

# Doka Xpress

The Formwork Magazine | Issue 01 | 2017

Thinking outside the box



## Editorial



**Dear customers, dear readers,**

“Think outside the box and find a solution for this problem” is a statement I hear many times in many different contexts and I guess many others are being told so on many occasions.

In a world of projects with increasing complexity, shapes becoming more sophisticated and with an utmost focus on safety it is indispensable to think outside the box in order to provide the most innovative and effective formwork solution and thereby meeting the individual demands of each project.

Be it the stunning Aurora Project in the heart of Melbourne, the architectural highlight in Kuala Lumpur “Exchange 106” or the impressive Hutong Pylon representing the tallest pylon on earth, all unique formwork solutions have been developed by our experts together with the teams from our customers. It goes without saying that without the capability of looking at each individual project from a completely different perspective, with an unbiased view and going new, innovative paths in providing formwork solutions it would have not been possible to provide these formwork solutions.

In the same way as thinking outside the box happens on the front line with our customers and their projects, it happens on the back end equally. Just one example for Doka’s path for innovative technology is “Concremote” which conquers the construction industry rapidly. In short Concremote allows through advanced technology to save time, increase safety, reduce costs and enhanced concrete quality. How? Through Concrete monitoring in real time!

I invite you to explore together the world of “Thinking outside the box” and I trust this magazine gives you an overview of the fascinating world of formwork.

**Stefan Schedel**

Director Region East Asia & Pacific

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## Doka News

### Doka load-bearing tower d3 enters Philippine market ▶

Doka has delivered load bearing system d3 for the project South West Integrated Terminal. The construction company Megawide Construction Corporation has bought 880 towers (in total 200 tons). Main reason for using d3 was the high capacity up to 94 kN in order to minimize the quantity of towers and thereby labour costs.



Foto: Megawide Construction Corporation



Foto: Sands Infra Build

### ◀ Sands InfiniT Park – Tallest IT towers in Kochi, India

Sands Infra, the IT wing of LuLu Group International builds 30-storeyed Twin IT towers at SmartCity, Kochi. With a total height of approximately 165 meters the Sands InfiniT Park will include the tallest IT towers in the region.

### Golden Bull Award 2017 honors businesses in Malaysia for their achievements ▶

Doka Malaysia and Singapore (DMXS) received the Golden Bull Award 2017 for its outstanding performance in the industry.





# Digitisation yields the crucial advantage in construction

**Interview with Toine van Casteren**, Managing Director BIAIS

Earth's population, according to scientific forecasts, will rise to eleven billion by the year 2100. There will also be an enormous increase in urbanisation. Right now half the people in the world live in cities; by 2050 the figure will be in the region of 75 percent. These developments pose huge challenges in terms of creating living space and an increase in the construction of infrastructure projects, especially in large parts of Asia, Africa and South America. One solution for the building industry is digitisation. Clearly, the industry is aware of the importance of the megatrend toward digitisation. The problem lies rather with implementation. We talked with Toine van Casteren about innovative technologies and developments in the construction industry.

## **How can the building industry meet the increase in urbanisation?**

We need to develop greater efficiency in construction processes in order to meet the challenges as regards infrastructure, especially in mega-cities. It's necessitate the use of innovative technologies. Doka contributes significantly to BIM (Building Information Modelling), the interactive, end-to-end process optimisation over the entire life cycle of a structure. More and more entrepreneurs, first and foremost institutional project owners and product developers, are coming to rely on this method that uses computer software to optimise the entire process from planning and bid management through project implementation to ongoing >>



## **About Toine van Casteren:**

Toine van Casteren is a civil engineer (Delft University of Technology, Den Hague) and managing director of BIAIS Research & Technology, an international concrete research and engineering company with headquarters and very modern test facilities in Venlo and subsidiaries in Belgium and Germany. He specializes in research and process optimization at the construction site and precast factory and developed Concremote in order to measure strength development of fresh concrete in real-time.

**“The possibilities opened up by Construction 4.0 give players in the construction industry all kinds of ways to boost their productivity. Doka is thus actively promoting the change in the building sector – in the direction of increased efficiency and profitability.”**

**Toine van Casteren,**  
Civil engineer and managing director of  
BIAIS Research & Technology

maintenance, making everything more transparent and traceable.

**Everyone is talking about digitisation and the future of construction – what is digitisation to you?**

In the building industry we are on the brink of a digital revolution. Laptops and tablets are already common on jobsites. Lists of materials, drawings, delivery deadlines and details of progress on the build are all, only a click away. These days, site managers and foremen get important data like the degree of concrete hardening flashed to their smartphones as text messages in real time. None of this is a vision of the future, this is day-to-day construction on many of our projects. Even so, as regards digitisation and also in terms of productivity and efficiency, there is still plenty of latitude for improvement. Doka took a big step toward Industry 4.0 with the acquisition of Dutch technology company BIAIS last year.

**The best example for an innovative technology is Concremote. What are the benefits of Concremote on construction site?**

In tough everyday construction site situations it is always important to work quickly, safely and economically. Reliable information on the temperature and strength of the concrete is vital to the construction workflow. This is precisely what Doka provides with Concremote: the technology supplies data on temperature and strength development in real time and has already proved indispensable on numerous jobsites. Real-time data enable

more accurate control of the forming and in-situ concreting operations. The stripping and curing times, for example, plus the earliest possible time for pre-stressing are all computed on the basis of concrete-strength development. And it is also a reliable tool for documentation, which can be of great benefit in cases of liability.

**Can you mention some concrete projects in the East Asia & Pacific region, where Concremote is already successfully in use?**

Concremote is used in one of the most prestigious projects in Malaysia, the Merdeka PNB 118. When completed in 2024, the tower will be, with a height of 635 m and 118 stories, the tallest building in Malaysia and the fifth tallest in the world. Another interesting project, which is also located in Malaysia, is the precast slab production for the Sunshine Mall. The entire project will be over 3.7 million square feet of gross area, spread over three blocks of 38-storey buildings, comprises 270 units of serviced apartments, 144 units of small home offices (Sohos), a supermarket, 300 retail outlets, a medical specialist centre, a 320-room business class hotel, and cineplexes.

Already prior to the project start, the company worked intensively with the customer. Concrete tests were carried out to determine the best formula for the concrete. Concremote is already in use (core walls and mega columns). It calculates the temperature development, the strength gain in real-time and the enhanced concrete quality. Also other countries in the region are already interested in the innovative solution. In Taiwan, Indonesia, Vietnam and Hong Kong there is already strong interest in Concremote.

