North and South Abutment structures is essentially complete and the fitting out of their interiors (to provide office, workshop and storage space) is continuing. Turning to the network connections, the works on the south side are virtually complete with only minor works remaining including finishing the verges and the tie-in with the public transport link heading into Edinburgh. Traffic lights will become operational on the new Queensferry Junction roundabout this Spring. On the north side, late January saw the temporary realignment of both A90 carriageways onto a ramp to allow the completion of the permanent southbound carriageway. Beneath, the re-positioned Ferrytoll roundabout continues to function well. Traffic management regulations have worked effectively and, once again, we thank all passing motorists for their continuing understanding and patience which has done so much to keep any potential traffic disruption to an absolute minimum.

Finally, a word on landscaping. Last year, we planted 40,000 trees and shrubs across the site. This year, we will be planting a further 50,000. This is part of an on-going operation which started a few years ago and will see an impressive total of over 400,000 trees, shrubs and hedgerow plants planted as part of the Queensferry Crossing Project.

As ever, the weather continues to play a significant role in the job with many of the remaining tasks to a greater or lesser extent dependent on favourable weather conditions. While we have a credible timetable in place to achieve traffic opening by the end of May, it would be foolish to guarantee it. What we can guarantee is that we will spare absolutely no effort to finish the bridge on-time, safely and to the extremely high quality standards set out in the contract so that the end result is a bridge worthy of our pride and worthy, too, of its place next to its illustrious neighbours.

**David Climie**  
Transport Scotland Project Director

**Michael Martin**  
FCBC Project Director



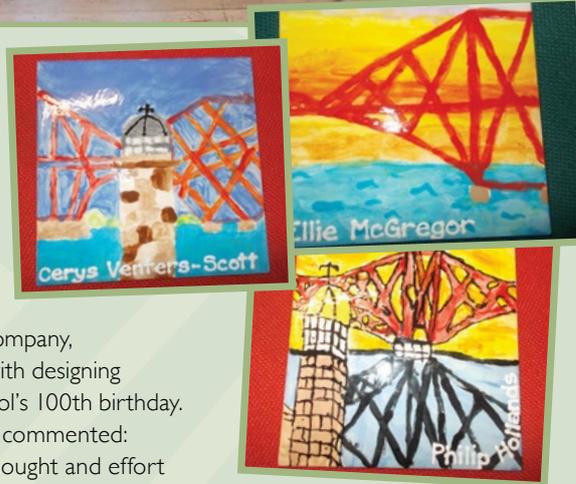
North Queensferry Primary pupils proudly display their tiles

Below: three of the colourful tiles inspired by local scenes

## Centenary Celebrations

North Queensferry Primary School's Centenary Tile Project has moved a step closer to completion thanks to funding from FCBC. Working with a local company, Ceramic Café, pupils were tasked with designing individual tiles to celebrate the school's 100th birthday.

Caroline Gardiner, Headteacher, commented: "The children put a great deal of thought and effort into their designs. We are very grateful to FCBC for their kind donation which will allow us to display the tiles within the school grounds for everyone to enjoy. This is a fitting and lasting commemoration of the school's significant birthday!"



## Working with Communities

The FRC Project Exhibition and Presentation Series at the Contact & Education Centre (CEC) recommenced in January with a series of annual update briefings for members of the public, elected representatives, stakeholders and media. These presentations were attended by over 400 people. Forums with representatives from communities north and south of the Forth continue on a quarterly basis and the schools' programme is proving as popular as ever.

The Project Exhibition at the CEC is open every Saturday from 10:00 to 16:00 and Project Presentations take place on the last Saturday and preceding Friday of every month at 10:30 and 13:00.

