

# Doka Xpress

The Formwork Magazine | Issue 01 | 2016

## Full formwork power for East Asia and Pacific

### Taiwan & India

Formwork solutions for LNG tanks

### China

Constructing double containment for Tianwan Power Station

### Laos

Forming Xayaburi Hydroelectric Power Project with d3, a new solution for high loads



## Editorial



### Dear customers, dear readers,

Welcome to our latest edition of Doka Xpress. I am very excited to present to you the latest news from around the Doka world, with a strong focus on Asia Pacific. In this large and diverse part of the world, where construction is booming, you will find that Doka provides solutions in many of the countries where we have offices, branches and agents.

In this latest edition, we place a strong focus on the civil sector, with many exciting energy projects under construction. You will be able to see how Doka has been supporting contractors in executing their work more efficiently, safely and quickly. LNG tanks are being constructed with Doka formwork solutions in Taiwan and India; and for the Nuclear industry, which is a key construction sector in China, where safety is paramount, the supplier of choice is Doka.

Even in a remote location in Laos, at the Xayaburi Hydroelectric Power Project, Doka is able to supply and support a value-adding solution. Wherever there is a need, Doka has the ideal solution.

I trust that you will find the reports we have chosen for you insightful and interesting. We are looking forward to partnering with you in your current and future projects and we would very much like to feature the exciting work that you have been doing in future editions!

Andrew Hunt, Director Region East Asia & Pacific.

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## Doka News

### The sky is the limit – Doka forms super high rise Merdeka PNB118 ▶

Merdeka PNB118 will be one of the five highest buildings in the world when completed in 2020. Contractor Samsung-UEMC JV relies on Doka's expertise in forming super high rises. In use are: the SKE100 plus, Large-area formwork Top 100 tec, Monolithic formwork system Doka OneGo and Automatic climbing formwork Xclimb 60.



### ◀ Doka marks its signature in Kuala Lumpur

The Tun Razak Exchange (TRX) is one of the biggest construction projects in town. Literally outstanding is its tallest building, the "Signature Tower", which will be approx. 400 m high. Doka will provide a mixed solution of Automatic climbing formworks SKE100 and SKE50, Large-area formwork Top 50 and Protection screen Xclimb 60.

### Building bridges in Belgium ▶

The 12 km motorway connection A11 between Bruges and Westkapelle is a logistical infrastructure project in a class of its own. On-site different construction methods and Doka formwork solutions are used. A 1.5 km long viaduct is erected using the launching-girder and railway tunnels in cut-and-cover construction.





▲ The LNG tanks are erected with Large-area formwork Top 50 and Climbing platform D15.

# Doka forms giant LNG tanks in Taiwan

In order to keep up with the demand for gas in Central and Northern Taiwan the LNG (liquefied natural gas) receiving terminal is being extended. Three LNG tanks are built in Taichung by RSEA Engineering Corporation.

The contractor builds on the previous success of Doka formwork technology and chose Large-area formwork Top 50 with Climbing platform D15 for its high loadability and safety. The climbing formwork includes platforms for working and pouring, as well as a special upper platform for the rebar work.

This project includes three 160,000 m<sup>3</sup> LNG tanks with a diameter of 78 m and with the cylindrical walls of the solid CIP concrete outer shells approximately 40 m high. The contractor requested an additional rebar platform on the climbing system.

It is designed for block heights of up to 4.10 m and tensile forces of the anchor of up to 150 kN. Its

2.4 m wide working platforms offer high safety and plenty of working space. Six levels of platforms are in use to facilitate construction work, such as rebar tying, pouring concrete and formwork operations. The inner and outer formwork, measuring 80 m in diameter, are equipped with ladders for convenient worker access to the platforms.

The figures match about 720 m<sup>3</sup> of concrete per section and formwork for 2,060 m<sup>2</sup> of wall surface. 48 Doka Climbing platforms D15 are in use for the outside of each LNG tank and another 48 on the inside. With this formwork solution, the site crew is achieving a two-week cycle for the concreting sections. //

## The Facts

### Project:

Taichung Harbour LNG Tanks

**Location:** Taichung, Taiwan

**Type of project:** 3 x 160,000 m<sup>3</sup> full containment above-ground LNG tanks with an inner diameter of 78 m, outer diameter of 80 m and a wall height of 40 m

**Contractor:** RSEA Engineering Corporation

**Systems in use:** Large-area formwork Top 50, Climbing platform D15



▲ The inner diameters of the tanks are 78 m.

## The Facts

**Project:** Tianwan Nuclear Power Station – units 3 and 4

**Location:**  
Lianyungang, Jiangsu province, China

**Type of project:** Double-containment nuclear power station construction

**Customer:** China Nuclear Industry Huaxing Construction Co. Ltd

**Systems in use:** Climbing formwork 150F



▲ The spacing between inner shell and outer shell is only 1.8 m, posing a challenge for the design of the formwork system.



▲ Tianwan Nuclear Power Station units 3 and 4 under construction

# Powering the infrastructure

The demand for energy around the world is rising; and that needs to be supplied in an efficient way. Doka delivered the perfect formwork solution for the synchronous construction of the double containment shells at the new Tianwan Nuclear Power Station units 3 and 4.

Tianwan Nuclear Power Station is one of China's key nuclear power projects. It is located in Lianyungang prefecture, in Jiangsu province. Already in operation are the first reactor units. Now, in "Tianwan Phase II", units three and four are under construction. The design focuses on achieving the same objectives as Europe's advanced pressurised water reactor EPR in terms of safety, reliability and economy – which are the primary goals of the third generation of nuclear power stations.

The main contractor for the new units at the Tianwan Nuclear Power Station is China Nuclear Industry Huaxing Construction Co. Ltd. The Tianwan Project Department awarded the contract for the design and supply of the required special formwork solution to Doka China. Thanks to

Doka's smart design, high level of safety and good performance in the field, Doka was able to provide a formwork solution for the project which satisfied the customer's needs.

## Challenging engineering structure

Containment is provided by a double concrete shell, with a steel pressure vessel of 44 m inner diameter inside and a 1.2 m thick concrete wall outside. In addition, the outer shell is made of reinforced concrete of 50 m inner diameter and a 0.6 m thick wall outside. The spacing between the two shells is 1.8 m. The barrel of the inner shell has a height of 43.2 m with a dome height of 72.5 m, while the barrel of outer shell is 60 m with a dome height of 74.5 m. The inner shell is fitted with horizontally placed pre-stressed cables.

