

# Formula

UK ISSUE 17

## LARGEST EVER SINGLE SPAN PEDESTRIAN BRIDGE

ALSO IN THIS ISSUE... TRAPAGARÁN VIADUCT, YAS HOTEL,  
CARILLION BRIDGE SLIDE, ROYAL VISIT AND TIGER BRENNAN DRIVE

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# EDITOR VIEWPOINT



Welcome to this, the 17th edition of our Formula UK magazine. Since our last edition, RMD Kwikform has been involved in some extremely interesting projects across the UK and the rest of the world, even breaking some of our own longstanding records!

In this edition it is great to see that even though the UK and global construction industry has and continues to have a challenging time, our innovative engineering solutions and programme time saving systems are making a significant contribution to a whole range of projects.

With our attendance at the Infrastructure show at the NEC on the 18th-20th October 2010 now booked, we have taken the opportunity in this edition to highlight some interesting infrastructure projects.

Our front cover shows one such RMD Kwikform record breaking project, to provide our longest ever single span pedestrian bridge, crossing the river Ouse for Interserve Project Services. Compare this to one of Europe's largest viaducts in Bilbao and the scale of equipment used and engineering is very different.

Moving onto the rails with Carillion, we were able to work within extremely tight confines to help replace a bridge section on the North London Line. But probably our most rewarding story was a recent visit from Her Royal Highness Princess Anne to thank staff for their contribution to the delivery of vital Olympic building projects, including the Aquatics Centre. As an added bonus, Princess Anne also presented us with the 'Queen's Award for Enterprise International Trade 2010' for our work in developing the business overseas.

Switch on to RMD Kwikform TV - our new TV channel is now up and running with videos of project reports from across the globe. Why not visit it at [www.rmdkwikform.tv](http://www.rmdkwikform.tv)

Don't forget if you want to keep up to date with Formula online you can visit [www.rmdkwikform.com/formula\\_online](http://www.rmdkwikform.com/formula_online)

Enjoy the read.

**Mike Follett**  
UK Managing Director, RMD Kwikform

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## QUEEN'S AWARD ROYAL VISIT WITH ADDED 2012 THANKS

For staff at RMD Kwikform's head office in Aldridge, a visit from Her Royal Highness The Princess Royal, representing the Queen and acting as a member of the London Organising Committee for the Olympic Games, was the highlight of a 2012 Olympics filled year.



**Her Royal Highness Princess Anne presents the Queen's Award for Enterprise International Trade 2010 to divisional managing director Steve Dance**

The visit was a double celebration arranged to present and congratulate the employees of the company for winning the 'Queen's Award for Enterprise International Trade 2010', whilst also recognising their involvement in helping to deliver a number of important construction projects for the Olympic games.

Commenting on the visit, RMD Kwikform's managing director, Mike Follett said: "It is a real honor to welcome HRH The Princess Royal to our UK Headquarters in Aldridge. It is a particularly special occasion, as she will be presenting us with our 'Queen's Award for Enterprise International Trade 2010', whilst also thanking our staff as part of a Royal tour recognising the importance of

the role played by a number of businesses in the West Midlands to the delivery of the Olympic Games."

"I know all of the staff who have worked tirelessly over the last year to deliver solutions and services to a help achieve the aims of the London Organising Committee will share my excitement and sense of achievement by being honoured in this way."

As formwork and falsework specialists, RMD Kwikform staff have been working in partnership with a number of construction firms to engineer, design and deliver a whole range of equipment solutions for the progression of work on and around the main site for the games.

**QUEEN'S AWARD AND OLYMPIC ACHIEVEMENTS AT A GLANCE**

- Increased overseas business by 185%, to 30 countries, over six years, generating a total revenue of £154m
- One of very few UK headquartered construction support companies to increase turnover in a recession
- Innovative solutions developed to support complex Olympic Aquatics centre roof construction
- Involvement in additional Olympic work crucial to RMD Kwikform UK staff and company turnover for 2009/10 and 2011
- See the Aquatics centre roof construction on [www.rmdkwikform.tv](http://www.rmdkwikform.tv)



**Work on projects like the Dubai Metro in the Middle East have helped RMD Kwikform to expand overseas**



**Overcoming engineering challenges to construction the Bridge over the River Homen in Brada, Portugal**



**Engineering solutions for the impressive 2010 Olympics Aquatics centre roof**



## RMD KWIKFORM IBÉRICA FORMWORK AND FALSEWORK HELPS TO CONSTRUCT ONE OF EUROPE'S WIDEST VIADUCTS

**Formwork and falsework designed and erected by RMD Kwikform Ibérica is being used to construct the main section of the Trapagarán Viaduct, one of Europe's widest viaducts that makes up part of the the new 36km Metropolitan Southern by-pass of Bilbao – Spain's most expensive motorway ever!**

Measuring 41 metres wide, 5.9 metres deep and 123 metres long, the main three span section of the seven lane Trapagarán viaduct, that links together four separate viaduct structures to complete the 786 metre long, 45m Euro project, is set to be one of Europe's widest viaducts.