▼ Once the concrete has been screeded, Concremote slab sensors are placed and start measuring automatically.



**Construction projects are becoming ever more complex. In response, the industry must find ways to reduce complexity and costs, raise productivity and guarantee quality. How?**

Construction workers devote only about 30 % of their working time to their principal activity. The remaining 70 % is taken up by running errands, transporting materials, cleaning up, rearranging the building site and looking for materials and equipment. It is therefore perfectly understandable that many businesses see a need for optimization. This is where digital technology can help. Supply software, for example, can be used to ensure that materials are delivered to the site just in time, i. e. precisely when they are needed. Storage and rearrangement work can be minimized as a result. The possibilities opened up by Construction 4.0 give players in the construction industry all kinds of ways to boost their productivity. Doka is thus actively promoting the change in the building sector – in the direction of increased efficiency and profitability. //

# CONCREMOTE

Concrete Intelligence. Real-time.



Save time



Increase safety



Enhance concrete quality



Reduce costs



## Concremote – concrete monitoring in real-time

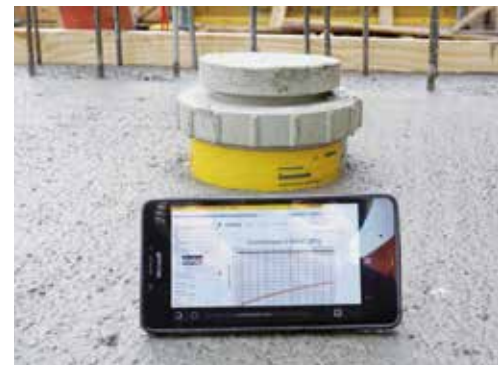
**It improves construction productivity** by optimizing cycle time, quality and costs.

In tough everyday construction site situations it is always important to work fast, safely and economically. Reliable information on the temperature and strength of the concrete is vital to the construction workflow. Concremote automatically measures the fresh concrete temperature development and calculates the compressive strength gain in real-time. The use of Concremote could shorten the construction cycle on the core build of a 47-storey highrise by a day per storey, resulting in a 20 % increase in productivity. Concremote has a very wide operating range. As proved at temperatures down to minus 40 Celsius on the Muskrat Falls project, Canada's second largest hydroelectric facility, it is also in

great demand in the East Asia and Pacific region. Concremote was used on sites Merdeka PNB 118 and Sunshine Mall, both in Malaysia.

### **Doka Malaysia and Singapore (DMXS) awarded for Concremote**

DMXS had participated in ARCHIDEX trade show for architecture, interior design and building industry in Kuala Lumpur. This year, Concremote was the highlight and had won the New Product Award. It was recognized for its great innovation and technological advancements. The Doka booth had welcomed more than 400 visitors. //



▲ Accessing real-time data around the clock and from any mobile device

▼ Doka Malaysia and Singapore won New Product Award for Concremote





Photo: Aurora Melbourne Central

▲ Aurora Melbourne Central rising up!

# Thinking Outside the Box

## The Challenge

The largest challenge has been to develop a core system suitable for the project. The greatest challenge for Doka was the complexity of the shape of the building – from the top it looks like a butterfly.

**Smart thinking delivers** an innovative formwork solution for Melbourne's luxury Aurora project.

As the only residential tower with direct access to Melbourne's underground City Loop rail line, the Aurora building has been designed with a focus on convenience, luxury and sophistication. Combining 92-levels and reaching more than 269 m in height, it features 941 residential apartments, 250 serviced apartments, retail spaces and strata offices, as well as 300 car parking spots and 780 bike spaces. Aurora's unique curves and attractive

curtain wall (glass façade), including led fins made of vertical aluminum panels, will provide a dynamic and beautiful addition to Melbourne's skyline – reflecting the iridescent silver, blue and rose hues from the bay, the city and the mountains beyond.

Probuild engaged the services of Lubeca for specialist formwork solutions to achieve their targets for this impressive project. Lubeca and Doka have



## The Solution

The Xclimb protection screen with the monorail for façade installation will become the modern way of highrise building and we are very excited to see this innovation leading the charge.

worked again successfully together. Speaking about the Aurora project, Crispian Packeer, Design Manager with Lubeca, said: “Probuild requested the large core to be split into two separate climbing systems to achieve quicker cycle times. They also needed access and egress from each system to the other system. The main challenge was to develop a split core system to give the project efficiency and flexibility. The integration of Lubeca’s platform system and the Australian-tailored Screen Protection and Monorail System give the Aurora Project an even greater competitive edge.

### Butterfly design – Up for the Challenge

Not surprisingly, the combination of complex design, building height, the compact site footprint and Aurora’s inner-CBD location presented some significant construction challenges. These included the design, supply and operation of formwork for the project. Richard Wimmer, Doka’s Project Manager Global Expertise Center (GEC) Highrise, said: “I still remember very well when I met Alexei Simm, Project Director from Probuild for the first time in February 2015. From this time on we’ve been in contact. He also visited our Doka Forum at our headquarters. In meantime Doka Australia & HQ developed a new system especially for the Victorian market with the focus on Aurora.” The greatest challenge for this project is the complexity of the shape of the building. From the top it looks like a butterfly. From level 68 it will change to a heart form. Another challenge for Doka is to assemble 56 screens together and transport them to the site. We also had to consider new design updates and be flexible in finding solutions,” Richard added.

### Ready for the solution:

“The Xclimb protection screen with a monorail to install the façade will become the modern way of highrise building. We’re very excited to see this innovation leading the charge. With the focus on speed and safety – we are promoting a product customized to Australian standards and expectations – our client, Probuild, is one of the biggest construction companies in Australia. We’re delighted to be in a strong partnership with them,” Christian Unger, Doka Managing Director said. The first protection screens were delivered on site from mid-June.

“This project sets the tone for what is to come in the Victorian highrise construction market. We have been able to break into the market with a highly innovative concept and deliver it in practice,” Doka Managing Director Christian Unger said. “We are truly proud and excited to be supporting Probuild in the construction of one of Melbourne’s tall-

est and most iconic residential developments,” said Adam Halliburton, Lubeca’s Managing Director.

