

BUILDING THE MERSEY GATEWAY

a step by step guide



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INTRODUCTION

Construction of the new Mersey Gateway Bridge across the Mersey Estuary and connecting it to the main road network is a hugely challenging and complicated task.

Whilst it looks like one single bridge across the estuary, the bridge is actually made up of three parts – the main bridge structure across the river and then two elevated approach viaducts connecting it to the main road networks in Widnes and Runcorn.

The project is about much more than just a bridge. It also involves upgrading 7km of highways to the north and south of the river (the main bridge is 2.2km long), and changing traffic flow so the vast majority of traffic will use the new bridge. The construction team will be building 12 new bridges across the site, which stretches from Speke Road in Widnes to Junction 12 of the M56 in Runcorn.

The Merseylink team is on programme to complete the project and have the new bridge open to the public in the autumn of 2017.

The project is being constructed in a number of overlapping stages.

1 ACCESS ROADS



Temporary access roads

In order for the construction teams to reach and work in the estuary, we started by building access roads.

These two access roads have been built across the saltmarsh on both sides of the river.

The access roads will be removed once the new bridge has been built. The saltmarsh and the adjoining land on both sides of the river will be restored to their original condition as part of a final landscaping scheme.

The work started in May 2014 and took 16 weeks to complete.

Approximately 200,000 tonnes of locally-sourced stone was used to construct the two access roads. These will provide a safe method of reaching the estuary by workers and the heavy machinery required to build the bridge.

2 TEMPORARY BRIDGE



View of the temporary trestle bridge looking southwards towards Runcorn

We have completed a temporary trestle bridge as an access platform for the construction teams to work from when building the new structures in the river.

In August 2014, work started on the bridge at both sides of the estuary – at Wigg Island in Runcorn and Spike Island in Widnes. The structure is approximately 1,000m long and 9m wide.

To build the trestle, around 140 steel piles were driven approximately 16m into the ground to support the temporary structure. Each pile is 20m long and weighs 3 tonnes.

Hundreds of concrete slabs, which form the trestle bridge road surface, have been made in nearby Northwich, while the trestle frame was manufactured in Warrington.

The trestle bridge was completed in May 2015. It will be dismantled and removed completely once the new Mersey Gateway Bridge has been constructed.

3 PYLON FOUNDATIONS



Excavations for the southern pylon taking place within the temporary cofferdam

We are building temporary cofferdams to enable foundations to be laid for the three pylons that will support the main bridge.

The foundations for the three bridge pylons need to be placed in the riverbed below water level. This can only be done in a dry environment so cofferdams are used to create temporary watertight enclosures.

These are formed by driving huge sheets of steel (steel piles) into the riverbed to form two circular enclosed spaces: an outer circle of 40m in diameter and an inner circle of 20m in diameter.

Approximately 300 steel piles will be used for each cofferdam: around 200 for the outer circle and 100 for the inner circle.

Once built, water is pumped out and the cofferdams are filled with locally sourced stone or sand (approximately 8,000 tonnes) to create a dry environment. This allows workers and equipment to access the site and begin the necessary excavation inside the inner circle for the foundation works for the bridge pylons.

Construction of the foundations involves making a concrete base layer – or floor – inside the cofferdams

and assembling a steel cage made out of 190 tonnes of steel reinforcing bars. Upright steel reinforcement bars are then fixed into the centre of the cage to form the beginnings of the pylon shaft.

Once the assembly work is finished, up to 1,400 cubic metres of concrete is pumped into the cofferdams to form the foundations.

The north and south pylon foundations were completed in early August 2015 and the concrete pour for the central cofferdam foundations will take place in autumn 2015. Once the new bridge is completed the cofferdams will be removed.

4 SUPPORTING PIERS



We need to build supporting piers for the elevated approach viaducts, which cross the Manchester Ship Canal and the St Helens Canal.

Work is already underway to build the foundations for these supporting structures – where the bridge meets the land at either side of the estuary.

Each approach viaduct is held up by a number of supporting piers – there are 20 in total, which will stretch across the saltmarsh on either side of the estuary.

Once the foundations for the 20 piers have been laid, a reinforced concrete base (a pile cap) for each main pier column or ‘shaft’ will be built. Work will then start on the pier shaft itself, which is also made out of reinforced concrete.

Each pier shaft will be 5.8m x 3.5m deep with the height varying depending where the pier is situated. The tallest pier, nearest to the centre of the bridge, will be around 20m high and the shortest pier, nearest to the land, will be around 2m high.

Once a pier shaft has been built it will be topped with a ‘pier head’. This is a huge block of load bearing

reinforced concrete, which will support the main bridge deck.

This work started in early 2015 and is due for completion in early 2017.

5 ELEVATED APPROACH VIADUCTS



The elevated approach viaducts will be constructed out of reinforced concrete using a specially-built movable scaffolding system (MSS) – which looks and operates a bit like a giant Meccano set.