Located in the province of Vizcaya, just outside Bilbao in northern Spain, the main section of the Trapagarán viaduct has been designed to allow a seven lane toll plaza to be accommodated in one single structure. Once completed, this plaza will be tasked with collecting payments for what will become the new toll motorway BI-30, incorporating the 36km Metropolitan Southern by-pass.

For main contractor UTE Trapagarán (a joint venture between construction specialist

Construcciones Adolfo Sobrino SA, Cycasa SA, Fonorte SA and Urssa S.Coop), the importance and complexity of this section of the viaduct, which crosses a rail line and also overhangs the A-8 motorway, meant that getting the formwork and falsework solution for its construction right was critical.

Having worked with all four companies on previous projects, providing formwork and falsework solutions for works including the Euskotren (Basque railway), Barranco de Torrent Viaduct on the Valencia TGV line and propping towers for "Pabellón" bridge in Expo. Zaragoza, as well as smaller scale projects, RMD Kwikform Ibérica were the natural choice for the complex Trapagarán viaduct section.

Using practically the whole range of RMD Kwikform Ibérica products, the design and

erection of the equipment was all carried out by RMD Kwikform Ibérica staff. With a total of 2000 tons of equipment used to support the section, its design involved a team of five engineers, which were supported by up to 34 erection specialists, cranes and other equipment.

Commenting on the structure and the formwork and falsework challenge Roberto Miranda RMD Kwikform Ibérica project manager said: "Although we have a great deal of experience in this arena, we have never had to come up with a viaduct formwork and falsework solution on this scale before. The addition of the two significant safety challenges, namely the crossing of the rail line and the overhang onto the A-8 motorway, which had to remain open, also made its delivery more complex."

"From a practical point of view, we therefore had to design a solution that could span the rail line and provide enough support to cope with the A-8 motorway overhang, whilst compensating with the central part of the deck."

"The overall design therefore relied upon the strength of our 1000kN per leg Megashor steel shoring product. This was used to create large Megashor towers up to 25 metres in height, consisting of four individual legs, braced with steel Superslim soldiers."

**"You only have to look at the shape and detail of the final formwork and falsework design in-situ to see how challenging and complex the final structure was to achieve."**

"Working with uneven sloping ground conditions, our engineers had to model the requirements for the size of the towers at each supporting section. With the use of jacks and the nine different leg sizes, ranging from 90mm to 5400mm, we were able to construct over 11 Megashor towers to support the more detailed formwork and falsework structure above used to form the viaduct."

To overcome the challenge of the A-8 motorway overhang, instead of designing standard Megashor towers, RMD Kwikform Ibérica engineers developed a totally new approach using Megashor and Superslim soldiers to create a Y-shaped support structure. This enabled the footprint of the Megashor support to stay within the safe confines of the construction site, whilst allowing the overhang of the viaduct to be cast safely."

Roberto: "With the Y-shaped Megashor supports we added extra bracing and increased the tolerances of the design to build in greater safety so we were able to support the load of the overhang and compensate them with the central part of the deck."

"Once the Megashor towers and Y shaped supports were erected, we were able to use our R700 girders to span up to 25 metres across the railway line and our steel beams to provide a primary beam support structure. From this base we were then able to begin the erection of the more intricate part of the design."

"Here we had to design a solution that could be used to construct the variable



box sections formed by multiple faces of differing dimensions and inclination. In between the primary beams or girders and the deck formwork, we placed our steel Kwikstage shoring project in order to achieve the curve, inclination and correct camber of the bridge deck."

Completing the three stage erection process, to create the box sections, RMD Kwikform Ibérica erection teams used a combination of its very versatile steel Superslim soldiers as primary beams and T200 wooden beams as secondary beams, to which plywood was attached.

To finish the formwork and falsework design, Maxima heavy duty panels were used to construct the interior gables and diaphragms of the deck, which once completed created a structure and deck of almost 6 metres deep. The whole structure was then filled with over 8000 tons of concrete and steel reinforcement, using a specialist crane mounted concrete pump.

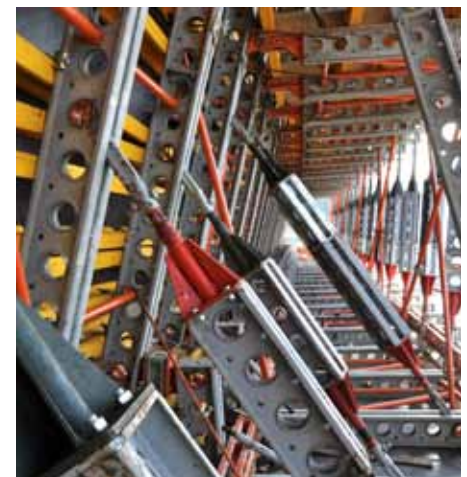
Roberto concluded: "You only have to look at the shape and detail of the final formwork and falsework design in-situ



**"The key to the success of the project was our ability to engineer a solution that could adapt the formwork perfectly to the geometry of the deck, something that could not have been achieved without the use of our full equipment product range."**

to see how challenging and complex the final structure was to achieve. The key to the success of the project was our ability to engineer a solution that could adapt the formwork perfectly to the geometry of the deck, something that could not have been achieved without the use of our full equipment product range."