### Safety is the key

Safety is important to us. Our work starts with safety in mind and carries through to all of our products and services. We also understand if it’s done safely, it’s also the fastest way to do the job. Safety is the number one thing we do. Doka and Lubeca have been involved in the innovation developed on this project including how to ensure the approach could and did indeed work safely and efficiently. At the moment, construction works are on schedule. We have spent much time with Lubeca and Doka in the initial set up and planning stage, received great support for several challenges and have tackled innovations we wanted to include in this project especially in split core system and the rail system. The solution to this challenge was to provide external trailing walkways and additional external stair units hanging from system 1. The two levels of cantilevered walkways and additional stair towers give workers safe and easy access through a door opening in the cladding (on the outer face of the system) of system 2 and access to the poured stair shaft in system.

The design for the Aurora project was developed with the Doka Australia team, GEC Highrise, led by Mr Richard Wimmer from Doka’s High Rise Expert Center at Headquarters, and the Lubeca design team. They kept the client interested for the protracted 24-month bidding process. Aurora is to date the biggest single order for Doka Australia. As soon as Doka Australia was awarded the project, they created a team straight away. The effort Doka Australia put in was well worth it as potential projects are already in pipeline. This was only possible due to a highly motivated team.

The Aurora development is scheduled for completion in late 2019. //

### The Facts

**Project:** Aurora Melbourne Central

**Client:** Probuild

**Location:** Melbourne, Victoria

**Start and scheduled end date of work:** July 2016 – End 2018

**Systems in use:** Protection Screen Xclimb 60 with Monorail, Lubeca’s platform system

**Overall m<sup>2</sup>:** 4,100 m<sup>2</sup> of Xbright



### The Expert

**“We are truly proud and excited to be supporting Probuild in the construction of one of Melbourne’s tallest and most iconic residential developments.”**

**Adam Halliburton,**  
Lubeca Managing Director



### The Professional

**“Safety is important to us. Our work starts with safety in mind and carries through to all of our products and services. We also understand if it’s done safely, it’s also the fastest way to do the job.”**

**Darren Ingram,** Site Manager,  
Aurora Melbourne Central



▲ The lead Lubeca System for the Aurora Project, including allowance for crane and palcing boom.

► Doka fully satisfies the client's various requirements on the fast-tracking construction by using Automatic climbing formwork SKE50plus and SKE100plus for corewall and ensure the safe working condition at the slab using protection screen Xclimb 60.

## The Facts

**Project:** The Exchange 106  
(formerly called The Signature Tower TRX)

**Location:** Kuala Lumpur, Malaysia

**Type of structure:** Office building

**Architect:** Mulia Group Architects

**Project owner:** Mulia Group

**Lead contractor:** China State  
Construction Engineering Corporation

**Start of construction:** Spring 2016

**Scheduled completion:** Late 2018

**Number of storeys:** 106

### Formwork technology:

Products: Automatic climbing formwork SKE100 plus, Automatic climbing formwork SKE50 plus, Large-area formwork Top 50, Xlife form-ply, Protection screen Xclimb 60 with integrated Material Catch Fan  
Services: Formwork instructors from Malaysia and Headquarters in Amstetten

### Formwork planning:

Doka Malaysia, Global Expertise Center  
Highrise Doka Headquarters



# Reaching new heights in a 3-day cycle with Doka



## The Professional

**“Mulia’s Exchange 106 project is a fast-track super highrise building, and as such we felt it was important to have a reliable partner on board with both international and local expertise. Doka’s climbing formwork system for the core along with on-site instruction for formwork assembly and operator training allow us to confidently cycle floor to floor at a rate of 3 days with the greatest efficiency and assurance of high quality.”**

**Corey Suckling**, Project Engineer from  
Mulia Property Development

**The twin skyscrapers Petronas Towers are among the most famous highrise buildings in Kuala Lumpur.** At the end of 2018, the Exchange 106 (formerly called The Signature Tower TRX) will be a new architectural highlight gracing the skyline of Malaysia’s capital city. The building will be one of the tallest in Asia and it will rank among the world’s top 15. Doka’s formwork expertise is very much in demand on this mega-project – another important milestone in highrise construction for the company.

When finished in late 2018, Malaysia’s Exchange 106 will soar 492 metres into the sky. The build is under construction in the city’s new Tun Razak Exchange district, which when finished will occupy some 13,877 m<sup>2</sup> in the heart of Kuala Lumpur. The district is planned to become Malaysia’s new international finance and banking centre. The design of the Exchange 106 was drafted by Mulia Group Architects. The building tapers continuously

as it rises. It is topped by a 48-metre high illuminated crown made of special glass. In the dusk and at night-time the skyscraper will stand out as a unique light effect in Malaysia’s capital. Project owner of the new highrise building is Indonesia’s Mulia Group, which has planned the structure with 106 floors primarily as office space. The individual floors average 3,100 m<sup>2</sup> in size. There are no interior columns. Lead contractor on this build is



China State Construction Engineering Corporation. Doka was selected as formwork technology partner based on its many years' experience in highrise construction and innovative approaches. Construction work started in spring 2016.

### Decoupling the forming and the reinforcing operations

The core of the Exchange 106 is made of reinforced concrete and the floor slabs are of steel-composite design. The core wall reduces its size at Level 33 and Level 51. Working closely with the highrise specialists at headquarters in Amstetten, Doka Malaysia developed a practical formwork and safety concept adapted to the tight construction schedule and the customer's high safety requirements. "Mulia's Exchange 106 project is a fast-track super highrise building, and as such we felt it was important to have a reliable partner on board with both international and local expertise. Doka's climbing formwork system for the core along with on-site instruction for formwork assembly and operator training allow us to confidently cycle floor to floor with the greatest efficiency and assurance of high quality", emphasizes Corey Suckling, Project Engineer from Mulia Property Development. After Level 51 the tower raises with a 3-day cycle to the sky.

On this project the building core is exceptionally large and is being built with Automatic climbing formwork SKE plus. SKE100 plus and SKE50 plus climbing units are in use. The combination makes the implementation of the project solution efficient and fast as well. With a lifting capacity of 10 metric tons per climbing unit, the SKE100 plus system is eminently suitable for the structure of the building core and the high ratio of reinforcing material. The automatic climbing systems are combined with Large-area formwork Top 50 to give the concrete its shape. The Top 50 formwork is suspended on rollers, so forming times are fast and stripping paths large. Changing form-facings is a complex job, so for this build the formwork was faced with Xlife sheets and fitted with steel corners, permitting high numbers of re-use cycles.