▼ Tianwan Nuclear Power Station will be the biggest nuclear power station in Lianyungang prefecture.





For the construction of double containment, one of the biggest challenges is the design of the formwork system. The gap between the inner and outer shells is only 1.8 m, so careful consideration must be given to the available space – especially in terms of whether or not the formwork hoisting and retracting distance can be guaranteed, and if there is sufficient operating space.

### The powerful solution

Working closely with the customer, Doka China's formwork engineers concentrated on developing brand-new solutions, adopting Doka's exclusive Climbing system 150F and making a number of special adjustments in its design for double containment formwork. These included:

- An additional vertical strongback fixed to the outer formwork of the inner shell using two tie rods at the top and bottom, for a pouring height of 2.65 m. There are no tie rods within the pouring section, which makes the installation of the rebar and pre-stressing cables easier and greatly improves work efficiency.
- The original slanting platform handrail was removed from the inner formwork of the outer

shell and an enclosed design adopted instead. This ensures compliance with hoisting-collision and safety-enclosure requirements. With the scissor-type strut of 150F, the max. retraction distance of formwork is 70 cm; meanwhile, platform width can be within 155 cm so that double containment formwork can be lifted by crane.

- Additional bracing for the outside formwork of the outer shell increased the load-bearing capacity of the top platform for higher material loads and manload.

The dome of Tianwan Nuclear Power Station unit 3 was smoothly lifted and the important node of the inner shell was completed.

By focusing on innovation, safety and performance, Doka, together with China Nuclear Industry Huaxing Construction Co. Ltd, successfully realized a more economical climbing formwork construction method for double containment, which can be lifted completely by crane. Tianwan units 3 and 4 – known as Tianwan Phase II – are scheduled to begin power generation in February 2018 and December 2018, respectively. //

### The Challenge

The design of the formwork system is one of the biggest challenges, when constructing double containment. This is due to the limited space available for hoisting and retracting formwork, as well as for operations.

### The Solution

Doka China formwork engineers adapted Climbing formwork 150F specifically to forming double containment in close collaboration with the customer.





▲ Innovative design – up to the challenge with Dokadek 30

# Another ‘feather in the cap’ for Dokadek 30

## The Facts

**Project:** Spire Apartments

**Client:** Oakdale Group Pty Ltd

**Location:** Newcastle, Australia

**Construction start:** December 2015

**Scheduled completion:** May 2016

**Systems in use:** Panel floor formwork  
Dokadek 30, Dokaflex

## The Challenge

Building with irregular column and balcony locations and a fold in the slab.

Dokadek 30 Panel floor formwork sets a new benchmark in formwork performance at Newcastle’s Spire Apartments.

With the first images of the new Spire Apartments development in Newcastle on the coast now revealed, interest in this multi-million dollar development is growing rapidly, with many now rushing to get a piece of this unique luxury property. This exciting new development in Newcastle’s Marketown precinct offers unique apartment living, uninterrupted panoramas of Newcastle, the harbour, coastline, beaches and hinterland from the apartments and the building’s stunning 4,000 m<sup>2</sup> ‘sky garden’. Designed with an emphasis on space and luxury, Spire Apartments offer sophisticated inner city living, with generous one, two or three bedroom apartment designs. The project’s formwork contractor Oakdale Group Pty Ltd selected the newly developed Dokadek 30 Panel floor formwork system for this remarkable residential project. Doka Australia provided a total of 2,000 m<sup>2</sup> of Dokadek 30 Floor Panels for the Spire Apartments project.

## Highlighting the benefits of ‘mock-up’ demonstrations

Developed with a focus on speed, safety and versatility, the Dokadek 30 system sets a new benchmark in panel formwork systems. Dokadek 30 is the result of over five years research and development work – including numerous field trials – and the Spire Apartments development is benefitting from all advantages this system has to offer.

A critical element in the successful delivery of any project is for all stakeholders to have a clear and full understanding of the construction methodologies, products and processes being used. In particular, the formworker and the structural engineers must have a comprehensive understanding of the functionality and design goals of all components of the structure and all the equipment being utilised



## The Solution

The flexible and safe Dokadek 30 Panel floor formwork combined with clever infill solutions where the Dokaflex system and Doka beams could easily be incorporated.

during construction. For many, the best way to understand a new product is to see it in action. And with that in mind, the Doka team organised a large-scale mock-up demonstration of the Dokadek 30 Panel floor formwork system for the Oakdale Group team. The demonstration provided an ideal opportunity to highlight the unique features and benefits of the Dokadek 30 Panel system, and played a critical role in securing the business.

“Importantly, the successful ‘mock up’ demonstration also allowed us to develop a solution to meet Oakdale’s specific needs, which in turn, led us to supplying them with a Dokadek 30 floor formwork”, explained Jonathan Derbyshire, Doka Senior Sales Representative.

### Innovative design – up to the challenge

The project presented a number of challenges in the design stage, thanks to some irregular column and balcony locations and a fold in the slab. Importantly, Doka was able to overcome these challenges by using the flexible infill system with the Dokadek 30 Panel floor formwork system. For infill areas, the system is fully compatible in terms of engineering and safety standards with all other Doka formwork products. There is also a range of infill panels and beams to suit the most common situations. Using Dokadek infill beams and Dokadek suspension clamp H20 for infill areas around columns and between panels, the Dokadek 30 system integrates seamlessly into the Dokaflex slab formwork system. For typical infill areas around a single column, the use of the Dokadek H20 suspension clamp means there is no need for any extra props to be used.

And Dokadek infill beams can simply be inserted and the plywood laid on top, so infills between panels can be formed without the need for any extra beams or props. “The Dokadek 30 Panel System becomes a very flexible solution through the use of some clever infill solutions,” added Doka Project Engineer Stephen Lake.

The Oakdale Group 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.

### Meeting customers’ needs

Dokadek 30’s large hinge design allows it to be easily connected to the previous panel. Once connected, it is simply propped into position without requiring any work from above the base level. Importantly, once the panels have been propped into position, they lock in so they can’t be accidentally knocked out or ‘blown’ out of position by updrafts. For added safety Dokadek 30 is also fully compatible with the Doka integrated handrail system. Together with the savings offered in terms of erection and dismantling speed, Dokadek 30 is also extremely quick and easy to move around a jobsite – factors which can result in significant improvements in productivity and a reduction in total construction cost. In fact, the Doka Australia teams that have been working with the Dokadek 30 system have increased productivity to 10 m<sup>2</sup> per person per hour, even on the first slab. //



### The Professional

**“We really enjoyed using the system, it is super-quick and safe. Most importantly, we didn’t have to worry about too many components.”**

**Bluey, Site Supervisor**



### The Professional

**“It is a great system, it is easy to put up and the speed of the system really helps us to get on the deck quicker. This is particularly true for infill areas, where we could easily incorporate the Dokaflex system and Doka beams. In fact, in my opinion, Doka has the best prop on the market. It’s quick and easy to use; with the numbered holes and quick-turn threads, which work well even when loaded.”**

**Esa Laukka, Oakdale’s Contract Manager**

▼ Simplified logistics on site – with Dokadek 30 only two panel sizes need to be stored and transported.