With work commencing on the eight month project in September 2009, RMD Kwikform Ibérica completed the formwork and falsework construction phase in April 2010, with the complete stretch of the 784 metre Trapagarán viaduct due to be opened in 2011.





## LARGEST EVER SINGLE SPAN PEDESTRIAN BRIDGE

RMD Kwikform's engineering team has designed its largest ever light-weight single span temporary access pedestrian bridge, in support of Interserve Project Services' £1.5m restoration project to refurbish the historic 39 tonne, 19th century Southease bridge for the Environment Agency.

The Grade II listed Southease bridge, near Brighton, crosses the River Ouse between Lewes and Newhaven, providing an important link for local residents to Southease train station and ramblers using the popular South Downs Way track.

Having identified the need to refurbish the bridge as part of a restoration project to preserve the rich heritage of the Ouse, the Environment Agency awarded the contract to lift out, repair and reinstate the 18th century historical bridge to Interserve Project Services.

**"This project was by no means an easy task. The location of the bridge was a major issue as it was situated down a narrow lane. In addition, all equipment had to cross a rail line, with no other potential route available, as the site is surrounded by protected meadows of special scientific interest, with limited site access and storage."**

As part of the project delivery, Interserve Project Services had to provide a temporary bridge crossing for pedestrians who depend on the bridge, whilst the original bridge was lifted out in sections and refurbished over a number of months.

In order to achieve this, a temporary pedestrian bridge had to be constructed and lifted into place. Due to the location, restricted site space and crane access issues, Interserve Project Services were faced with the challenge to create a strong, lightweight yet rigid temporary bridge structure that could span 47m. It was at this stage they contacted RMD Kwikform, whose engineers at its Aldridge headquarters worked with the project team to design the overall solution complete with landing piers.

Commenting on the project Interserve Projects Services' Noel Baker said "This project was by no means an easy task. The location of the bridge was a major issue as it was situated down a narrow lane. In addition, all equipment had to cross a rail line, with no other potential route available, as the site is surrounded by protected meadows of special scientific interest, with limited site access and storage. This meant we had a major dilemma of getting a crane big enough for the job into the site.

**"The bridge itself is the longest single span temporary bridge we have ever designed in the UK. In order to meet the strength, rigidity and weight requirements of the structure we designed it using our R700 steel girders for strength, that were then laced top and bottom with steel supports for rigidity. Lightweight aluminium beams were also used on the base to hold the decking in place."**

"Following remedial widening works to the lane, we were able to get a 500 tonne crane into place which was capable of lifting the cast iron bridge. Thanks to its swing design we were able to lift the bridge out in two sections, one 12 tonne and the other 27 tonne, reducing the crane weight significantly. However in order to install the temporary bridge we needed to make sure the structure designed by RMD Kwikform



was both rigid enough to span the 47m gap and light enough to be craned into place."

The pedestrian temporary access bridge was erected onsite by a team of Interserve Project Services site operatives, who also prepared the concrete base and temporary piers on each side of the river that would support the bridge.

The complete structure was then lift tested before it was moved into place. Once the testing was complete, the task of lifting the new bridge into place on top of the piers took less than 15 minutes from lift to first fix.

**"For the landing piers, we designed a special landing plate mounted onto a steel section girder with supports that were fixed to a concrete base. The strength of this landing pier was designed to bear both the load of the bridge and the passengers crossing it."**

Commenting on the bridge, John Porter, RMD Kwikform sales representative said: "The bridge itself is the longest single span temporary bridge we have ever designed in the UK. In order to meet the strength, rigidity and weight requirements of the structure, we designed it using our R700 steel girders for strength, that were then laced top and bottom with steel supports for rigidity. Lightweight aluminium beams were also used on the base to hold the decking in place."



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As an important part of the local and regional history, saving the bridge was an important challenge for the Environment agency as Ian Nunn, East Sussex Team Leader commented: "With this project we are protecting the rich heritage of the Ouse while ensuring the full and safe use for the local community in the future."

"This is an extremely interesting and challenging project and we look forward to re-opening the bridge for use by the community and visitors in the coming months."

The bridge project is due to be completed in November 2010 when the pedestrian bridge will be removed and the refurbished Southease bridge will be lifted back into place and reinstated.

To view a short film about this project, visit [www.rmdkwikform.com](http://www.rmdkwikform.com) and click through to Formula online.