The Automatic climbing formwork SKE100 plus has rising working platforms. In other words the formwork and the reinforcing operations are decoupled, so work proceeds on a number of different levels at once. All the forming work is done on the main working platform. Other working platforms are integrated above and below. They are for the jobs of installing the reinforcement, pouring the concrete, operating the climbing system, finishing the concrete and installing connectors for the steel composite floor slabs. All these jobs proceed in parallel, so progress on the build is faster and construction time is shorter. What is more, the

SKE100 plus system has plenty of storage place for reinforcing materials, so the site crew has everything ready to hand.

### Building core climbs in two sections

Another particularity of this build is that the building core is divided into two sections with multiple shafts. So the entire climbing scaffold on the outside of a core section can climb quickly and safely in a single repositioning operation. No apertures occur during climbing, so no construction materials or gear can fall from the platforms. Alternate repositioning of the sections of the building core speeds up construction to a tremendous extent. "We have to stick to a 4-day cycle, so everything has to be coordinated. All the influencing factors have to interact seamlessly: fast repositioning of the climbing system, ample storage space for the reinforcement and different jobs going ahead all at the same time. The crew splits into parallel teams for working the formwork, placing the reinforcement, pouring the concrete and doing the various finishing jobs. The timing is all-important", stresses Thomas Hofer, Senior Engineer, Doka Malaysia.

While working out the details of the formwork solution, Doka was planning for optimum usage of the cranes on the inside and outside of the building core. The cranes integrate seamlessly into the formwork concept. The concrete placing boom system is also repositioned with the Automatic climbing formwork SKE100 plus. This SKE100 plus climbers, which supports the CFB, is located separately underneath the core formwork. This allow more flexibility. The corewall system can be repositioned to the next level independent and at the same time other locations can be casted by using the CPB.

### Safety first

The Exchange 106 will have a steel skeleton façade. The Doka Protection screen Xclimb 60 with trapezoidal metal sheeting provides all-round protection during construction. A special feature of the variable enclosure is that it has integrated Material Catch Fan what means the safety nets are mounted to the protection screen and also get repositioned together with the screen. All the work connected with the reinforcement, the installation of Bondek (loose formwork) and the pouring of the concrete carries on inside the protection screen. The steelwork and the welding work proceed above the protection screen. The nets catch tools and small items if they are dropped. This solution was designed specifically for the high safety requirements on the Exchange 106 build. The material was installed in January 2017. This will be the first time they have been used on a building project anywhere in the world. //



▲ Forward-thinking formwork planning – right from the start the cranes were taken into account in the formwork concept. So now they integrate seamlessly. Doka also supplied all the illuminated logos.



▲ The building core is divided into two sections and is being built with Automatic climbing formwork SKE100 plus and SKE50 plus. The entire outside of a section can be repositioned in a single operation with hydraulic cylinders.



▲ Topping out at 492 metres, the Exchange 106 will be another architectural highlight in the skyline of Kuala Lumpur.

## The Facts

**Project:** Shanghai-Nantong Yangtze River Bridge

**Client:** 2<sup>nd</sup> and 4<sup>th</sup> Engineering Co., Ltd. of China Railway Major Bridge Engineering Group Co., Ltd

**Contractor:** China Railway Major Bridge Engineering Group

**System in use:** SKE100 plus, Top 50

**Overall height:** 325 m

## The Challenge

Difficult geometry, changes of cross section and climbing 55 casting steps from bottom to top without major platform rebuild and no plywood exchange a big challenge for the Doka design team.



## The Solution

30 pieces automatic climbers SKE100plus with telescopic platform adapt easy to geometry changes at each pylon leg. With 1 piece Hydraulic unit V140 the platforms climbing all together, ensure high safety and always 100 % covered solution. The wall formwork Top 50 with Doka Xface plywood allow high number of reuses.

## The Professional



**“Height of more than 300 meters and poor foggy weather conditions are the biggest challenge for that job site.”**

Yuan Bo, Project Manager

## Expert Advice

Doka Xface sheets ensure high number of re-uses by its great durability against scratching and vibrator damages.

► 1<sup>st</sup> casting step with Doka formwork of the 325 m high Hutong Pylon.



▲ Doka formwork solution for 6 m regular step height shortening the construction progress.

# New Record – Automatic climbing formwork for tallest Pylon

**Hutong pylon** will be with 325 m height the tallest pylon on earth.



Shanghai-Changjiang River Bridge is a new Shanghai-controlled railway project, with total length of 11,072 meters. The link will be the world's tallest dual-use cable-stayed bridge, with main span of 1,092 meters. The bridge is divided into two layers, the lower with 4-line railway, the upper with 6-lane highway. Diamond-type concrete bridge pylons are 325 meters high. Based on the world's largest deep water sink foundation equivalent to 12 basketball courts and 115 meters depth. //

# A rendezvous with luxury and style

**Doka delivers the appropriate formwork solutions** for Indiabulls Sky Forest, the tallest residential tower in Mumbai.

Rising majestically above the City and the Arabian Sea, Indiabulls Sky Forest stands as the tallest residential tower in Mumbai. It is a destination unto itself, which has set the benchmark for urban planning in the country. The two towers are approximately 220 meters high with 52 floors. Each apartment has large double height decks which create a sense of space in this congested city of Mumbai. The towers consist of duplex apartments ranging from 3 bedrooms to 6 bedrooms. The presence of the vertical green walls and its sheer scale makes it available to the general public and

can be enjoyed from a distance. The twin towers are connected on 9<sup>th</sup> floor by a large podium with common amenities like swimming pool, gymnasium and other recreational/sporting facilities. With its close proximity to corporate hubs like Nariman Point and Bandra-Kurla complex via Bandra Worli Sea Link and involvement of internationally acclaimed designers, Indiabulls Sky Forest Duplex and Triplex apartments are Mumbai's latest rendezvous with luxury and style. The apartments will also offer panoramic displays and uninterrupted sea view. //

▼ The combination of Doka climbing formwork SKE50 and Xclimb 60 Protection screen offers highest safety standards for highrise projects.