For Xayaburi Hydroelectric Power Project, Doka supplies 36,000 frames of Load-bearing tower d3, which is designed specifically for large shoring heights and high loads.

### The Facts

**Project:** Xayaburi Hydroelectric Power Project – Power House

**Location:** Xayaburi, Lao People's Democratic Republic

**Construction Company:** Ch. Karnchang (Lao) Co. Ltd

**Construction start:** November 2015

**Systems in use:**

Load-bearing tower d3, Large-area formwork Top 50, Dokaplex formwork sheet, Timber formwork beam H20 eco P



# Doka formwork power for Laos

On the Mekong, one of Asia's longest rivers, the large-scale Xayaburi Hydroelectric Power Project is currently under construction with Doka formwork solutions.

When completed, the hydroelectric power project in northern Laos will be 820 metres long. The power project will house seven 175 MW turbine generators and one 60 MW turbine generator. With 7,406 GWh annual production, the hydroelectric power project will provide electricity for the region.

On this mega-project, construction company Ch. Karnchang (Lao) Co. Ltd is literally building on Doka's formwork power. From September 2015 to February 2016 Doka supplied 36,000 frames of Load-bearing tower d3, 68,000 running metres of Timber formwork beam H20 eco P and 18,155 m<sup>2</sup> of Large-area formwork Top 50. Doka's formwork solutions will be used in the powerhouse for the water-intake area, the draft tube and the floors.

## d3 – a new solution for high loads

The thickness of the concrete cast will be as much as 3 m, so the ability to carry very high loads was crucial. Doka scored with its new Load-bearing tower d3, which has been available since 2015 and which was designed for high shoring heights and high loads. The combination of hot-dip galvanised frames and diagonal crosses enables the towers to transmit loads up to 94 kN per leg. The components themselves are light, so d3 towers are easy to assemble and no tools are needed. The client was particularly satisfied with the fast and easy set-up, which saves both time and costs. As a modular

system d3 is very versatile and suitable for a wide range of applications, ranging from falsework for tunneling through industrial high-rise builds to power-plant construction. d3 adapts to any length, width or height, so it could be adjusted precisely for the site specifics of the Xayaburi Hydroelectric Power Project.

On-site of Xayaburi Hydroelectric Power Project d3 is combined with Large-area formwork Top 50 as the formwork superstructure. Top 50 also helps cut labor and equipment costs because forming times are short and the number of repeat uses is high. Another Doka formwork solution in use at the Xayaburi Hydroelectric Power Project is Timber formwork beam H20 eco P. The high-performance beam is easy to handle and saves on quantities. The beam weighs only 5.2 kg, moment is 5 kNm and the shear-force is 11 kN.

## On-site support for speedy formwork operations

Accurate planning and correct handling of formwork systems are essential for speed, safety and cost-effectiveness on construction sites. So Doka also provides on-site support for the Xayaburi Hydroelectric Power Project. Doka experts give instruction to local engineers on the design and static calculation of the d3 system. Further assistance is provided by the formwork instructor, who trains workers on-site in the correct handling of the systems in use. //



▲ Timber formwork beam H20 eco P is easy to handle and weighs only 5.2 kg.



▲ The combination of hot-dip galvanised frames and diagonal crosses of d3 enables the towers to transmit loads up to 94 kN per leg.



## Expert Advice

The surface of the Xayaburi Hydroelectric Power Project's water intake has to be smooth. Dokaplex formwork sheets were chosen to ensure compliance with this requirement. Their high format accuracy and close tolerances produce a smooth, high-grade concrete finish.

◀ After completion the large-scale Xayaburi Hydroelectric Power Project will be 820 metres long and 32.6 metres high.



▲ The 5-star Supernova Spira Tower in Northern India. Construction of this architectural masterpiece was significantly quicker and more efficient thanks to Doka's innovative formwork solutions.

## The Facts

**Project:** Supernova Spira Tower

**Location:** Noida, India

**Type of project:** High rise project

**Client:** Supertech

**Main contractor:** ACC India Ltd

**Systems in use:** Automatic climbing formwork systems SKE100 and SKE50, Platform SCP, Large-area formwork Top 50

## The Challenge

The unusual shape of the building presented a significant challenge for moving components.

## The Solution

To overcome this challenge, Doka used connecting bridges between systems and columns. The bridges enabled workers to work at the same level and to access other sections.

# Extraordinary solutions for non-standard shape

Supernova Spira Tower is one of the iconic projects located at Noida on the bank of the Yamuna river and offering panoramic views over the Noida bird sanctuary and waterways.

Supernova will be a pioneering new mixed-use development featuring five super-high rise towers. With panoramic views over the Noida bird sanctuary and waterways, one of the towers, the Supernova Spira Tower, is set to become Northern India's tallest mixed-use development. At 80 storeys, it will include premium residential apartments, a 5-star hotel and the highly desirable Supernova Spira Suites. Building such a high structure requires a top-level of safety procedures and systems on-site. Doka India was commissioned by client Supertech to provide the formwork systems required to build the iconic 80-storey high rise building. When completed, the Supernova Spira Tower will stand 300 m tall and will comprise a total of 80 floors. To assist the client to

achieve his dream of creating a world-class architectural masterpiece, Doka supplied Supertech with Large-area formwork Top 50, Automatic climbing formwork systems SKE100, SKE50 and the Platform SCP for external lift core, column and internal lift core respectively.

## The challenge: The extraordinary design trend brings new challenges

The oval shape of the building presented a big challenge for the Doka India team. The biggest challenge was to develop a system that could cater to the building's oval shape while also catering to the many changes which occur at various levels on the core

wall construction. There was also the matter of two dedicated lift clusters – three units in each cluster, with changes from level 20 onwards and single walls. Needless to say, when it came to designing a suitable formwork solution, the Doka design team had to “start with the end in mind”.