#### BRIDGE RESTORATION AT A GLANCE

Restoration and improvement work will bring the historic gem back to looking its original glory, by:

- Strengthening the bridge structure
- Repairing and replacing the corroded steel deck
- Rebuilding abutments
- Replacing deck and supporting timbers
- Applying new longer lasting corrosion protection

Further environmental work is planned for the site including enhancing habitats for reptiles and invertebrates and improving the slipway for leisure users of the river.



## RMD KWIKFORM MIDDLE EAST LIFTS THE SHROUD ON ABU DHABI'S THE YAS HOTEL

RMD Kwikform Middle East creates the most innovative and challenging grid-shell shroud support system the world has ever seen.

Designed using specially developed 3D software, the heavy-duty Megashor system was used to support 911 node points required for the installation of a landmark steel ladder and glass paneled shroud structure covering The Yas Hotel.

When RMD Kwikform Middle East was awarded the contract to support a new 217-metre grid-shell shroud - an expanse of sweeping, curvilinear forms, constructed of steel and 5,096 pivoting diamond-shaped glass panels - the business took on one of the most innovative and exciting structures in the world.

For primary contractor Al Futtaim Carillion, working for developer ALDAR Properties, the requirement for a formwork and falsework based temporary works system that could safely support no fewer than 911 different node points throughout the grid-shell shroud design was essential to the project delivery.

For RMD Kwikform, the design and practical execution of the formwork and falsework temporary works support were the two most challenging elements to the project.

Paul Williams, RMD Kwikform managing director explains: "The end goal of the project that has now been completed was to have a steel and glass shroud that would cover the Marina Hotel, a two tower 499 room structure that was built on either side of the Abu Dhabi Formula One race track."

"With very few companies able to take on a job of a scale and complexity, never before seen in the heat of the Middle East, we recognised the only way we would be able to make it a success was to base the whole system design around our Megashor heavy-duty shoring product."

Once RMD Kwikform's design team saw the 3D models of the Waagner Biro designed grid-shell, the team began the design process in July 2008. Working closely with Al Futtaim Carillion they presented several solutions to supporting grid shell while ensuring there was as much access as possible along the bottom of the structure.

Paul: "This was made more difficult due to the grid-shell's location, connecting to the hotel which also incorporated a man-made marina. This meant some of the grid-shell had to be supported on dry land and other parts from the much deeper marina. It was this factor that determined the only product we could use was Megashor, as we had to come up as high as 40 metres."

"The next challenge to overcome was how to get the equipment in such volumes to the site. Logistically this meant sourcing a massive amount of material with more than 2,600 tonnes of product required in total. To meet these needs we shipped in Megashor from other RMD Kwikform group companies across the globe"

### TOWERING SUPPORT

Due to the varying height and nature of the grid-shell shroud, Megashor towers were erected on jacks with varying leg section lengths from 90mm to 5400mm used to meet the very precise levels required.

At any one time, up to 64 Megashor towers were in use on the site, erected and dismantled to be moved onto the next section in modules.

Commenting on the design of the Megashor towers, Harprit Dogra, RMD Kwikform Middle East project manager said: "Thanks to Megashor's capability to withstand leg loads of 1000kN per leg, we were able to space the towers far enough apart. This meant the client could bring in various equipment and modules/pods for the hotel, while we were still assembling the temporary works above, making best use of space"

Once erected, each Megashor tower weighing up to 8 tonnes was capable of supporting at least 1000kN. With each steel ladder making up the shroud, weighing up to 30 tonnes, the challenge for RMD Kwikform engineers was to design a solution that would ensure the millimetre accurate positioning (zero tolerance) and installation of each of the 217 steel ladders. With each ladder having at least 4 multiple node points, no fewer than 911 individual node points had to be safely secured in position.

Harprit Dogra: "Because each node point support required a zero tolerance approach, which is virtually impossible on a building site, the key to the success of the formwork and falsework system was the use of our new 3D modelling software called Locus. This allowed us to model and perfect the whole design approach before equipment even arrived on site (all clashes were cleared due to 3D modelling prior to erection)."

"For the off slab support, we came up with a simple 'A Frame' design. The 'A Frame' was built out of Superslim Soldiers using left and right hand jacks and a special node point, which allowed us to pick up the relevant points on the grid-shell."

#### MEGATRUSSES APPROACH ALLOWS WORK TO CONTINUE BELOW

"When we moved onto the connection point between the hotels the client wanted to be able to have access to as much of the site as possible. Therefore, instead of erecting towers between the two hotels, we were able to keep the bridging space open by designing a Megatruss and R700 girder arrangement across the span."

"Made up of lengths of Megashor, the truss, supported by Megashor towers was able to span the 27 metre gap, whilst giving support to the Rapidshor 'birdcage' above. In a similar fashion R700 girders were used to create support platforms on top of the Megashor towers and Megatrusses."

