



Global Mega-Projects for Improved Infrastructure

Global trends such as urbanisation and the population growth are important triggers for innovations in the construction industry. We need to develop greater efficiency in construction processes in order to meet the challenges as regards infrastructure, especially in mega-cities. Infrastructure projects for the world of tomorrow are being implemented today using the expertise of Doka.

Every year, some US\$ 2.5 billion are invested in infrastructure worldwide. This is not enough by any means, as a recent study by the McKinsey Global Institute (McKinsey&Company) dated June 2016 demonstrates. As far as can be seen today, an investment of US\$ 3.3 billion annually until 2030 would be necessary to keep pace with population growth, urbanisation and demographic change. In order to bridge the gap a variety of approaches will be necessary from both politics and industry. Here the construction sector is called upon in particular. One lever would be an increase in productivity in the construction of infrastructure projects, because a reduction in construction times reduces at the same time the required investment.

Innovation for an improved infrastructure

It is evident that an enormous amount of potential is still dormant within the construction sector. According to a study some 57% of the operations in construction are due to activities which do not create added value – for example, inefficiencies, errors or lack of communication. And if we study the development of productivity in the building industry in important industrial countries like Germany, the United Kingdom and the United States, it is clear that during the past twenty years this has stagnated or even declined, as the current study by the McKinsey Global Institute proves. As a supplier to the construction industry, the Doka Group makes an important contribution to increased productivity within the sector and hence also to infrastructure projects. The international formwork experts from Austria aim to make the entire construction process even more efficient in future – from planning to building to maintenance and ultimately even the disposal of property. The formwork experts have already taken a number of crucial steps in this direction. The company deals with innovative technologies, building materials and methods. It is also expanding its expertise, most recently through the takeover of the Dutch technology company B|A|S. Doka is thus actively promoting the change in the building sector – in the direction of increased efficiency and profitability.

The following projects show, how Doka puts this into practice:

Graz Southern Ring Road – An important infrastructure project for Austria (AUT)

The Graz Southern Ring Road forms part of an important infrastructure project in Austria which will be completed in 2017. Along a length of two kilometres, 1.4 km of which will be a tunnel construction, the road will run in future as a four-lane carriageway, most of it underground. As a result, traffic jams will be a thing of the past. The DokaCC formwork traveller combined with Concremote, Doka's digital concrete monitoring system, ensures that the tight five-day cycle time with the planned 12 m can actually be kept to.

Muskrat Falls – A superlative hydraulic power station project (CAN)

Concrete crack prevention and consequently leakage is a prime criterion for the construction of hydropower plants. This also holds true for the 824 MW hydropower plant Muskrat Falls in



Canada, which will supply electricity to the provinces of Labrador and Newfoundland. Because extreme weather conditions were a major challenge for this project. Concreting on this site had to continue even when temperatures plummeted to -40 Celsius in winter and rose to +30 Celsius in summer. With hundreds of measurements, Concremote – the new concrete sensor technology by Doka – ensured reliable on-site temperature monitoring and hence secured the quality of the mass concrete structures. Temperature development measurements are fundamental for monitoring thermal stresses in the concrete that develop as a result of temperature variances. This data helps to put into place avoidance actions mitigating development of thermal cracks and the potential for future structural damage.

Three World Trade Center – New York acquired 260,000 m² more infrastructure (USA)

Tower 3, with 80 storeys, was built at the heart of the former Ground Zero. Doka made an important contribution to keeping the formwork times as short as possible with the Doka Super Climber SCP, the rapid self-climbing formwork system for the North American market. Doka engineers contributed much to the planning phase as well, so the optimum formwork solution could be defined early in the project. Also as regards safety Doka supplied top quality. The safety systems incorporated into the solution surpassed the requirements of New York City's building code and those of the Port Authority of New York and New Jersey. The skyscraper was designed by architect Richard Rogers and offers over 260,000 m² office and shop space. As in Towers 2 and 4 the formwork solution was provided by Doka.

Gerald Desmond Bridge – A bridge solution for one of America's busiest ports (USA)

Since 1968 the Gerald Desmond Bridge has played a major role in the port of Long Beach as an important trade route. More than 15 % of all containerized cargo imported to the United States arrive via this port in California. In order to be able to process bigger freight ships in future and so as to increase safety and improve traffic flow, a new cable-stayed bridge with two pylons is being constructed. On this infrastructure build the self-climbing formwork from Doka proved very cost-effective, because it required no additional crane time and keeps construction progressing in an 8-day cycle.