The irregular shape of the building presented a significant challenge. Doka needed to design and deliver a solution that could climb an elliptical core wall safely and efficiently. The Doka team worked in close cooperation with the client and the main contractor to design a system that could deal with an oval-shaped core wall and still ensure that the required cycle times are achieved – despite the complexity of the building’s design.

### The customised solution

Doka India engineers suggested Large-area formwork Top 50 as the most suitable system, as it can be easily adapted to any shape and size of the structure and offers comprehensive workplace safety with compatible ladderways and working platforms.

In tandem with Automatic climbing formwork SKE100, which was proposed for the external lift core walls at the periphery of the structure, SKE50 was proposed for climbing the structure’s sixteen 4 m x 2 m columns, and Platform SCP proposed for the extremely dense internal lift core and for supporting the placing boom. The customised Top 50 system proved that any challenge can be met when attempting to reach the greatest heights. To achieve the required 7-day cycle time, Doka decided to split the core wall into two parts. They are cast one after

the other, with both core walls coming to the same level at the end of the cycle. In this scenario Doka provided the Platform SCP for the inside and SKE50 for the outside of the core walls. Due to the region’s extreme weather HDPE netting was used for air circulation at the platforms.

Using the SKE50 on the outside of the core wall also allowed the system to cater for the stepped reduction in wall thickness. Doka’s system design effectively split construction of the core walls into two halves. This not only boosted construction efficiency and productivity, it also helped to optimise the use of on-site resources and minimise construction downtime and delays.

The building’s design specified no fewer than 16 different sizes for shear walls at the external facades – Doka’s engineers put forward a solution that was able to deal with all the design complexities. Another significant challenge for the Doka team was to work out the most efficient method of moving the components around as construction progressed. To overcome this challenge, Doka came up with the innovative idea of having connecting bridges between systems and columns. This was found to be the most efficient way of planning the casting and jumping sequence – with workers all working and being able to access the same level thanks to the connecting bridges.

Both the client Supertech and the main contractor ACC India Ltd were extremely impressed with Doka’s innovative formwork solution. Doka has also provided Supertech with a solution for lifting a concrete placing boom with the Platform SCP. //



### The Professional

**“Doka climbing system is very convenient for construction of highrise towers. It is fast construction techniques with safe working.”**

Sharat Chandra, D.G.M. Project, Supertech Ltd.



### The Professional

**“Doka provided solution for the complex structure by designing and delivering an efficient and safe system to achieve the desired cycle time and quality for construction.”**

Ani Ray, MD, ACC India

▼ To ensure working access, Doka had the innovative idea of linking systems and columns with bridges.





▲ Downstream view from right to left: North Transition Dam, 6 Spillway Piers, Centre Transition Dam, Separation Wall

## The Facts

**Project:** Muskrat Falls

**Location:** Lower Churchill River in Newfoundland / Labrador

**Type of project:** Hydroelectric generating facility generating 824 megawatt (MW) output. 6 spillway piers, 3 transition dams and powerhouse

**Owner:** Nalcor Energy

**Concrete contractor:** Astaldi Canada Inc.

**Start date and scheduled end date of work:** April 2014-2017

**Systems in use:** Large-area formwork Top 50, Dam formwork D22, Load-bearing tower Staxo 100, Framed formwork Framax Xlife, Platform system Xsafe plus

# Forming Muskrat Falls

Doka Canada is the formwork supplier for Nalcor Energy's Muskrat Falls Project in Newfoundland and Labrador, Canada. The 824 megawatt hydroelectric generating facility is one of the largest construction projects in Canada and is situated on the Lower Churchill River.

The facility will be the second-largest hydroelectric generating facility in the country when completed and will consist of the main powerhouse structure including four turbines, three dam structures, six spillway piers, a large separation wall and smaller retaining walls. It will power homes and businesses across Newfoundland and Labrador.

On-site a multitude of Doka formwork systems is used. The Large-area formwork Top 50 is combined with the high-performance Dam formwork D22 to build the asymmetrically-shaped concrete structure. The slabs for the powerhouse, which are up to 4 m thick, will also be formed using Large-area formwork Top 50, with support of the Load-bearing tower Staxo 100. The Staxo 100 system has been especially designed for very high loads and is therefore ideally suited for the construction of this type of structure. In addition,

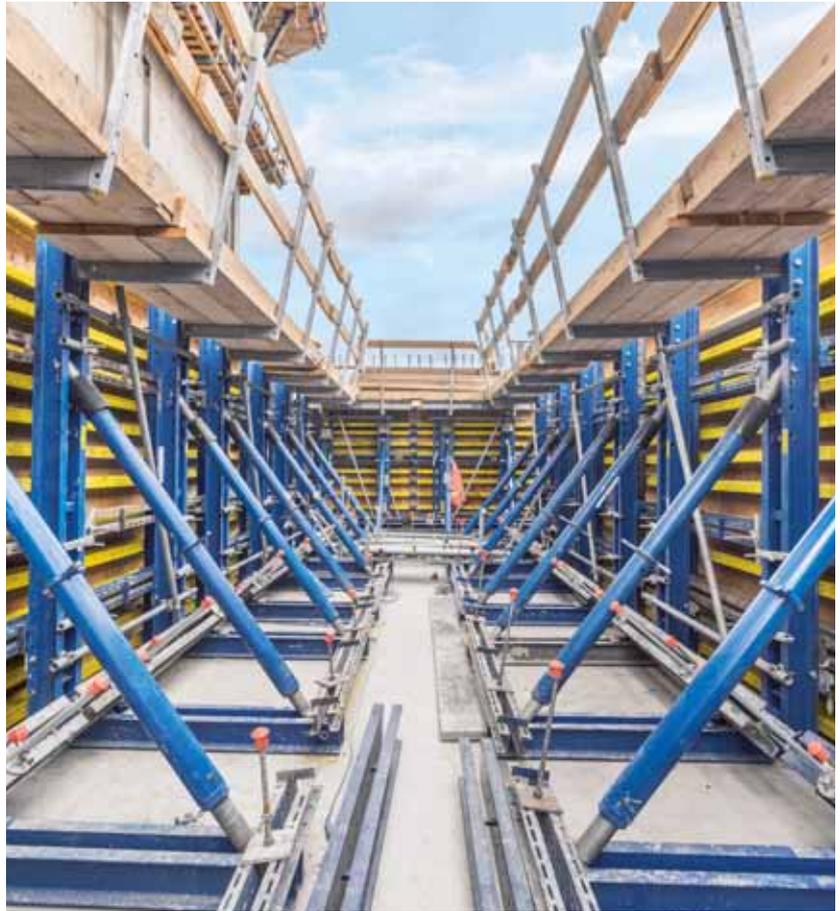
Framed formwork Framax Xlife is used, as well as various tie rod systems.