## The Facts

**Project:** Indiabulls Sky Forest

**Client:** Indiabulls Real Estate Ltd.

**Location:** Lowe Parel – Mumbai, India

**Start and scheduled end date of work:**  
July 2016 – July 2018

**Systems in use:** Climbing formwork SKE50, Xclimb 60 Protection screen

**Total Project Area:** 3.80 Acres

▼ The gapless Protection screen Xclimb 60 allows the crew to work safely at the top levels of Indiabulls Sky Forest.



## The Challenge

Protection Screen for double height – Doka India is using this type of system the first time. So they needed to do all kind of design, calculations, risk analysis and methodology from initial stage.

## The Solution

Doka Protection Screen Xclimb 60. Special Profile to cover approximately 20 metres in height and free standing protection of more than 4 floors at a time.





▲ Doka d3 load bearing tower system used for slab construction.

# Doka formwork in Singapore Metro Project

## The Facts

**Project:** T206 Woodlands MRT Station

**Location:** Woodlands, Singapore

**Contractor:** Shanghai Tunnel Engineering Co (S'pore) Pte Ltd

**Doka delivery start date:** May 2016

**Doka materials returning date:**  
3<sup>rd</sup> quarter 2017

**Total formwork supply:** 2,366 m<sup>2</sup>

**Systems in use:** Large-area formwork  
Top 50, Frami and Dokamatic Table with  
Load-bearing Tower d3 & Shifting Device

**Frami system for tunnel** of new MRT Line mounted on wheels.

Since the first MRT stations were opened in 1987, the train system has become the backbone of Singapore's public transport network. Today, it spans some 150 km across the island and moves more than 2 million passengers daily. Doka forms a tunnel as a part of a new MRT Line, which is running from north

to south of Singapore. The wall formwork is mounted on wheels for ease in displacing within the tunnels.

Thomson-East Coast Line is a new joint Line between the Thomson Line and the Eastern Region Line. The 43 km Line will add 31 new stations to

the existing rail network, with seven interchange stations which will link to other Lines. Commuters can use the new MRT Line in stages from 2019.

Doka forms one of the new tunnels in T206 Woodlands MRT station project, which has a length of 495 m and is situated between Thomson Line Woodlands Station and Woodlands Ave 12 including crossover- and reception tunnels to a depot for Thomson Line. Both large-area Formwork Top 50 and Frami were used to cast the internal and external walls respectively.

### Innovative design of Frami system

For the tunnel basement wall construction, where crane access is obstructed by the heavy strutting system of the open excavation, Doka came up with an innovative design of Frami system combined with A-frame on wheels to cast the wall in sections. The system is light weight but sturdy enough to withstand the concrete pressure and most importantly can be installed, shifted and dismantled just by pure manpower and no crane assist. Slab casting was using the Dokamatic Tables and Load-bearing Tower d3 for casting height from 4.8 m to 8.13 m with slab thickness from 1.2 m to 2.0 m.

The design of the formwork is catered to work within the confine of the tunnels at 30 m below sea level. Final fixation of the formwork is done

below the tunnel and it is easily man handled with the wheels attached. Due to one side of the external wall being too close to the skim wall, Frami allowed easier access for assembly on the other side by individual piece to close the wall formwork.

### Close coordination and fast processing

From design stage to execution stage, close monitoring of the design approval and materials delivery was carried out with the site team. Doka engineering submitted the design approval for each set of drawing promptly. With design approved, materials preparation was carried out with the final design for delivery planning. The formwork instructor provided classroom and site practical training to the two subcontractor teams for each of the three formwork systems supplied. Doka project management team was closely communicating with site staff for site-coordination and execution of delivery and returns of the project.

The proposed formwork system for both walls and slab formwork took into consideration of the foreseeable site situation below the tunnel during execution by site staff. The key conditions were namely ease of assembly at site, displacement of formwork without crane and allowed access of closing the formwork from the confine space between the skim wall and the Frami wall formwork. //



### The Expert

**“ In order to achieve customer requirement of 3 days pouring cycle, Doka has delivered the innovative solution with tailor-made formwork on wheels for fast and quick construction method. This solution able to ease the transferring for next casting.”**

**Colobong Renato Jr. Samudio,**  
Singapore Engineering Group Leader

### The Challenge

For the tunnel basement wall construction, crane access is obstructed by the heavy strutting system of the open excavation.

### The Solution

Doka came up with an innovative design of Frami system combined with A-frame on wheels to cast the wall in sections.



▼ Doka d3 load bearing tower system used for slab construction.



## The Facts

**Project:** UOW Student Accommodation

**Client:** Formsite

**Location:** Wollongong, NSW

**Start and scheduled end date of work:**  
July 2016 – March 2017

**Systems in use:** Dokadek 30 Panel System, Dokaflex, H2O beams

**Overall m<sup>2</sup>:** 7,000 m<sup>2</sup>

# Time, labour and costs savings on university project

**Doka formwork solution** gets trades on deck within 3 days.

## The Expert



**“Site training and demonstrations at project’s start ensured everyone got off on the right foot and production was high from the beginning. Doka Australia has ensured Formsite will only use one system on site and one design. This eliminated the need to erect another system and saved time and labour costs. As well, the safety aspect was covered as you work from the ground with the Dokadek 30 Panel System.”**

**Jonathan Derbyshire,**  
Senior Sales Representative

Hutchinson Builders was selected by Living & Learning Custodians to develop the University of Wollongong’s Student Accommodation. The new student residences on Northfields Avenue, Wollongong, will deliver a unique and contemporary accommodation solution that complements the strengths and qualities of the campus. These three buildings, each with seven storeys, will be connected via covered walkways to encourage student interaction.

The project’s formwork contractor, Formsite Pty Ltd, selected the newly developed Dokadek 30 Panel System for this remarkable residential project. Doka Australia supplied a total of 7,000 m<sup>2</sup> of Dokadek 30 Floor Panels for two buildings.

## Design – Up for the Challenge

The University of Wollongong Student Accommodation project presented several challenges.

“The biggest challenge was to find a system which could get trades up on the deck within three days. It was challenging to find a solution with high productivity and no gaps left in the system to ensure our trades worked safely,” said Mathew Anderson, Formsite’s Project Manager.

Another challenge was having a system which worked very well with infills. Formsite did not want to change the system in any part of the slab – they wanted to save time and go right through to all of the edges without any problems.

## Solution tailored for the customer

“Importantly, we were able to overcome these challenges by using the flexible infill system with the Dokadek 30 slab formwork system,” Stephen Lake, Project Engineer Doka Australia said.