Doha Metro – Public transport infrastructure for Qatar (QAT)

The project is on track for a 2020 launch where this state-of-the art integrated metro line will be one of the most advanced rail transit systems in the world. The Doha Metro includes in the first phase over 111 km of underground tunnel sections and 37 stations. The Red Line, also known as the Coastal Line, forms the key line in Qatar's infrastructure system. In order to expedite the progress on site, Doka Qatar provided pre-assembly services for the Large-area formwork Top 50 base slabs, lining walls, lift walls and staircase walls, as well as pre-assembly of the Load-bearing tower Staxo 100. Fabrizio Fara, Assistant Construction Manager ISG JV pointed out how Doka added to efficiency on site: "The Doka system is known for its dependable quality, however in addition to this, the industry knowhow amongst both the sales and engineering teams has offered a big advantage in terms of job safety and efficiency."

Midfield Terminal Complex – Extension of Abu Dhabi International Airport (ARE)

The Midfield Terminal Complex at Abu Dhabi International Airport is currently one of the most impressive construction projects in the Emirate and at the same time the core element in the growth strategy "Abu Dhabi Economic Vision 2030". Doka is supporting the extension of the air traffic hub with high-performance formwork systems. This solution enables a shifting of formwork from one 20 m segment of tunnel to another within three days only.



Queensferry Crossing – World's longest cable-stayed bridge with 3 towers (GBR)

On Scotland's east coast, not far from Edinburgh, the Queensferry Crossing viaduct is under construction across the Firth of Forth. 2.7 km in length, when finished it will be the world's longest cable-stayed bridge with 3 towers. Composite bridge travellers from Doka were used for the formwork of the twin viaducts. Additionally, 110 bridge deck units weighing 760 metric tonnes were built with static shoring and formwork from Doka. The formwork solution from Doka ensured speedy progress on the build.

Northern Hub – Faster rail connections for the North of England (GBR)

New, faster rail links for the north of England is the objective of the rail project Northern Hub. When finished, the mega-project will link the region's major cities, with Manchester as the main node. One of the biggest challenges on this project is that some of the new railway bridges are right beside listed structures of historic importance. Doka was able to provide custom-tailored formwork solution for the complex design of the viaduct piers. At the same time Doka speeded up work routines by delivering the pre-assembled formwork ready-to-use to site.

Motorway bridge SO 223 – top bridge-building technology for Slovakia (SVK)

More than 1 km in length, the bridge on the D3 motorway near Zilina, the fourth largest city in Slovakia, will ease the traffic situation in the country's north-western region. Two separate bridges, each with a carriageway width of 11 m, will carry the motorway across a reservoir on the River Vah. Various formwork solutions were used on account of the project's complexity. They were planned by the engineers at Česká Doka branch. Progress on this build was rapid, because the equipment deployed included several Cantilever formwork travellers. Due to short site-erection times, fast repositioning and cycle times, formworking operations could move ahead at a rate of 40 m per week.

Aurora – Living space on 92 storeys (AUS)

Melbourne's second-highest residential building, which is being erected in the city centre, will even have direct access to the underground "City Loop Line". The formwork expertise of Doka and its Australian subsidiary Lubeca ensures that construction progress is rapid. The core of the building is being built using two climbing systems. This solution ensures fast cycle times and at the same time fewer workers are needed in comparison to more conventional methods of construction. Aurora is rising skyward in a four-day to five-day cycle time. When completed, the high-rise will provide space for 941 flats, 250 serviced apartments and office and shopping space.

About Doka:

Doka is a world leader in developing, manufacturing and distributing formwork technology for use in all fields of the construction sector. With more than 160 sales and logistics facilities in over 70 countries, the Doka Group has a high-performing distribution network which ensures that equipment and technical support are provided swiftly and professionally. An enterprise forming part of the Umdasch Group, the Doka Group employs a worldwide workforce of more than 6,000.



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Graz Southern Ring Road

The Graz Southern Ring Road forms part of an important infrastructure project in Austria which will be completed in 2017.

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Muskrat Falls

On site of the hydroelectric generating facility temperatures as low as –40 degrees are not uncommon and represent a major challenge for this project.

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Three World Trade Center

Tower 3, with 80 storeys, was built at the heart of the former Ground Zero with formwork solutions by Doka.

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Autobahnbrücke SO 223

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