

Concrete evidence of progress

The final stage in the completion of the new bridge's foundations will begin this Spring. Here, FCBC Senior Materials Engineer, **John McEvoy**, outlines some of the challenges involved in carrying out one of the largest underwater concrete pours ever seen in Europe.

The route which the new bridge will take across the Forth is now picked out by the position of the three steel caissons and various sheet piled cofferdams which help form the foundations of the bridge's towers and piers.

The operation to backfill the caissons with underwater concrete has been the subject of detailed planning for many months. At the end of last year, a specially designed concrete batching plant was constructed on-site in the Rosyth docks. The plant is fully computerised and automated, making it one of the most modern in the UK. The concrete will be batched here before being shipped out on barges to the middle of the Forth in a continuous operation which, at its peak, will involve up to 100 people.

In operations of this sort, you only get one chance to get everything right. That's why we are carrying out extensive advance trials in our on-site laboratory to ensure exactly the right mix and consistency of concrete. These trials are going well. When the operation starts for real, the team will be required to deliver a total of 33,000 cubic metres of underwater concrete to the three caissons. The biggest single pour is planned to be 18,200 cubic metres for the South Tower foundation, the plan being to complete the pour in a non-stop process, 24 hours a day, lasting up to two weeks.

Much of the raw materials which make up the concrete – the sand, aggregates and water, for example – is being sourced locally. At full tilt, the plant will be producing up to 120 cubic metres of concrete per hour, a very high production rate. That means a truck-load will be leaving the plant



A view of the FCBC concrete batching plant, Rosyth

every four minutes and making its way to the dockside where it is pumped onto one of four specially designed barges, each carrying six static concrete mixers on its deck. These mixers keep the concrete mix "live" as the barges, which were specially fitted out for FCBC by Briggs Marine in Burmtisland, are pulled by tugs out to location. Each mixer carries 12 cubic metres of concrete, giving each barge a total capacity of 72 cubic metres.

On arrival at the destination, the concrete is pumped from the mixers into the foundation caissons through a "tremie" pipe which moves around the inside of the structure on flotation devices in order to ensure an even spread. The pipe is withdrawn upwards as the concrete rises. At this stage, the concrete mix is close to the consistency of runny porridge. This fluidity ensures it settles correctly and any trapped air is driven up to the surface. Underwater concrete contains a retarding agent to delay the setting process and a waterproofing agent which ensures the substance does not mix with the seawater inside the caissons. As the concrete level rises, the seawater inside is displaced back into the Forth. When complete, the concrete will not be visible to observers since the top surface of the completed concrete pour will be 14 metres below sea level.

To put some scale on things, it is worth pointing out, for example, that the South Caisson alone will account for 250 barge trips!

The concrete pour operation is executed in one continuous cycle. As one barge is discharging its load, another will be returning to dock to fill up again. A third will be in transit, fully loaded, while the fourth will be in dock filling up. Each complete cycle – filling up, sailing to the site, unloading and returning to dock – will take up to four hours.

The main challenges in a non-stop process like this are logistical: ensuring a constant supply of raw materials to the batching plant followed by correct batching to produce the right quality of concrete. Careful management of the plant and having back-up measures to take account of any breakdowns will guarantee the desired, consistent rate of supply is achieved.

A further consideration is the need for us to liaise closely with all marine traffic out on the Forth. This includes the requirement to vacate the dockside at the North Quay on those occasions when international cruise ships are calling into port.

The team is ready for the challenge ahead and is pleased to be playing a part in one of the most important aspects in the construction of this new historic bridge.



Showcasing the Forth Replacement Crossing project

Lawrence Shackman, Transport Scotland Project Manager, explains the role which the recently completed Contact & Education Centre (CEC) in South Queensferry will play in the years ahead.

Q What is the purpose of the CEC?

A It has two principal functions. Firstly, it is the main contact point for the public to raise any issues or to obtain information relating to the project directly from members of the project team. Secondly, it provides a large exhibition space where members of the public and interested groups, such as schools and colleges, can pre-book for presentations on the project and see the permanent exhibition which will be updated regularly as construction progresses. From this month, the CEC will also become home to the Traffic Scotland Control Centre from where road conditions Scotland-wide are monitored and the variable message signs on motorways and trunk roads are controlled.

the bridge's road deck to the towers. In addition, modern audio visual equipment will provide information to enhance the permanent exhibition.