## Pre-Assembly Service

Concrete contractor Astaldi also chose Doka to preassemble all formwork elements off-site to ensure the highest level of quality, accuracy and productivity on site. At the time of project completion, Doka will have assembled about 5,000 working and protection platforms and over 16,200 m<sup>2</sup> of Large-area formwork Top 50.

## Logistics matter

Given the remote location of Muskrat Falls also logistics and transportation of all formwork elements are challenging. The material for the entire project is managed and handled through the Doka Toronto



▲ The Dam formwork D22 with the integrated Platform system Xsafe plus is in use for the outer slope of the spillway.

branch with a distance of 2,400 km and an average transit time of 5 days to the jobsite. To ensure that all material is delivered in correct order, Doka and Astaldi prepared detailed planning schedules.

### Customised solutions

To increase productivity on site, many customised solutions and products were developed for this

project. As for example, tie-loop anchors to tie down formwork diagonally to vertical rebar, in order to avoid long horizontal ties running through the entire structure. Furthermore custom off-set brackets were fabricated to support the Top 50 formwork in complex applications. All of these helped Astaldi save on labor and material as well as successfully adhere to the construction schedule. //

### The Challenge

As the second-largest hydroelectric generating facility in Canada, the complexity of this project required multiple solutions to complete the main powerhouse structure including four turbines, three dam structures, six spillway piers, a large separation wall and smaller retaining walls. Additionally, Astaldi Canada has a zero tolerance policy for unsafe conduct and methods on their jobsites.



Spillway Piers – Downstream view, approx. 45 m high

### The Solution

Doka was selected above other competitors due to the company's level of experience with challenging and engineering-intensive projects as well as their highly efficient products. The multiscope services and materials provided by Doka will save the contractor Astaldi from using different suppliers on this project and therefore reducing the amount of time spent on procurement, training, logistics and quality control. Additionally, a reputation for safety, efficient formwork solutions and professional support made Doka the top choice supplier for the project.





▲ Up to four climbing units are automatically climbed up to the next pouring section using innovative, double-acting mobile hydraulic cylinders. The hydraulic cylinders are operated easily and quickly by remote control.

## The perfect combination

For the Elite Pavilion in Kuala Lumpur, the high-performing automatic climbing formwork systems are the ideal solution.

In the heart of Kuala Lumpur, the Elite Pavilion is rising as another landmark in Malaysia's capital city. 230 metres and 50 storeys high, the structure will be one of the highest buildings in the country. The high rise extends the existing Pavilion KL Shopping Center, offering a superlative shopping experience on 10 floors. The remaining storeys will accommodate 369 exclusive residential apartments.

The building consists of a solid in-situ concrete core with a connected steel skeleton. The floor slabs are of composite construction. The in-situ concrete core has a 10 x 20 m footprint and climbs

ahead; it consists of 11 shafts in all, with each of the six elevator shafts measuring only 2.5 x 2.5 m. On this build, lead contractor BUCG relies on the made-to-measure formwork solution from Doka Malaysia. The combination of the Xclimb 60 Automatic climbing formwork for the outside of the core and SKE50 plus, SKE100 plus, Xclimb 60 in the interior of the core affords optimum support for the construction process.

### Perceptibly faster cycles

Broadly speaking, installation of the reinforcement accounts for about 25 – 50 % of working time

### The Facts

**Project:** Elite Pavilion

**Location:** Kuala Lumpur, Malaysia

**Construction company:**  
Beijing Urban Construction Group

**Architect:** GDP Architects

**Building height:** 230 metres, 50 storeys

**Construction start:** March 2015

**Scheduled completion:** June 2017

**Systems in use:** Automatic climbing formwork systems Xclimb 60, SKE100 plus and SKE50 plus; Large-area formwork Top 50 with Framax stripping corner I

for construction of a high rise core. In order to expedite this labour-intensive work and minimise the time needed, the engineers from Doka Malaysia designed the Automatic climbing formwork SKE50 plus, SKE100 plus, Xclimb 60 in the interior of the shafts to take full-sized reinforcement platforms and pouring platforms. Consequently, up to 25 metric tons of reinforcing materials can be carried on the platforms.

Particularly in the centre of the city, where delivering and stockpiling construction materials constitute major logistic challenges, extra front-line buffer areas help to speed up the construction process to a considerable extent: firstly because the material is right where it is needed when it is needed, and secondly because fewer crane lifts are required. Another big benefit of these additional platforms is that the task of handling the formwork is decoupled from the job of placing the reinforcement, so work can proceed on several different levels at once. It all adds up to perceptibly faster cycles.

The wall formwork is suspended from rollers. It was custom-designed to meet the requirements of the construction method and enables fast forming and optimum travel for opening the formwork. The Doka solution with Large-area formwork Top 50 makes full allowance for the large number of embedded fixtures for connection of the steel skeleton to the core. The optimised number of form-tie points also helps to save time.

Particularly in the narrow elevator shafts, where room to work is severely limited, maximum benefit can be gained from the combination of Large-area formwork Top 50 with Framax stripping corner I and the Automatic climbing formwork SKE50 plus. Once opened by means of the integrated stripping function in the corners, the formwork is climbed to the next pouring section quickly and without crane lifts.

Doka designed the formwork concept end-to-end, so the placement of the concrete was already taken into consideration in the planning stage. This is why the engineering team opted for the high-performing SKE100 plus system. The system climbs the concrete placing boom and its ancillary equipment safely from floor to floor – without crane lifts.