"Fixed on top of the Megashor was a Rapidshor shoring 'birdcage' arrangement, designed to support and incorporate the node point used to help position the steel ladder sections into place. The 'birdcage' structure was inherently strong and capable of dispersing the load evenly from the all important node point, through to the Megashor towers."

"With each node point representing a different angle and position, due to the complexity of the grid-shell, each individual node point required its own bespoke shoring support. Therefore each node point had an individual drawing and plan for erection identified in 3D relative to the overall structure."

"The node point was the main load bearing connection, where the grid-shell members came together. Each of the 271 steel ladders has up to 7 node points to support, which are later removed after loose members are welded between ladders."

"For this part of the project, our engineering team used our 3D software to design the node point, ensuring once manufactured

**"Our requirements were so complex that there were not many companies who would have had the capability to design the works, let alone provide the proven materials and resources required to meet the timescales. It was for these reasons that we chose to work with RMD Kwikform Middle East."**

it could cope with the environmental and practical challenges of the job at hand."

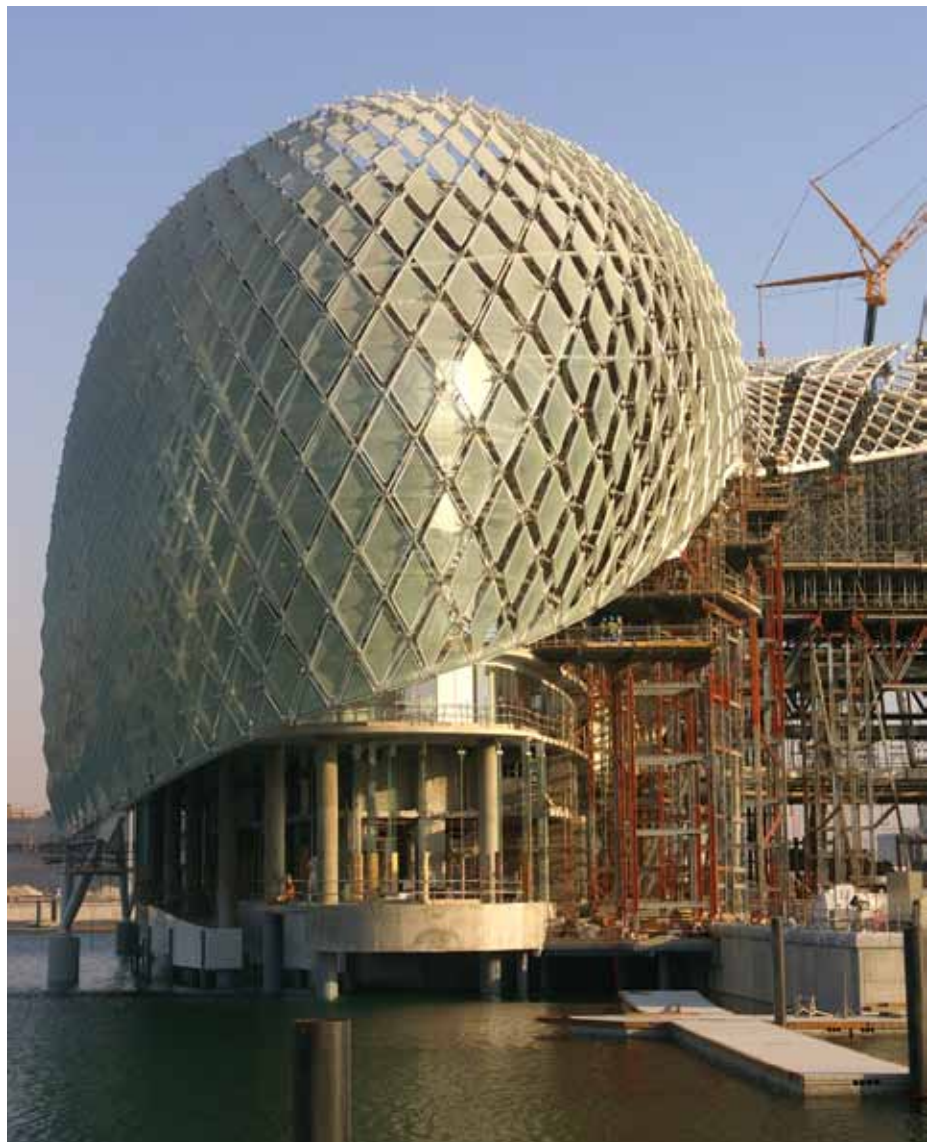
#### AL FUTTAIM CARILLION VIEW - MEETING THE PROJECT NEEDS

For primary contractor Al Futtaim Carillion, getting The Yas Hotel's two towers ready to the tight timescale, was a challenge in itself. Adding the grid-shell shroud to the

overall build made the project delivery even more complex as Martin Reeve, Project Design Director for Al Futtaim Carillion explains: "We were awarded the project in December 2007 on a very fast track nature, to build the hotel with its aesthetic iconic type grid-shell cloak, which posed in itself huge engineering challenges."