Q Is it normal for buildings like this to be built around construction projects?

A Not at all. It is a reflection of the scale of this project and the level of public interest in it that we felt a dedicated exhibition space was required. The CEC represents a great opportunity to showcase this amazing construction project and help the public to understand what is involved, as the bridge takes shape. With windows over five metres high looking out over the Forth, the space offers an unrivalled view of the two existing bridges and the construction site of the new bridge. We believe there is nowhere else in the world where you can see three iconic bridges representing the highpoint of engineering in three different centuries. Who knows, maybe a new generation of budding young engineers will be inspired to pursue a career in construction from watching and understanding the processes involved in building this bridge. We certainly hope so!



However, private groups are very welcome to book trips to come and see the exhibition and members of the FRC team will be happy to give them a presentation on construction progress. We are arranging a series of regular Open Days which will be run from 10am till 4pm. These will be advertised locally. In April, Open Days are scheduled for Friday 5th, Saturday 6th, Friday 26th and Saturday 27th and we look forward to welcoming as many members of the public as possible on those occasions. The new building, built by Dawn Construction to a design by Jacobs Arup, is well worth a visit.

Q Is the CEC available for private hire?

A Because the CEC is a working office 24 hours a day, seven days a week, it is, unfortunately, not possible to hire the exhibition space for private events.

If you are interested in visiting the CEC, group bookings can be made by ringing 0131 331 4514 or on-line at www.transportscotland.gov.uk/road/projects/forth-replacement-crossing/communities/Contact-and-Education-Centre/booking

project update

March 2013



M9 Junction 1a before...



...and after



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

Log on to the project website at www.forthreplacementcrossing.info

Or drop into the **Contact & Education Centre** Adjacent Forth Road Bridge Administration Office, South Queensferry, West Lothian EH30 9SE

Opening times
Mon-Fri: 0900-1730, Sat: 1000-1600



Project Directors' update

An overview of progress to date on the Forth Replacement Crossing project. **Page 2**

M9 Junction 1a and Fife ITS

The roadworks to improve direct road access to the new bridge for north and southbound traffic are now complete. **Page 3**

Technical focus

We take a look at what's involved in filling the foundation caissons with underwater concrete. **Page 5**



Moving steadily ahead

Welcome to the latest edition of our quarterly newsletter containing news about the Forth Replacement Crossing project. Our aim is to keep readers up-to-speed with activity on this vital infrastructure project – one of the biggest currently underway anywhere in the country – and to let you know what will be happening in the period ahead.

As we went to press last time, work had just been completed on the installation of the new Intelligent Transport System (ITS) on the M90 north of the Forth, the temporary road works had been removed and the dedicated bus lane (the first on a Scottish motorway) had become operational. Early monitoring of the scheme has seen buses making good use of the bus lane and more stable traffic flows along this busy stretch of road at peak hours (see p 3).

Another milestone was reached at the beginning of February when construction work on the remodelling of Junction 1a of the M9 was also completed – ahead of schedule (see p 3). The improvement works have widened the M9 at key locations, improved existing slip roads and, for the first time, allowed traffic to flow between the M9 Spur (now renamed the M90) and the M9 towards West Lothian using new west-facing slip roads. The Fife ITS and M9 Junction 1a schemes not only represent major improvements to Scotland's trunk road network in themselves, but are vital elements in eventually connecting the new bridge to the network when it is opened.

Also completed is the new Contact & Education Centre in South Queensferry which will provide an important information link between the FRC construction team, interested organisations and members of the public for the remainder of the project (see back page for more details).

Work on the new bridge's foundations is continuing. Local people will be familiar by now with the sight of the three steel caissons and various cofferdams out in the estuary. In the period ahead, we will face the challenge of pouring the huge



David Climie and Carlo Germani

underwater concrete plugs in the caissons (see p 5). These plugs will form the foundations of the reinforced concrete tower bases. In all, some 33,000 cubic metres of specialist underwater concrete is involved – one of the biggest non-stop concrete pours ever seen in Europe. Logistics planning and concrete pre-testing for this operation are at an advanced stage and a dedicated concrete batching plant has been established in Rosyth Docks.