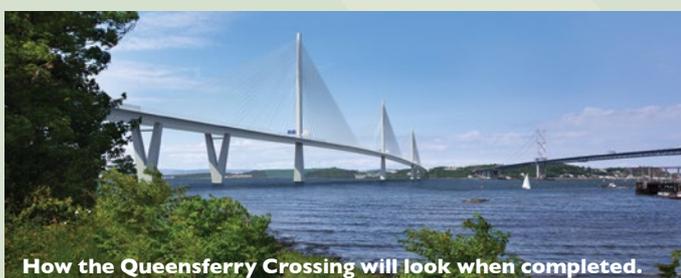


## Building Bridges

A community based project set up by local writer and performer, Gowan Calder, and supported by FCBC is seeking to "build bridges" between the people of North and South Queensferry. School children from North Queensferry Primary School and St Margaret's Primary School in South Queensferry will participate in a series of creative workshops run by local artists.

"The aim of the project is to utilise both our environment and members of our community to engage children in their local heritage," says Gowan.

The project began in October when North Queensferry based artist Karen Trotter spent two days with children exploring the local Ferry Glen (see photo), creating organic art works both in situ and back in the classroom. Other workshops will include the history of the Forth Bridges, developing themes around bridge building, music, drama and film.

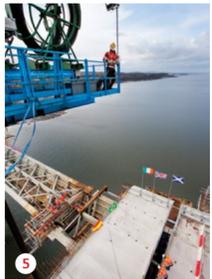


How the Queensferry Crossing will look when completed.





**1** The final deck segment begins its journey by barge from the dockside to the South Tower span. **2** A "fitting" conclusion: the final deck segment, weighing 570 tonnes, makes its way up to its destination. **3** Slipping neatly into the tight space at the top, members of the team can relax after another successful lift operation. **4** Worth cheering about, FCBC team members celebrate the completion of the final deck segment lift. **5** A brief moment of contemplation on the scale of what has been achieved as the last deck segment approaches the end of its journey. **6** Perfect conditions for a deck segment lift: light breeze, sunny, clear and dry. If only it was always like this out on the Forth! **7** Almost there: the culmination of a lot of hard work.



**1** Catching the sun, the new bridge is a stunning sight and destined to become a very familiar one. **2** Aerial view of one of the UK's most distinctive bridges. **3** On the road deck looking at the crossover stay-cables, a unique feature of the Queensferry Crossing. **4** The first of the temporary "trestles" is removed in January 2017 from the North Tower. **5** A unique location for bridges: the three bridges here span three centuries as well as the Forth. **6** A view of the southern approach viaduct and its series of supporting, V-shaped piers. **7** Proud to be a part of the team on this special bridge. **8** Aerial view of the narrowing gap between the southern approach viaduct and the South Tower deck span, January 2017.



## Technical Focus



### Working through a big "to-do" list

With the last of 122 deck segments now installed, the Queensferry Crossing's structure is essentially complete. But a huge amount of work remains to be done before the bridge is finished and traffic can start flowing across what is one of the world's great bridges. Here **Alan Platt**, FCBC Construction Director, summarises the finishing works to be completed this winter and Spring to allow the bridge to open.

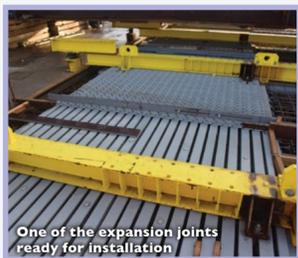
Below is a brief description of the principal tasks still to be carried out or completed. Many of them – the laying of the road surface, for example – could not begin until the bridge structure itself was complete. Others, such as the installation of the various mechanical and electrical systems, started earlier but their completion similarly has had to await the completion of the main structure.

#### External Works: the most visible

**Stay-cables:** at the time of writing, there are still six pairs of stay-cables to be installed. These are the longest on the whole Project (up to 420m in length) so the experience gained over the past 15 months in threading the individual steel strands which make up each cable through the long external white pipes will be invaluable. Each of the 288 cables is individually load checked to ensure the correct geometry of the road deck below and to make sure they will perform their function to the optimum for many years to come.

**Road surface:** from abutment to abutment, the laying of a specialist waterproof membrane on top of the reinforced concrete deck is now in full swing. This membrane protects the concrete from the potential harmful corroding effects of rainwater sitting on top. Next, we will place a layer of hot rolled asphalt over the membrane before the final course of low noise "black top" is laid and the road surface is complete.