"Our requirements were so complex that there were not many companies who would have had the capability to design the works, let alone the ability to provide the proven materials and resources required to meet the timescales. It was for these reasons that we chose to work with RMD Kwikform, as they were able to prove they had the experience, design capabilities and most importantly access to the equipment we needed to make the project a reality."

Having lit up the Formula 1 Etihad Airways Abu Dhabi Grand Prix in 2009 the hotel continues to be enjoyed by thousands of F1 enthusiasts and visitors to the region.





## RMD AUSTRALIA IS THE NATURAL SELECTION IN DARWIN

**RMD Australia supplies formwork and falsework to the Northern Territory's most expensive road development project to date.**

The \$89 million stage 2 of the Tiger Brennan Drive Extension comprises of a 7.5km dual carriageway linking Palmerston with Darwin and a grade-separated intersection with the Stuart Highway. Once completed it will provide much needed relief to local congestion, reducing traffic delays for about 34,000 commuters per day. As an indication of just how massive this project is, a staggering 120,000 cubic metres of land had to be 'blasted' to make way for the new four-lane dual highway extension.

Macmahon Contractors Pty Ltd, the primary contractor to the site, needed a formwork and falsework supplier that not only had experience on projects of a similar scale, but also had the appetite, drive and most importantly the engineering expertise to tackle the challenges that lay ahead.

Securing the contract on this project has been the culmination of 18 months hard work by the team at RMD Australia's Darwin office. Romano Lazzarin, Branch Manager at RMD Darwin comments, "It's a great boost for RMD Darwin to be involved in such a high profile project in the region. We wanted to be on this project and the sales team here put in a lot of hard work and perseverance to make sure we were involved, and this paid off in September 2009 when we supplied the first batch of equipment to the site".

RMD Australia's involvement in the project is quite extensive, including supplying shoring, wall formwork, column and pier supports and falsework and headstock formwork to the projects three 20m wide bridges. But

perhaps the most challenging aspect of the build for RMD Australia's engineers to date was a 52 metre long, 9 metre high, 400mm thick wall that had to be formed in one single pour.

Romano Lazzarin, Branch Manager at RMD Australia explains the potential difficulties in such a pour; "As specified by Macmahon Constructions, this particular wall could have no horizontal cold joints, which meant a single pour of 185m<sup>3</sup> concrete. This creates all sorts of difficulties when designing a formwork solution, firstly we had to ensure we could adequately contain that much concrete over such a large area, secondly we had to consider the curing times of the concrete. This is especially vital as with such a publicly visible structure, the final finish of the concrete takes on increased importance. What happens is that when we pour a large volume of concrete the bottom of the pour dries before the rest, then the final finish is compromised."

Engineers firstly designed the all-important formwork, using Superslim Soldiers as the primary vertical beams and secondary LVL timber beams horizontally with high quality plywood shuttering. Both sides of the wall formwork were then connected with Rapid Bar Ties ready for pouring. To add additional strength throughout the formwork, Superslim props were anchored to the concrete base to accommodate the large volume single pour, and provide additional support near the base of the formwork where the bulk of the load would be most felt.



**"RMD Australia's approach to this project has been second to none, from the very beginning they showed a commitment to be part of what we are doing here."**

To avoid a substandard final finish to the concrete the pouring of the 185m<sup>3</sup> of concrete had to be calculated to achieve the correct flow rate and avoid any premature hardening of the concrete, especially difficult in the mid summer conditions of northern Australia. To ensure a consistent flow, two concrete pumps were operated simultaneously at the pre-calculated flow rates. The result was a resounding success, with the extra strengthening applied to formwork resulting in zero movement and the achievement on an excellent class two finish.

Graham Gust, Project Engineer at Macmahon Contractors Pty Ltd commented, "RMD Australia's approach to this project has been second to none, from the very beginning they showed a commitment to be part of what we are doing here. We have a selection of hire and sale RMD equipment on the site, backed up by RMD's engineering staff, all of which is meeting the high standards a build of this size requires."

Stage 2 of the Tiger Brennan Drive Extension is due to complete in mid 2010, we hope to be able to bring you an additional report on the bridge construction in our next issue.



## MAFRAQ INTERCHANGE PROJECT IN ABU DHABI USES OVER 100,000m<sup>3</sup> OF RMD KWIKFORM'S RAPIDSHOR SHORING

**RMD Kwikform Middle East has supplied an estimated 100,000m<sup>3</sup> of its Rapidshor shoring product, in addition to specialist bespoke formwork and falsework solutions for the construction of three bridges on Abu Dhabi's key infrastructure project - the US\$204 Million Mafraq Interchange.**

As the largest infrastructure project currently underway in Abu Dhabi, the Mafraq Interchange will allow traffic to run from North to South, connecting the Abu Dhabi Airport to Saudi Arabian Border and East to West easing congestion from Al Ain to Abu Dhabi City.