Finally, a special event. On 1st March, FCBC hosted a visit by "veterans" of the Forth Road Bridge construction project 1958-64 keen to share their experiences and learn all about the design of the new bridge and the technical challenges involved in its construction (see p 4). It was a real honour to meet these talented and committed people who helped build "our" bridge's famous predecessor, the longest suspension bridge in Europe at the time. Whilst there are a lot of similarities in construction methods between now and then, much has also changed for the better, especially welfare and Health & Safety standards. Many fascinating tales were swapped during the day!

David Climie
Transport Scotland
Project Director

Carlo Germani
FCBC
Project Director



What's in a name?

The search for an official name for the new bridge has captured the public's imagination in a big way. During the 9 week nomination phase which ended on 31 January, an incredible 7,600 separate names were nominated via the Name The Bridge website, by post and by telephone. Over 1100 separate comments were also left in support of people's favourite suggestions.

An independent advisory panel is now tasked with drawing up a shortlist which will be put to a public vote in late Spring. Meanwhile, nearly 300 schools have entered a linked competition to win a VIP visit to the site next year and the opening ceremony in 2016.

Public briefings

Transport Scotland and contractors FCBC are committed to keeping everyone well-informed about the project's progress as construction continues and to provide information on upcoming works. The newly opened Contact & Education Centre was the venue for a series of public meetings and briefing sessions held at end of January.

Over 200 people attended the four public sessions and associated briefings for elected members, representatives from stakeholder organisations and media. Thanks to everyone who came. Further events will be held as the project progresses.

Improved junction completed ahead of schedule

A major milestone in the FRC Project has been achieved with the completion of the M9 junction 1a upgrade works, writes Seamus O'Brien, SRB Project Manager. SRB Civil Engineering completed the works ahead of schedule which meant that the junction became fully operational on the 1st February when it was officially opened by Scottish Transport Minister, Keith Brown MSP.

The works to improve this vital link to and from the new Forth Crossing began in July 2011. Since then, the landscape of the area around the junction has seen some significant changes, including:

- major earthworks to construct the new west facing link roads (see front cover).
- construction of a new bridge structure over the M9.
- installation of 17 gantries which form the backbone for the new ITS system which is being installed throughout the complete Forth Replacement Crossing scheme from Halbeath in Fife to Junction 1a of the M9.
- modifications to existing structures and culverts.

In excess of 400,000 man hours were put into this difficult project which was carried out with live traffic running through the site on a daily basis.

Traffic management was one of the major challenges for the team; whilst some queuing was inevitable in a project of this scale and complexity, in general commuting



Scottish Transport Minister, Keith Brown MSP, and the Junction 1a team at the Official Opening

traffic experienced minimal disruption. Since the junction has been opened fully, there has been a significant drop in the levels of traffic queuing in peak hours in the village of Kirkliston and on the M9 Spur southbound.

SRB would like to thank everyone involved in the project, the Employer's Delivery Team,

designers, sub-contractors and the local communities to mention just a few. Everyone in SRB Civil Engineering Limited is proud to have played a part in this project and we wish all the best to everyone involved in the rest of the Forth Replacement Crossing project in the years ahead.

ITS working well

The Scottish winter has thrown us all its usual challenges but this hasn't stopped the Forth Replacement Crossing from delivering some key elements of the project ahead of schedule.

On 4th December last year, the Fife ITS contract on the M90 reached completion. As well as significantly upgrading the road itself, the scheme introduces new features for Scotland's trunk road network with the introduction of variable mandatory speed limits and bus priority lanes, delivered as part of the phased introduction of ITS (Intelligent Transport Systems) across the FRC corridor from Halbeath on the M90 in the north to Junction 1a of the M9 on the south side.

ITS uses overhead gantry-mounted equipment to assist in the management of traffic. The state-of-the-art technology detects traffic building up and then lowers the mandatory speed limit to smooth flow and reduce queuing. The gantries also control bus lane operation, ensuring the hard shoulder is always available in emergencies.