For infill areas, the Dokadek system is fully compatible from both an engineering and safety standard

## The Professional



**“I highly recommend Dokaflex system and Dokadek 30 Panel System. We are very, very happy with it. The reasons why we like the system include: Speed – quick up and down; good quality off-panel finish; easy to manoeuvre around the site; equally effective for high strutting floors; easy to transition from panel to conventional formwork with the use of the infill beam; prop centers allow excellent, easily delineated access under formed deck; and not many components so easy to manage on site.”**

**Matt Anderson,**  
Project Manager, Formsite



▲ Uniform and clean concrete finish after stripping the formwork.



▲ System compatibility to all other Doka floor systems.

with all other Doka formwork products. There is also a range of infill panels and beams to suit whatever Australian construction sites demand.

“Using Dokadek infill beams and H20 beam suspension clamps, infill areas around columns and between the panels the Dokadek 30 system integrates seamlessly into our Dokaflex slab formwork system,” explained Stephen.

“For typical infill areas around a single column, the use of the H20 suspension clamp means there is no need for any extra props to be used. Additionally, by simply inserting the infill beams and laying your plywood down on top, the Dokadek infill beams also allow for infills between panels to be formed without the need for any extra beams or props,” he said.

### Outcome suits the client

The Formsite team was also pleased with the safety features of the panel system. Dokadek 30's unique design means that it is erected from below; it cannot be put together from the top down. This not only means that the formwork crew can see that they're putting it together correctly; it also eliminates the risks associated with crews standing on an unstable surface or working from above.

“The reasons why we like the system include: Speed – quick up and down; good quality off-panel finish; easy to manoeuvre around site; equally effective for high strutting floors; easy to transition

from panel to conventional formwork with the use of the infill beam; prop centers allow excellent, easily delineated access under formed deck; and not many components so easy to manage on site,” said Matt Anderson, Project Manager, Formsite.

Stephen Lake, Project Engineer Doka Australia, added: “The lockable head means the panel can only be installed from the ground. This reduces the temptation to install it from the top. In short, this makes for a safer system,” he added. “Furthermore, the finish of the concrete is better due to the plastic-faced plywood. Another bonus is the panel size allowing fewer joint lines compared to our competitors' systems.” //

▼ Reduced use of props thanks to Dokadek 30.



▲ The new student residencies at the University of Wollongong will deliver a unique and contemporary accommodation solution. With a total of 1,054 beds across 3 buildings, the facility is focused on the integration of learning and social opportunities in a residential context.

### The Challenge

Provide a slab formwork system that can be easily replicated across all three similar towers to ensure uniformity and speed from repetition when forming

### The Solution

To provide a formwork system for the complete slab that satisfies the cantilever requirements to suit the scaffold layout at the perimeter of each building.





▲ Dam formwork D22 and Large-area formwork Top 50S from Doka are used to construct the draft tubes and the spillways.

# Full Doka-formworking power for mega-scale hydro in Canada

## The Facts

**Project:** Keeyask Generating Station

**Location:** Manitoba, Canada

**Construction work by:**  
BBE Hydro Constructors LP

**Start of construction:** 2014

**Scheduled completion:** 2021

**Type of structure:** Hydropower station

**Output:** 695 megawatts

**Systems used:** Formwork: Dam formwork D22, Large-area formwork Top 50S, Load-bearing towers Staxo 100, Framed formwork Framax S Xlife, Services: Formwork planning, formwork instructors, pre-assembly

**Doka's biggest ever power-plant contract in North America: for the construction of the Keeyask Generating Station 300,000 sq ft of Doka formwork are in use.** Doka's services on this site range from engineering and consulting, up to pre-assembly and instructions for a safe use of the formwork systems. Completion is scheduled for 2021.

In the Canadian province of Manitoba the 695 MW hydroelectric Keeyask Generating Station is under construction on the Nelson River. The scale of this project is enormous: for example the reservoir of the plant will have a surface area of some 23,000 acres. On completion, scheduled for 2021, the plant will supply some 4,400 GWh of electricity a year to homes and businesses in Canada and the US. With more than 300,000 sq ft of formwork, it's a record-breaking project for Doka too. Keeyask is the biggest project ever undertaken by Doka Canada

and the biggest power-plant job for Doka in North America. Up to now, the 824 MW hydropower plant Muskrat Falls in the Canadian province of Labrador, has been the largest power-plant project for Doka in North America.

## Counting on international formworking expertise

A team of Doka engineers in four countries is working on finding the best formwork solution for



Keeyask. A real challenge, because it's essential to take into account diverse factors, such as simultaneous erection of multiple structures, use of concrete with a high early strength, and the specifics of local geology. The Doka engineers meet these requirements by combining Dam formwork D22, Large-area formwork Top 50S, Framed formwork Framax S Xlife and Load-bearing towers Staxo 100. Formwork systems from Doka are being used to construct the draft tubes, the spillways, the powerhouse and the service bay complex.

### Non-tied forming with Dam formwork D22

The Keeyask build is taking shape steadily also with our Dam formwork D22. In use on all of the construction sections where Doka is involved, the system scores especially on account of its high load-bearing capacity and its versatility. One bracket up to 13 ft in height can carry loads up to 220 kN (49.5 kip). These loads are transferred to the preceding concreting section. And no form ties are needed; the formwork is secured only to high-strength suspension points on the structure. The rocky terrain on site of the Keeyask hydroelectric power station is a major challenge for the construction crew. Doka came up with a custom-tailored solution. The bracket of the Dam formwork D22 was made pinnable, instead of the usual welded design. So it is versatile and easy to adapt to the differing rock formations on site. To speed up formworking operations, the D22 can be repositioned as an entire unit, which is eased by the rolling-back function of the formwork. A total of about 2,000 units will have been used by the time construction is finished.

### Top 50S – one system for many different requirements

Large-area formwork Top 50S is highly versatile and very much in demand on this build, where it is used for construction of the draft tubes, through which the water is lead away from the turbines. High numbers of use cycles and high levels of re-usability have helped to minimize the need for custom-built formwork. The large-area formwork arrives already pre-assembled on site, and minimizes craneage – due to large repositioning units –, as well as assembly work on site. The Large-area formwork Top 50S was also chosen because, given the wide choice of both form-facing and tie-rod pattern, it can be adapted to very widely differing requirements and any fresh concrete pressure. This was an important criterion for the Keeyask build, where some sections could only be accessed with difficulty and were thus formed with self-compacting concrete and hydrostatic pressures of 1,500 psf.