**Expansion joints:** being installed at both ends of each carriageway between the bridge's road deck and the approach roads, a total of four expansion joints will ensure the road deck



One of the expansion joints ready for installation



Stunning all day long: a computer generated image of the nighttime architectural lighting

can move – as it's designed to do – vertically, longitudinally and laterally according to current traffic load, ambient temperature and wind load. These are some of the largest expansion joints ever manufactured and installed, accommodating an impressive range of 2.3 metres of movement.

**Wind & noise barrier:** unlike the Forth Road Bridge, the Queensferry Crossing features a modern wind barrier system designed to reduce the impact of the wind on traffic, therefore keeping the bridge open to traffic in all but the rarest and most extreme of weather conditions. In total, we will be installing 5.7km of 3.6 metre high, open-louvered windshielding panels along the east and west edges of the entire structure and on the Ferrytoll viaduct just north of the new bridge. At the southern end of the bridge, the wind barrier will be further enhanced to help mitigate the impact of traffic noise on nearby residents.

**Vehicle restraint system:** more commonly known as "crash barriers", these will also be installed along the entire length of the road deck on both sides of the carriageways.

**Lighting:** various types of lighting systems have to be installed on the structure. The road lighting on the bridge is limited to the ends of the structure at the approaches to

the road junctions. This lighting is provided by modern, low level street lights which illuminate the carriageways whilst reducing light pollution. There is also architectural lighting built into the wind barrier as well as up and down the towers which will ensure the distinctive shape and structure of the bridge is highlighted at night. Finally, for safety, there are marine navigation and aircraft warning lighting systems to be installed across the structure.

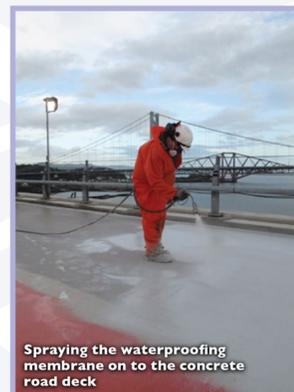
**Inspection gantries & cradles:** in order to allow regular inspections and maintenance of the steel undersides of the deck, four mobile gantries will be installed, between them capable of covering the full length of the road deck. Two further gantries carry out the same function on the approach viaducts. Tower inspection cradles will also be provided.

**Tower cranes:** the beginning of the year saw the start of the decommissioning and dismantling of the three enormous yellow cranes (at approximately 235 metres in height, the highest anywhere in the UK) which have stood next to the Queensferry Crossing's towers for the past three years and more. Work on this will continue for a few more months.

**Falsework:** the six temporary steel "trestles" (known as falsework) either side of each tower below deck level and the



Installation of windshielding panels on the northern approach viaduct



Spraying the waterproofing membrane on to the concrete road deck

temporary work platforms they support have to be removed. Indeed, the first came down in late January. Weighing several hundred tonnes each, these temporary structures will be pivoted at the base of the towers and lowered onto a barge below before being removed for re-cycling.

**Caissons & cofferdams:** other temporary steel structures due to be removed in the next few weeks include the temporary caissons around the North and South Towers and the cofferdam at the base of the Centre Tower on Beamer Rock. Their removal will allow the sea to come in and lap directly against the towers whose concrete is specifically designed to be impervious to the effects of water.

#### Internal Works: less visible, just as crucial

**Abutments:** fitting out of the north and south abutments will continue over the next couple of months to provide office, workshop and storage space as well as access to the inside of the road deck. The abutments are also the hub of all the services that are provided in and onto the bridge (for example, power, water, drainage, security and CCTV).

**MEP works:** "MEP" stands for mechanical, electrical and plumbing and covers the installation of a wide range of hardware vital for the successful long-term operation of the Queensferry Crossing. Principally these include the power supply (and an emergency back-up supply in the event of power cuts) needed to power all the various items of electrical apparatus used to operate the bridge.

**Deck shuttles:** running the entire length of the bridge, inside the steel deck, will be two monorail shuttle cars, one for each carriageway, which will be used to transport equipment and personnel for bridge inspections and during periods of maintenance.