### **Doka automatic climbing formwork systems cost-effectively combined**

In order to offer BUCG a solution that would be both economical and high-performing, the team from Doka Malaysia made full use of the automatic climbing system portfolio and put together high-performing climbing systems in an ideal combination. This also involved the first use of an innovative

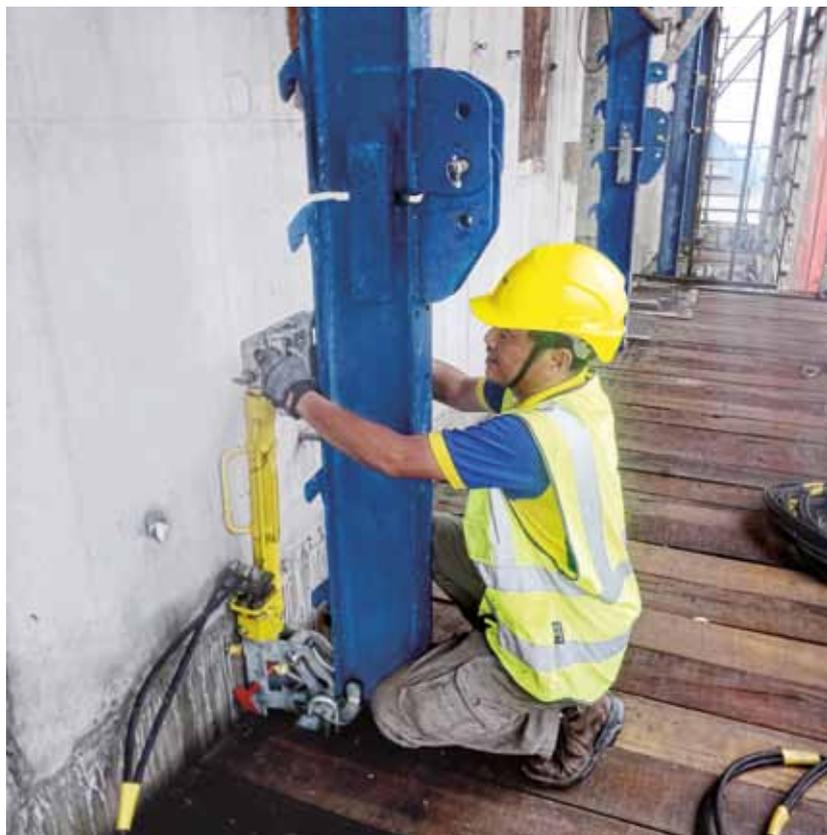
mobile hydraulic unit in Southeast Asia. The arrangement makes it possible to operate the Automatic climbing formwork Xclimb 60 on the outside of the structure and the SKE50 plus, SKE100 plus, Xclimb 60 automatic climbing systems on the inside with a single type of hydraulic unit. Another advantage is that instead of the previous limit of four, now a total of eight Xclimb 60 climbing brackets can be climbed simultaneously and safely from one pouring section to the next on the outside of the structure.

### **Safety at all levels**

Members of a construction crew can feel at risk, when working high above ground level and this perceived insecurity can have a major effect on productivity. So the team from Doka Malaysia opted to have all platform levels fully enclosed with perforated trapezoidal metal sheetings. Protected from wind and weather, the workers on the platforms also feel just as safe, as when working on the ground. The people working below on the steel skeleton or on the lower floors are also protected: the sheeted enclosure around the building core prevents small items from being dropped.

Completion of the Elite Pavilion is scheduled for June 2017. //

▼ Up to four climbing units are automatically climbed up to the next pouring section using innovative, double-acting mobile hydraulic cylinders. The hydraulic cylinders are operated easily and quickly by remote control.



### **The Challenge**

- Inner-city site, so space is strictly limited
- Steel skeleton connecting to the core, with composite floor slabs
- Six very narrow shafts
- Concrete placing boom has to be climbed with the formwork
- High payloads of 25 metric tons / storage area for reinforcement

### **The Solution**

- Detailed delivery and deployment planning by Doka
- Custom planning of the Large-area formwork Top 50 with due provision for the number of embedded fixtures for the steel skeleton
- Automatic climbing formwork SKE50 plus as shaft system with centrally positioned climbing drive permits straightforward closing and opening of the formwork inside the cramped shafts
- SKE100 plus enables the concrete placing boom to be climbed without crane lifts



# Indian LNG projects boom is in full swing

The demand for liquefied natural gas is continuously growing all over the world and especially in India. Afcons Infrastructure Ltd banks on Doka India's know-how and high-performing climbing systems for the construction of two LNG storage tanks in Dahej.

## The Facts

**Project:** LNG Terminal

**Location:** Dahej, India

**Type of project:** LNG tank

**Customer:** AFCONS INFRASTRUCTURE LTD.

**Client:** Petronet LNG Ltd

**Systems in use:** Climbing formwork 150F, Large-area formwork Top 50

Petronet LNG Ltd., owner of the LNG Terminal in Dahej in the state of Gujarat, decided to enlarge the terminal with two additional LNG storage tanks, each having a net storage capacity of 170,000 m<sup>3</sup>. To meet the tight schedule of six months, construction company Afcons Infrastructure Ltd contracted Doka India to supply the entire formwork solution for these two tanks, each with a diameter of 84 m and height of 48 m.

## High-performing climbing formwork

For fast and consistent pouring of the circular walls, Doka recommended using the high-performing crane-lifted Climbing platform 150F combined with Large-area formwork Top 50. The platforms and the formwork offered quick and smooth construction progress by being lifted as one unit, thereby reducing the time the crane is busy.

For casting the projected pressure ring at the top of the tank, a special compression bracket was placed. The same circular Top 50 formwork with minor modification could be re-used easily. Thus, the whole cycle time of the tank was not disturbed and proceeded in compliance with the method statement approved by IHI Corporation (project owner).

## Customised safety solution

On-site a high level of safety had to be ensured. For this reason all levels of working platforms were equipped with a circumferential railing. To gain more safe working space on the main platform level, Doka India introduced a new design of an additional attachment to the standard 150F climbing bracket. With these additional extensions of the brackets the width of the platforms increased from 1.50 m to a comfortable 2.20 m. All in all, Doka supplied three levels of platforms: A suspended platform ensured a safe removal of the re-usable anchor parts. Moreover, an intermediate platform has been installed between the bottom and the main working platform to meet the local standards in terms of height restriction for the workers. In total, 16 fixed ladders provided a safe vertical access to the platform levels. The comprehensive safety solution was not only appreciated by Afcons but also by the project owner IHI Corporation.

Thanks to Doka's key added value solution including the special brackets for the pressure ring, proper project planning, on-time delivery and an extraordinary site support, the project has been completed ahead of schedule. //

## The Challenge

High wind speeds near the coast are a special challenge for forming LNG tanks.

## The Solution

Doka's formwork solution for the LNG Terminal at Dahej is adjusted to the region's basic wind speed of 180 kmph.

► Doka India was chosen to supply climbing and wall solutions for this remarkable project.





▲ On-site about 13,700 m<sup>2</sup> of Doka formwork solutions will be used.