Replacing the current two lane interchange that is now too small to cope with the increase in road traffic, the Mafraq Interchange, once completed will consist of four lanes in each direction, two main arched flyovers known as R5 and R6 and two smaller main deck bridges known as Bridge 10.

**“The real challenge came with the design of two bespoke formwork and falsework solutions for the project.”**

For primary contractor China Civil Engineering & Contracting Co, the main challenge of the project was the rapid construction of the three bridge structures. With two bridges measuring 980m in length and climbing up to 22m high and a third measuring 300m, the key to delivering the project on time and budget was the use of a combination of formwork and falsework equipment from RMD Kwikform Middle East.

In addition to 100,000m<sup>3</sup> of Rapishor, special components were designed and

manufactured for the wing walls, with SuperSlim primary and GTX secondary Beams used to form the support for the plywood deck structure.

With a total of 2,260 metres of bridge to construct China Civil Engineering & Contracting Co. opted to part purchase and part hire the equipment required for the job from RMD Kwikform Middle East, as the Rapidshor system could then be reused on future projects.

With 100,000m<sup>3</sup> of Rapishor needed to complete the job, the Mafraq Interchange represented one of the most significant projects undertaken using Rapidshor in the Middle East. For the two arched flyovers R5 and R6, constructed simultaneously, approximately 50,000m<sup>3</sup> of Rapidshor was used for each structure. The product was then re-used to construct the first span of Bridge 10, with approximately 15,000m<sup>3</sup> of Rapidshor fully decked out, which on completion was then re-used to construct the second span.

But the challenges posed by the project delivery were not related to the supply of Rapidshor as Elpidio Aspillaga, RMD Kwikform's sales manager explains: “The real challenge came with the design of two bespoke formwork and falsework solutions for the project. The first required our engineering team to design a new solution to allow the overall system to follow the wing profile of the bridge. This used

**“Throughout the whole approach design solutions were used to speed up the construction process cycle time.”**

a combination of standard and cranked Superslim soldiers.

“The second challenge was to design the deck edge support system which had to brace the Superslim soldier beams against each other. The solution to this requirement was the design and fabrication of 440 specially oversized turnbuckles.”

“Throughout the whole approach design solutions were used to speed up the construction process cycle time, allowing China Civil Engineering & Contracting Co to erect the forms at ground level in completed side units. This made for very little adjustment of the units when they were placed along the bridge edge shoring. On a long repetitive bridge such as this one, reducing cycle time was very important. By using a cantilever design, the side units could be removed early in the striking process and reassembled at the next stage of construction, speeding up the process dramatically.”

On completion the impressive and dramatic scale of the Mafraq Interchange will support the growing demand for transportation solutions in the region.



## SUCCESSFUL BRIDGE SLIDE ON NORTH LONDON LINE

Faced with demolishing and replacing a whole section of the Camley street rail bridge in Camden as part of its North London Line upgrade contract, Carillion opted for a falsework solution from RMD Kwikform that could cope with its very tight programme demands.

Given just three days of rail time possession in which to complete the demolition of the existing deck and slide in the replacement unit, Carillion had to ensure the solution chosen to complete the task was swift, safe and reliable.

Working in the extremely tight confines of the Camley street location, Carillion had to complete the works whilst keeping road access open for local residents and businesses. In order to be able to complete the deck replacement in the three day possession window, the new deck structure had to be constructed offline, right next to the existing bridge.

In order to achieve this, RMD Kwikform and Carillion engineers designed a dual system for the slide path of the deck, using Rapidshor and Megashor heavy-duty shoring equipment. The Rapidshor, together with RMD Kwikform's steel Superslim soldiers formed the main bridge support, crash deck and access for the new deck to be poured and cast in-situ.

Constructed within the Rapidshor falsework lattice, a heavy duty Megashor shoring system was devised to support large steel beams that enabled the bridge deck to be slid into place.

Explaining the challenges and phases of the project, Carillion agent, Ray Rushe said: "There were three distinct phases to this project which were all critical to its success. The first was to design and erect a falsework and slide path system. This had to be located in the extremely tight confines of the space available on Camley Street and be capable of withstanding the pressures of the 353 tonne concrete deck. It also had to be an inherently safe system of work."

"The second phase was the deck pour. Again, here we had to cope with the very restricted space and the logistics of getting concrete supplied to site and pumped up to the deck. Thankfully we were able to fit a mobile pumping unit into the location that could be fed by the concrete mixers. Once the deck was cast and cured, we were

able to enter into the final phase of the demolition and slide."

"The slide itself was 13.2 metres in total. Having possession of that part of the line for three days, we first had to remove the existing number two line tracks and then demolish the deck. This took a full day, leaving just two days to slide the new deck into place, secure it to the remaining bridge structure, relay and test the tracks."