The system is managed by staff at the Traffic Scotland Control Centre where the traffic flows, ITS data and displays are continually monitored. The system will be evaluated to ensure positive adjustments can be made to improve it further.

The full benefits of ITS won't be felt until the new bridge



M90 Masterton Junction in Fife

is complete but Transport Scotland's FRC Roads Infrastructure Manager, Steven Brown, said the system is already working well. Steven said: "For the past 16 months, regular commuters on the M9 and M90 in the vicinity of the Forth Road Bridge have patiently witnessed the construction of the M9 Junction 1a and Fife ITS projects. It's still early days in this initial 'optimising' phase, however initial benefits are already being seen as traffic speeds at peak-time are being reduced on the approach to queues, helping to alleviate congestion and reduce the risk of accidents. More information is being provided to motorists via the electronic signs and public transport users are benefiting from quicker journeys as buses are utilising the bus lanes to bypass slow moving traffic."

Monitoring work will continue to ensure this level of service on this vital stretch of road is maintained.

Forth Road Bridge veterans' visit



On 1st March, we welcomed 30 veterans from the Forth Road Bridge construction project of 50 years ago to a Briefing Day on the site starting with a presentation at the Contact & Education Centre and culminating in a full site tour. The distinguished visitors thoroughly enjoyed their day and asked many searching questions of the FRC team. Both current and former bridge builders enjoyed swapping tales and finding out just how much things have changed in the last five decades. Many of the veterans hadn't seen each other for many years, so it was a chance to catch up on old friends as well as make some new ones. FCBC hopes to host other such visits in the years to come.



School visit

P6/7 pupils from Kings Road Primary in Rosyth pose with Miss Garrett and FCBC's Sally Chambers after completing their bridge building exercise and quizzes.

Helping good causes

The second round of FCBC's Environmental Monitor Host awards took place in February with local people who have kindly agreed to house our air quality, noise and vibration monitors and weather stations receiving cheques to the value of £500 each to give to good causes of their choice. Among the organisations to benefit this year are Queensferry Churches Care in the Community, RNLI, Queensferry First Responders, St Margaret's Primary School, Hillfield Swifts Junior Football Club, St Columbas Hospice, South Queensferry Primary School, North Queensferry Primary School and Scotsguards Colonel's Fund. A well worthwhile initiative and our thanks go to the Monitor Hosts.

Painting competition

Our work with local primary schools (and some not so local, Galashiels being our furthest afield so far) has been progressing well and we received an overwhelming response to our invitation to take part in our "Forth Replacement Crossing in the Making" painting competition. The standard of entries was extremely high, giving the judges a very difficult task in selecting the prize winners. Results will be announced soon and an awards ceremony held. FCBC will be making many of the winning entries into posters which will appear in high profile locations in and around the FRC site.

Promoting road safety

In December, FCBC was delighted, as main sponsors of the Fife Constabulary Road Safety Poster competition, to present a brand new bike purchased from Sandy Wallace Cycles (Inverkeithing) to winning poster designer, Isla Donald, who is in Primary 4 at Park Primary School in Rosyth. Eight year-old Isla proved to be a very proud winner and immediately sped off on a test ride within the boundaries of the school playground. Happy and safe cycling to Isla!



Public briefings and new Queensferry Junction

Another busy time for the Community Liaison team has seen them make a number of visits to schools, colleges, universities, clubs and community groups – as well as hosting on-site visits by others.

We have also had two public briefings in the period, providing a thorough update on construction progress and on upcoming activity over the next eighteen months. This included the proposed phasing of the works for the new A904 Queensferry Junction which will be to the west of South Queensferry. Here, the bulk of the new roads will be constructed "off-line" to minimise interference with existing roads. Then the final road connections will be made to enable traffic to switch onto the new roundabout. Towards the end of 2013 and in advance of the main part of these junction works commencing in earnest, we will hold another public meeting to explain these works and timings in more detail. Additionally, further briefings will be held later this year to explain the construction phasing for the works around the Ferrytoll junction area on the north side.

Contact the Community Liaison Team

If you would like to speak to the Community Liaison team – perhaps you have an idea for a new community initiative or would like us to come and give a presentation on the latest developments – please see the contact details on the back page.

www.forthreplacementcrossing.info