**Dehumidification:** currently being set up is a high capacity dehumidification system which will keep the inside of the steel road deck and the towers dry and free of any condensation or damp. Moisture will always find a way into any structure, but eight high capacity dehumidifiers are being installed which will keep the air inside moving and minimise moisture in the bridge's interior.

**Lifts, stairways and walkways:** the inside of each tower will feature a stairway from sea-level to tower top and, additionally, a lift from road deck level up to the top of the tower. Inside the steel deck, no less than 7.5km of walkways will allow access to the entire structure.



A section of the tower crane structure after removal

**Drainage:** a system of drainage pipes and outlets is being installed along the length of the bridge to allow rainwater to drain away easily and efficiently from both the road surface and other areas of the bridge.

**Cleansing water:** passing vehicles (in the case of the Queensferry Crossing likely to be in the region of 25 million vehicles per year) always make a bridge dirty and in less than optimum condition. So, a system of water pipes and taps is also being installed in the bridge to enable the various structural elements and such things as the lighting and wind barrier panels to be kept clean and in good condition.

**Control Room:** the long-term operation of both the Queensferry Crossing and the Forth Road Bridge will be the responsibility of the bridge operators, currently AMEY, based in their Control Room in South Queensferry, a couple of kilometres from the new bridge. A comprehensive network of electrical cables and fibre optic cables is being laid to connect the bridge's hi-tech operating systems to the Control Room where all the bridge's systems will be monitored 24 hours a day.

**Structural health monitoring:** this system measures various parameters relating to the structure of the bridge and indicates how, over time, it is coping with the loads it is being asked to handle under different conditions such as wind, temperature, movement and deflection. Linked sensors constantly monitor and store a wide range of data which is fed back to the Control Room.

**CCTV and fire detection:** the bridge will feature the latest CCTV technology to allow the bridge operators in their Control Room to monitor traffic movements and any other activities on the bridge. A comprehensive fire detection and alarm system is also due to be installed in the coming weeks.

**Security:** across the structure, there are over 300 access ways and doors. Each one is locked and most have active security systems, working in tandem with the CCTV cameras, to alert the Control Room should there be any unauthorised access to a particular area.

**So... if anybody tells you that the bridge is nearly finished just because it looks finished from a distance, please show them this article! As you can see, there remains a great deal of vital work to do before the first vehicles cross this magnificent bridge later in the year.**



The maintenance shuttle being trialled prior to delivery to site

# Photo Collage



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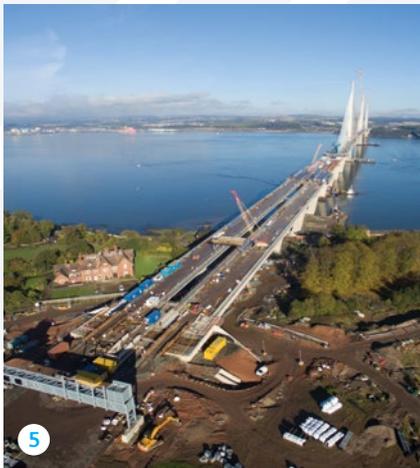
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5



6

**ROADS:** 1 December 2016, an aerial view of the complex road works underway on and around the M90 just north of the new bridge. 2 On the south side, looking east over the new, completed Queensferry Junction towards South Queensferry. 3 Virtually complete, the new stretch of motorway south of the new bridge has had the final black top road surface laid and the white lines painted. 4 It was a very complex operation to re-position the Ferrytoll roundabout north of the Queensferry Crossing while keeping traffic flowing at all times. The new roundabout was opened to traffic in November 2016. 5 Looking north over the south abutment area and the southern approach viaduct. 6 Looking west along the realigned A90 coming from Edinburgh and M90 Spur heading towards the new bridge.



## 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@forthreplacementcrossing.info**

Look for us online:

[www.forthreplacementcrossing.info](http://www.forthreplacementcrossing.info)

[www.queensferrycrossing.co.uk](http://www.queensferrycrossing.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



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