"When we were ready to slide the bridge section, we used the Megashor solution and hydraulic jacks to raise the height of the deck. The deck was then pushed forwards using a hydraulic ram. We had initially expected this phase to take 4-5 hours, but it was completed much quicker as the slide mechanism proved to be very efficient and easy to use."

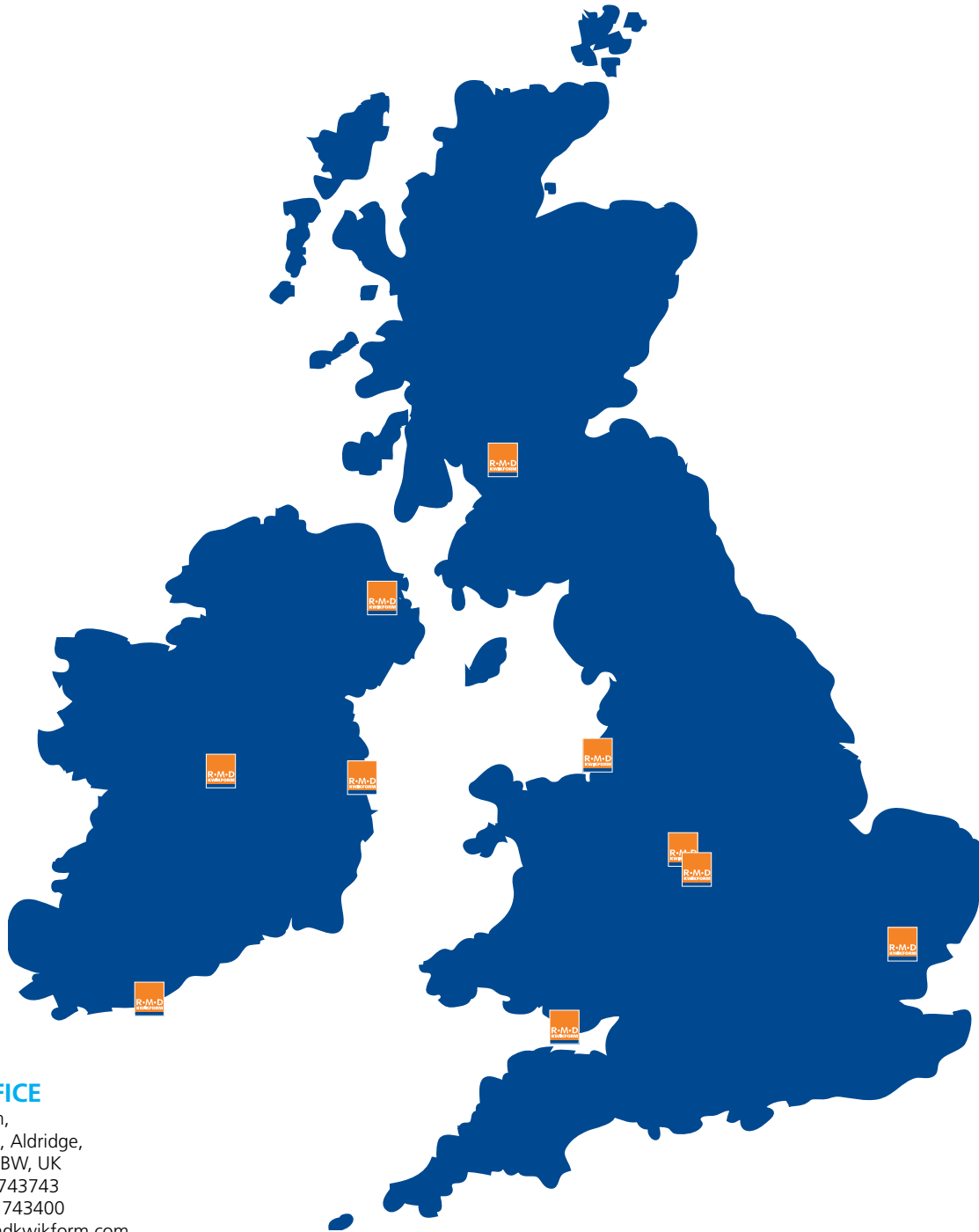
"Once in the right location the deck was lowered into place and secured with the tracks remounted. The whole process took just over two days, leaving plenty of time for testing and releasing the track for train and passenger use, limiting disruption to travel."

Now completed, the new bridge deck is playing an important role supporting the busy North London Line.



To view a short film about this project, visit [www.rmdkwikform.com](http://www.rmdkwikform.com) and click through to Formula online.

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## Solutions for your challenges

RMD Kwikform equipment and engineering solutions help clients tackle much more than formwork and falsework challenges. Our specialist repair, maintenance and improvement division provides expertise to support a whole range of projects across the UK.

Whether it is designing the largest single span pedestrian bridge we have ever engineered, specialist systems for façade retention or complex support structures, RMD Kwikform engineers have the skills and equipment to meet your challenges.

**Tailored Solutions • Global Expertise**

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