The MSS is a large piece of construction equipment, which once assembled, will attach to the bridge piers and enable the elevated approach viaducts to be built over the Mersey Estuary.

It is being put together on site and will be 157m long, 22m wide and will weigh 1500 tonnes when fully

assembled. It will take around three to four months to construct and will be on site for around 19 months.

The MSS will act as a giant concrete mould for the deck of the approach viaducts, which will be constructed in sections (known as ‘spans’) approximately 70m in length. It will take a few weeks to build each span.

Part of the machinery has to be attached to the bridge piers so that the machine can slide along. The process involves locking the MSS onto the bridge piers and then pouring concrete into the mould to create a deck span. The equipment then moves along to create the next span and the process begins again.

This process will be repeated until all eleven bridge piers on the north side have been connected, at which point it will be dismantled and transported to Runcorn. We will then begin work on the nine piers of the southern approach to the new bridge. In total around 23,000 cubic meters of concrete will be used to build the 19 spans.

This work will start in the summer of 2015 and is due for completion in 2016.

The MSS has been designed specifically for this project. When the work is complete, the equipment will be dismantled and recycled.

6 THE MAIN BRIDGE



The main crossing looking south towards Runcorn

The main bridge deck and three main pylons will be linked together with steel cables known as 'stay cables'.

The new bridge is unusual in that the two outer pylons (110m and 125m) will be taller than the central pylon (80m), giving it a unique look amongst major bridges in the UK.

Specialist equipment, known as 'auto-climbing system formwork', will be used to construct the pylons. This equipment enables vertical concrete structures to be built at height safely and efficiently. It works by building a section of the pylon then repeatedly 'climbing'

upwards to create the next section until the structure is complete.

Machines called form travellers will be used to build the main bridge deck between the bridge pylons. Form travellers act as movable concrete moulds for the deck spans and work in a similar way to the MSS, which is being used to build the approach viaduct.

The form travellers will be assembled on the cofferdam and then lifted by a hydraulic system to the bridge deck level where they will be fixed in place. After the first span has been cast it is then connected to a stay cable and the pylon for support.

The two form travellers are then separated and moved to the next span position, so the deck effectively 'grows' from each side of the pylon until the main bridge deck is complete.

The form travellers will arrive on site in September 2015, with pre-assembly and preparation works starting soon after. This work is due for completion in 2017.

7 IMPROVING THE ROAD NETWORK



The new Widnes Loops Junction

We need to reconfigure eight major road junctions in Runcorn and Widnes to improve the road network so it directs through traffic over the new bridge and away from the over-used Silver Jubilee Bridge.

This involves upgrading 7km of highways to the north and south of the river (the main bridge is 2.2km long), and changing traffic flow so the vast majority of traffic will use the new bridge. The construction team will be building 12 new bridges across the site, which stretches from Speke Road in Widnes to Junction 12 of the M56 in Runcorn.

This work is absolutely vital to connect the bridge to the main road network but it will inevitably cause some disruption to traffic during construction.

Work has already started in several locations and will be ongoing through to 2017.

8 IMPROVING THE ENVIRONMENT



How the Bridgewater Canal in Runcorn could look in the future

Reusing and restoring the land across the project site is important, as it will allow us to make major environmental improvements.

A significant amount of material is being excavated from within the project boundary and nearly all of this material will be reused on site.

In total, approximately 708,000m³ of material will be excavated – enough to fill 284 Olympic-sized swimming pools.

Approximately 98% of this material – almost 700,000m³ – is being treated if needed and then

reused as fill for embankments and landscaping activity across the Mersey Gateway site.

This will leave only 15,000m³ – or the equivalent of six Olympic-sized swimming pools – to be disposed of through landfill.

There will be an extensive landscaping programme once construction has finished. This will involve planting thousands of trees and hedges along the route and landscaping the surrounding area.

A special charitable trust – the Mersey Gateway Environmental Trust – has already been set up to help improve the long-term environment in the area.

Wherever possible, materials that have been used for temporary structures like the access roads and the trestle bridge will be recycled and re-used.

9 SILVER JUBILEE BRIDGE RESTORED FOR LOCAL USE



How the Silver Jubilee Bridge could look in the future

When the Mersey Gateway Bridge opens, the Silver Jubilee Bridge will be closed for extensive refurbishment. Pedestrians and cyclists will still be able to cross the Silver Jubilee Bridge during the refurbishment.

Around 80% of traffic will use the new bridge and the Silver Jubilee Bridge will be redesigned to deal with local traffic, cyclists, pedestrians and those using public transport.

This is likely to include:

- reducing the traffic flow to one lane in each direction
- dedicated space for pedestrians and cyclists
- improved public transport between the town centres of Runcorn and Widnes.

10 OPENING AUTUMN 2017



The new bridge

The new bridge is scheduled to open in the autumn of 2017.

Thanks for your interest and for being patient while we build the new Mersey Gateway Bridge.

You can view a 3D fly-through of the whole process on the Mersey Gateway YouTube channel at www.youtube.com/merseygateway.

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