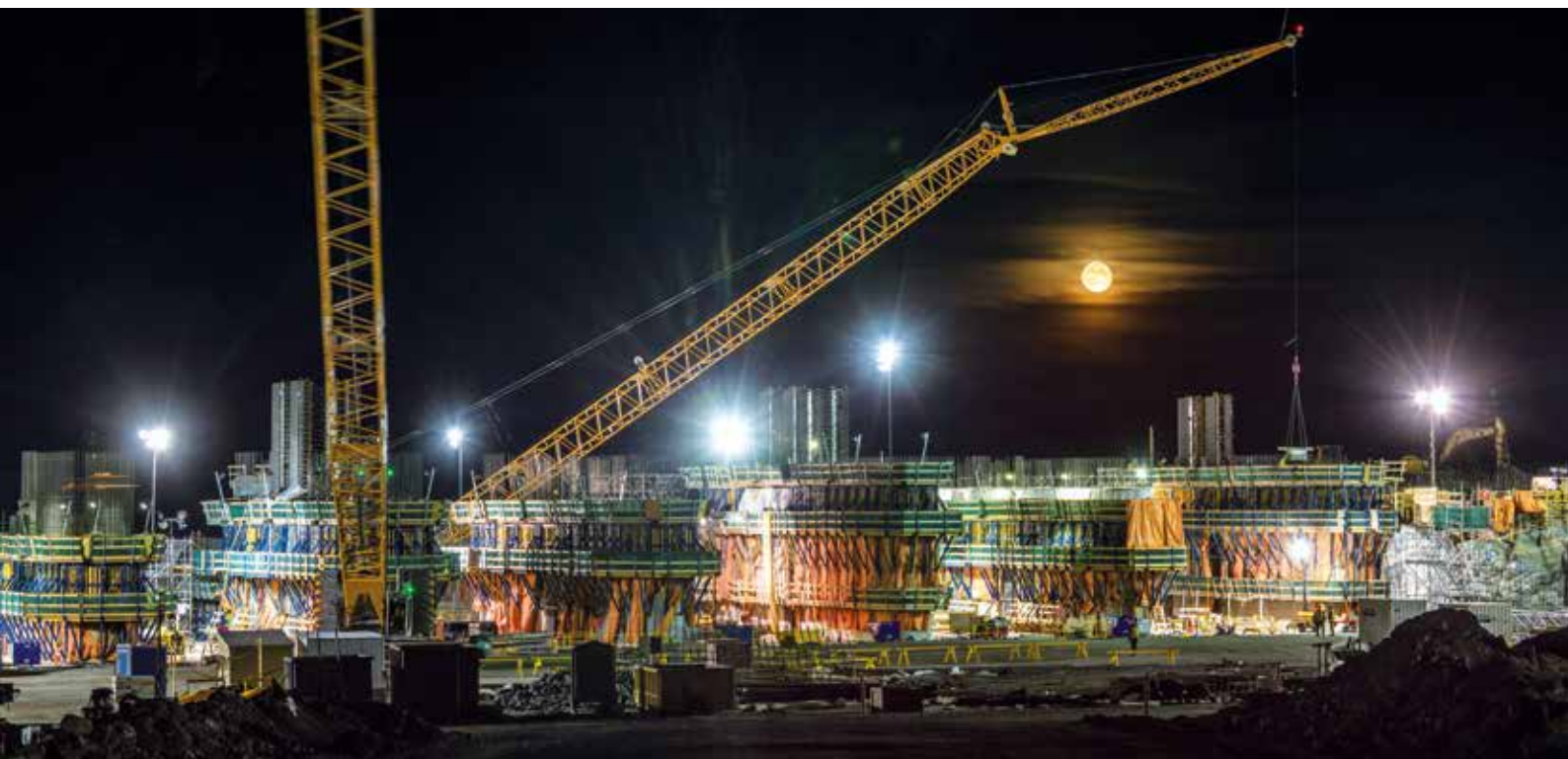
### Faster, and safer too

Doka also compellingly demonstrated the high level of safety of its systems. The Top 50S and D22 formwork systems feature integrated working platforms. Work can proceed in safety and formwork and platforms are repositioned in a single lift, so progress on the build is both speedy and safe. Safety starts with correct set-up and operation of the formwork. So the Keeyask site crew has the on-site support of Doka formwork instructors, who explain how to use the formwork effectively and in safety. //



▲ Because it is so versatile, Large-area formwork Top 50S is the ideal solution for the straight walls and tight radii characteristic of the spillways.

▼ In the Canadian province of Manitoba, formwork power from Doka is being used to build the 695 MW hydro-electric Keeyask Generating Station on the Nelson River.





# Stay safe



## for moments that matter!

Scan  
the QR-Code  
and watch the  
video now!

## Doka brings home the safety message

**Doka Australia launches 'Stay Safe – For Moments that Matter' campaign for the World Day of Safety 2017.**

Greater cost-efficiency, a reduced risk of accidents and enhanced employee motivation are the key advantages of implementing a professional approach to safety on construction sites. On the World Day for Safety and Health, to be celebrated on April 28, safety will be under the spotlight even more so. An international advocate for safety, Doka, a leading provider of construction formwork solutions, takes a holistic, comprehensive approach from product development to safety consulting, and to its extensive range of safety products and services.

It's only when you feel safe that you, as a worker, can concentrate on the job and perform at your best. An obvious truth, but one that needs repeating for construction sector, where the accident rate is double other sectors. Numerous studies have shown on safe job sites, people work faster. On the World Day for Safety and Health, Doka

launched a new safety campaign, Stay Safe – For Moments that Matter, with a YouTube video. This campaign, a first for Doka Australia, gets to the heart of what the company does – bringing people home safely.