# A new data centre for Singapore

In the so-called “Lion City”, a new data centre is currently rising with formwork solutions by Doka. When completed, the Singtel Data Centre West will reach 57 m (eight floors) and house a main building and four power blocks.

The development is designed to meet the critical hosting needs of the financial services industry, government agencies, cloud computing and internet service providers. On-site about 13,700 m<sup>2</sup> of Doka formwork solutions will be used until the completion of the project. To speed up construction work, client Cheng Yi Pte Ltd combines Doka tableform systems Dokamatic and Dokaflex, Load-bearing tower d3, Large-area formwork Top 50, Climbing formwork MF240 and Shaft platform.

The fast forming tableforms Dokamatic and Dokaflex are used for the typical slab of the main building of Singtel Data Centre West. Both systems are designed for large-area slab projects and optimised for speed. Complete units can be repositioned very quickly with a highly manoeuvrable shifting device. What’s more, both tableform systems cater to the specific needs of projects. Thanks to their practical constructional design, they can be adapted quickly to layout, height and floor thickness.

For levels two and higher of the power blocks, Doka supplies the high-performing and cost-effective shoring system Load-bearing tower d3, which is also used for the main building from level two up.

To achieve a short construction cycle for the vertical structural elements as well, staircase walls and lift walls will be formed with Large-area formwork Top 50 combined with Climbing formwork MF240. Operation of MF240 is intuitive, as climbing scaffold and formwork are moved up as a single unit. In addition, MF240 permits easy forming and stripping without a crane, thanks to its integrated travelling unit.

With Doka’s formwork solution on site, productivity can be increased at the construction of Singtel Data Centre West. What’s more, to the satisfaction of client Cheng Yi Pte Ltd, the systems can be used repeatedly and manpower can be reduced. //

## The Facts

**Project:** Singtel Data Centre West

**Location:** Yung Ho Road, Singapore

**Contractor:** Cheng Yi Pte Ltd

**Start of construction:** September 2015

**Completion scheduled for:**  
3<sup>rd</sup> quarter 2016

**Total formwork supplied:** about 13,700 m<sup>2</sup>

**Systems in use:** Large-area formwork Top 50, Climbing formwork MF240 and Shaft platform, Dokamatic table, Dokaflex table, Doka shifting trolley with attachable drive unit, Load-bearing tower d3



▲ Dokamatic tables are ideal for fast forming of large floor areas. At Singtel Data Centre West, they are used for forming slabs of 30 cm up to 1 m in thickness.

# New faces in East Asia & Pacific

**Welcome our new employees!** We are pleased and very excited to have them as part of our team. We wish them every success in their assignments.



**Elliza Ann R. Orate**  
Doka Australia  
Date joined: Feb. 2016  
Designation: Senior Engineer / Group Leader Melbourne  
"To be a part of Doka Group is a great opportunity. I'm really looking forward to be working with this world class team!"



**Andrew van Rhyn**  
Doka Australia  
Date joined: May 2015  
Designation: Operations / Commercial Administrator  
"It's an honour to join one of the leading formwork companies in the world."



**Romina Bartolome**  
Doka Australia  
Date joined: Oct. 2015  
Designation: Logistics / Operations Controller  
"After working for Doka Gulf FZE I took the opportunity of relocating to Doka Australia."



**Tan Gan Liong**  
Doka India  
Date joined: July 2015  
Designation: Lubeca Senior Supervisor  
"After joining Doka I feel proud. I will share my knowledge and experience to achieve our common goal."



**Biswas Rahul**  
Doka India  
Date joined: July 2015  
Designation: Project Engineer  
"I'm excited to be part of the Merdeka PNB118 project. I will keep contributing my experience to keep the brand No 1."



**Bamane Santosh**  
Doka India  
Date joined: May 2016  
Designation: Senior Engineer  
"I enjoy the positive environment at work and am proud to be a part of the Doka Group. I will always give my best for this organisation."



**Paulose Shibu**  
Doka India  
Date joined: June 2015  
Designation: Senior Project Technician  
"I'm immensely proud to be a part of Doka. I look forward to working with and being a part of the team and to meeting the challenges."



**Yogesh Patil**  
Doka India  
Date joined: May 2015  
Designation: Engineer  
"It's a great experience to work with leaders in the formwork industry. Doka provides great opportunities and trainings to increase our knowledge and confidence."



**Kanivala Kamaldeep**  
Doka India  
Date joined: July 2015  
Designation: Business Development Manager  
"It's a good opportunity to work with Doka India. I'm looking forward to being part of the Doka family."



**Yu Ishihara**  
Doka Japan  
Date joined: Oct. 2015  
Designation: Financial Accounting  
"It's an honour to be here. I'm looking forward to working with all of you."



**Zi Shi Dang**  
Doka Japan  
Date joined: Oct. 2015  
Designation: Trainee Technician / Draftsman  
"I'm very glad to join Doka Japan. I want to be a good team player, learn and hope to make more contributions in future."



**Aun Kua Teh**  
Doka Malaysia  
Date joined: May 2015  
Designation: Sales Manager  
"I'm very excited to begin my sales career with Doka Malaysia. I'm looking forward to furthering my knowledge and promoting Doka."



**T-Y Wan**  
Doka Malaysia  
Date joined: May 2015  
Designation: Sales Engineer  
"Thank you Doka Malaysia for giving me the chance to join this big family."



**Loderick Bautista**  
Doka Malaysia  
Date joined: May 2015  
Designation: Project Engineer  
"I'm proud to be part of a global player in the formwork industry. I strongly support Doka in becoming the number one in Malaysia."



**Peter Jedtke**  
Doka Malaysia  
Date joined: Oct. 2014  
Designation: Warehouse Manager  
"I appreciate the challenge and chance to manage the warehouse team of Doka Malaysia. I feel great in this region!"



**Kanesan A/L Vijayan**  
 Doka Malaysia  
 Date joined: June 2015  
 Designation:  
 Warehouse Assistant  
 "Doka gives me the chance to learn, which I really appreciate."



**G Celemin John Rafael**  
 Doka Malaysia  
 Date joined: Aug. 2015  
 Designation:  
 Project Engineer  
 "I'm proud to be a member of Doka. I'm excited to work in one of the biggest formwork companies."



**Nurul Shuhada Sukati**  
 Doka Malaysia  
 Date joined: Dec. 2015  
 Designation:  
 Account Executive  
 "I'm excited to work with Doka. I hope we will be successful together in future."



**Muhammad Yusri**  
 Doka Malaysia  
 Date joined: July 2015  
 Designation:  
 Formwork Instructor  
 "I'm glad to join Doka and hope we will be successful together."



**Shanmugam Sangeeta**  
 Doka Malaysia  
 Date joined: Aug. 2015  
 Designation:  
 HR & Admin Manager  
 "I'm happy to support Doka in this newly created position. I'm looking forward to new challenges."



**Thanasekaran Ravichandran**  
 Doka Malaysia  
 Date joined: Aug. 2015  
 Designation:  
 Warehouse Assistant  
 "I'm so proud to be one of the members of Doka Malaysia."



**Ravindra Kumar**  
 Doka Malaysia  
 Date joined: Oct. 2015  
 Designation:  
 Supply Chain Executive  
 "The opportunity to work with such a diverse group of people has been invaluable. Working at Doka is like being with family."



**Nordiana Ismail**  
 Doka Malaysia  
 Date joined: Oct. 2015  
 Designation:  
 Admin Executive  
 "I'm very happy to work for Doka. Good working culture and supportive team members. Looking forward to exciting new challenges."



**Wendy Lee**  
 Doka Malaysia  
 Date joined: Oct. 2015  
 Designation: Accountant  
 "I'm excited to be part of the team. I'm looking forward to contributing to Doka's success."



**Gabriel Sim**  
 Doka Malaysia  
 Date joined: Nov. 2015  
 Designation: Senior Supply Chain Executive  
 "I'm very proud to be part of Doka family. I look forward to have a challenging year ahead and gain something new everyday."



**Simon Low**  
 Doka Malaysia  
 Date joined: Dec. 2015  
 Designation:  
 Supply Chain Manager  
 "The work is challenging. Doka Malaysia has what it takes to become the best in the formwork industry in Malaysia."



**Shaun Kim**  
 Doka Singapore  
 Date joined: May 2015  
 Designation:  
 Sales Manager  
 "I'm proud to be part of the Doka family and am looking forward to the exciting challenges."



**Ng Zhi Qing**  
 Doka Singapore  
 Date joined: July 2015  
 Designation:  
 Warehouse Employee  
 "I'm glad to be given the opportunity to be working for Doka. I'm looking forward to enhancing my knowledge and acquiring new skills."



**Albin Debald Maria Soosai**  
 Doka Singapore  
 Date joined: Nov. 2015  
 Designation:  
 Warehouse Supervisor  
 "It's a great opportunity to develop my skills and to make a positive contribution to Doka Singapore!"

# In brief

News, dates, media, awards

## Load-bearing tower d3 is now available

With the new Load-bearing tower d3, Doka has developed a high-performing and especially cost-effective shoring system. d3 is designed specifically for large shoring heights and high loads and it is suitable for a very wide range of applications.

## Doka Campus – crowd-puller at bauma 2016

Munich, Germany – From April 11 to 17, bauma, the world's biggest trade fair for the construction industry, attracted about 580,000 visitors from 200 nations. At about 4,000 m<sup>2</sup> Doka successfully presented its formwork expertise with the new trade fair concept Doka Campus.

## New distributor for Myanmar

Myanmar – Doka expands its existing distributor network in South East Asia by entering into a strategic partnership with High Aims Formwork (Myanmar) Co. Ltd.



▲ The Load-bearing tower d3 scores with high load capacity, fast assembly and a broad spectrum of application.



▲ Doka Campus had a real surprise effect and drew people from all over the trade fair to Doka.



▲ Doka entered into a strategic partnership with High Aims Formwork Myanmar.

## Doka East Asia & Pacific Regional Office

Doka Formwork Pte. Ltd.  
9 Gul Circle #01-01  
Singapore 629565

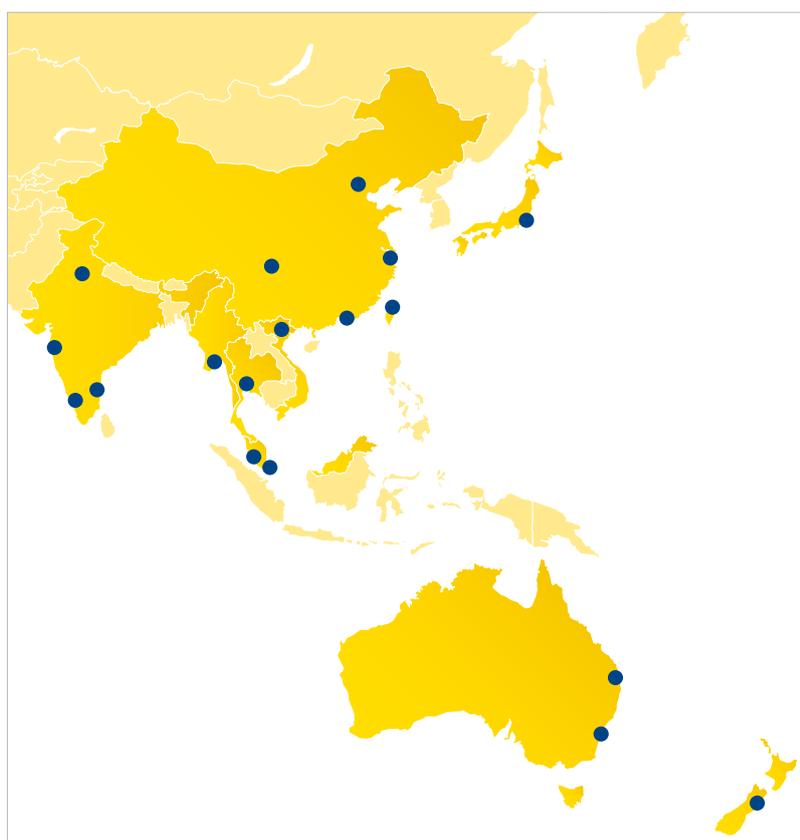
T +65 6690 0620  
F +65 6690 0643  
singapore@doka.com  
[www.doka.com](http://www.doka.com)



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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.

## Branches in East Asia and Pacific

- Doka Australia
- Doka China
- Doka India
- Doka Japan
- Doka Malaysia
- Doka Singapore

## Authorized Distributors in East Asia and Pacific

- Acrow Ltd – New Zealand
- DEC Engineering Corp. – Taiwan
- Subway Engineering & Supply Co. Ltd – Thailand
- SPECO (HK) Co / Chi Thang Construction Engineering and Trading Co., Ltd – Vietnam
- High Aims Formwork Co. Ltd – Myanmar

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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.**