"We aim to put safety firmly on the radar for our customers' every waking moment," says Doka Australia's Marketing Professional, Nelli Hegi. Doka Australia's Managing Director, Christian Unger, said: "The campaign aims to get to the core of Doka's business – to make sure its formwork systems keep people safe on site. We are keen to create an emotional connection with the audience and continue our conversations with our customers about Doka offering a safer system and we care about the people on site." It's easy to forget the real moments that matter. It is coming home safely after a hard day's work on site to spend time with your family," he added. //

### The Expert



**"The campaign aims to get to the core of Doka's business – to make sure its formwork systems keep people safe on site. We are keen to create an emotional connection with the audience and continue our conversations with our customers about Doka offering a safer system and we care about the people on site."**

**Christian Unger,**  
Doka Australia Managing Director

# Icon Siam: Highrise along the Chao Phraya River in Bangkok

**New landmark** in living and shopping.

The Icon Siam is spread over 800,000 square meters of land on the Charoen Nakhon Road and includes condominiums as well as shopping complexes, conference- and event-facilities. This luxury high-end project has two towers, Magnolias Waterfront Residences and SuperLux Residences, which are supposed to reach 72 and 54 storeys respectively.

Doka delivers slab formwork Dokadek 30 and flex system, which was used at the slab edge due to non-typical arrangement of balconies per floor level at both towers. For maximum safety, Xclimb 60 protection screen is in use with four working- and loading platforms. As one part of the six balconies

at SuperLux Residences is only appearing in every other floor level, the screen is lifted by crane. d3 tower system was offered to cast the slab. //



## The Professional



**“Dokadek 30 is a very good and efficient slab formwork system. The assembly is extremely fast and safe. Therefore less labour is required. With this system it is possible to speed up building cycle.”**

**Sirirach Denphaetcharngkul**, Project Manager Italian-Thai Development PLC

◀ Panel floor formwork Dokadek 30 for high-speed forming of large areas.



▲ Customer branded Protection Screen Xclimb 60 for safe working conditions at Icon Siam Tower “The Magnolias Waterfront Residences”.

# In brief

News, dates, media, awards

## Happy 5<sup>th</sup> birthday to Doka Australia or Doka Australia is five-years strong

2016 marked Doka Australia's 5<sup>th</sup> anniversary of operating in Australia. As a cutting-edge formwork solutions provider, Doka Australia has definitely earned its place in Australia's construction industry. Christian Unger, Doka Australia's Managing Director, said: "It's been fantastic going from a relatively unknown brand five years ago to one of choice for many of Australia's key players in the construction industry. "Thank you to everyone who has supported, worked for and taken a chance on Doka and believed in Doka Australia," he said. "We'll continue to invest in new technology, research and development to keep improving our offerings."

## Duct Tape Award to staff – Doka's inaugural awards will stick!

A Duct Tape Award for "someone who can/ does fix just about anything was one of the more interesting titles in Doka Australia's first ever staff awards ceremony, a highlight of the 2016 staff Christmas party. Held at Wolfie's Restaurant in Sydney on December 12 last year, the ceremony recognized and rewarded staff for their much-appreciated efforts in working for Doka Australia. The company produces and supplies innovative formwork systems for construction projects that tick all the boxes for safety. Six individuals received awards for their outstanding performance during 2016. They notched the highest number of nominations from their co-workers from all branches in Australia.

The winners were: Rookie of the Year – Romina Bartolome, Loyalty Award – Joe Schinella, Achiever Award – Thusitha De Alwis, Doka Spirit Award – Nelli Hegi, Duct Tape Award – Michael Healey, Healthy Living Promoter – Jonathan Derbyshire. Doka Australia's Managing Director, Christian Unger presented the awards backed by a great image presentation. Doka Australia will be running the awards again for service in 2017.



▲ Sweet anniversary for Doka Australia




▲ The winners of the award night from left to right: Jonathan Derbyshire, Romina Bartolome, Thusitha De Alwis, Nelli Hegi, Joe Schinella and Michael Healey.

## Doka East Asia & Pacific Regional Office

Doka Formwork Pte. Ltd.  
25 International Business Park  
#02-128  
German Centre  
Singapore 609916

T +65 6897 7737  
F +65 6897 8606  
singapore@doka.com  
[www.doka.com](http://www.doka.com)

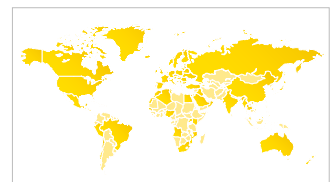
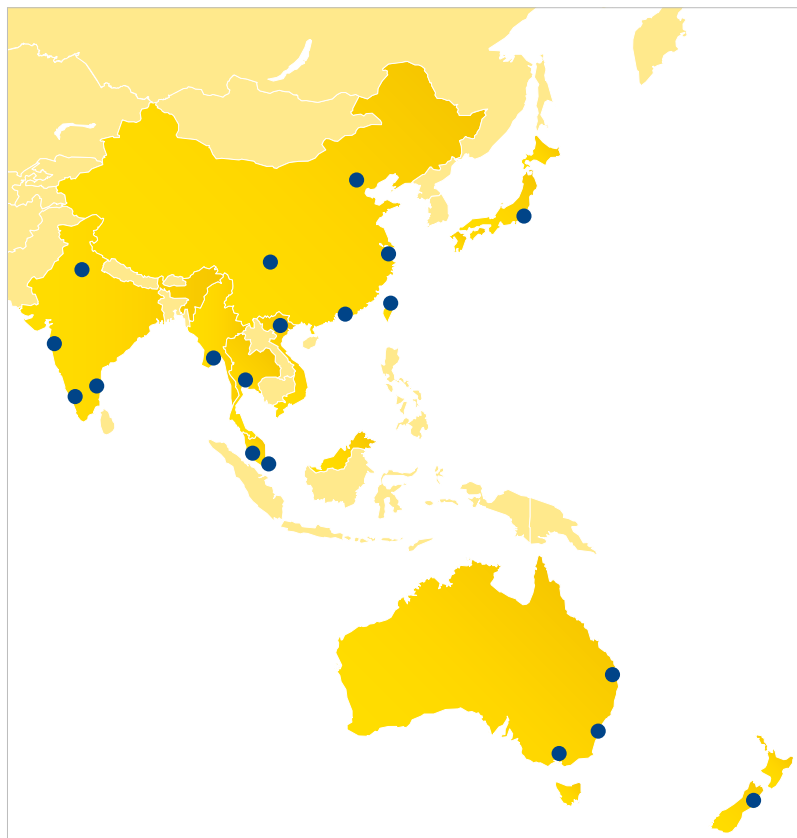


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## ▲ Doka branches worldwide.

With more than 160 sales and logistics facilities in over 70 countries, the Doka Group has a highly efficient distribution network.

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**In some cases the site photos show the situation during formwork assembly and are therefore not always complete from the point of view of safety.**