

# DokaXpress

The Formwork magazine Nordic issue 2019

**doka**

Denmark:  
Næsseskoven 04

Finland: Helsinki  
Olympic Stadium 06

Norway:  
Follobanen 08

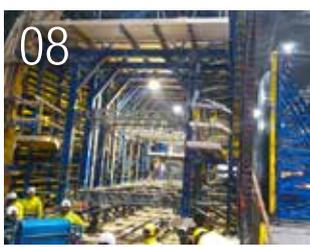
Sweden: E4 Bypass  
Stockholm 10

The reliable  
partner on your site



## Content

- 03 Newsflash
- 04 Denmark: Næsseskoven
- 06 Finland: Helsinki Olympic Stadium – Facelift for a Shrine to Sports
- 08 Norway: On the right track with Concremote
- 10 Sweden: E4 Bypass Stockholm
- 12 Safety starts in the mind
- 13 Systematic Safety
- 14 In the digital fast lane



Dear customers  
and dear  
readers,



It is a pleasure for me to introduce for the first time Doka Xpress Nordic and to share some of the great projects that our northern countries have been working on.

Our main goal as Doka is to be your reliable partner on your site. That's why we offer a comprehensive range of formwork planning, safety products, and services. We want your site to be as productive as possible therefore we develop as well digital solutions for you, in order to support with your projects.

I have been working for more than twenty years in different leading positions within Doka, five of those years have been as a regional manager, responsible for the Nordic countries. During this time I have been very close to the countries which made me appreciate a lot the close relationship with the customers. I am very excited to support the Nordic countries with their shift from residential to civil projects. This change needs know-how and experience which we have developed in our local countries organization but we also offer support from Headquarter with our global capacity and expertise.

I hope on the following pages you will find interesting projects and insight about new products, which hopefully will bring you forward in our common goal "to increase safety and productivity" on site.

**Kurt Steindl**

Director Region, Western Europe, Doka



# Newsflash



## The Concrete Gala

“The Concrete Gala” is the largest event in Sweden when it comes to Building Construction Industry. 2019 the fair took place on November 21<sup>st</sup> at Waterfront in Stockholm. About 40 exhibitors and 1.500 guests of the concrete industry took part. Together they discussed the “concrete future”. Doka Sweden seized this opportunity and presented Kontakt, the innovative digital jobsite platform for higher productivity and transparency. ■

## Expert meets Expert

Under the title “Expert meets Expert” Doka Norway presented the digital solutions from upbeat construction at customer events in Oslo and Trondheim. The events were divided into different sequences in which each product and concept was accurately presented. Both product owners from Doka Headquarter and local Norwegian experts had the opportunity to speak. ■



**Doka AR-VR app:** This edition of the Xpress is supported by the AR-VR app, meaning you can use our free app to maximise your experience and fully unlock our interactive experience, which includes images, videos and 3D models.

**AR Marker Symbol:** Use the AR markers to find even more content. Open the AR-VP app on your smartphone or tablet device, scan the image and fully experience the latest developments of Doka in Northern Europe!



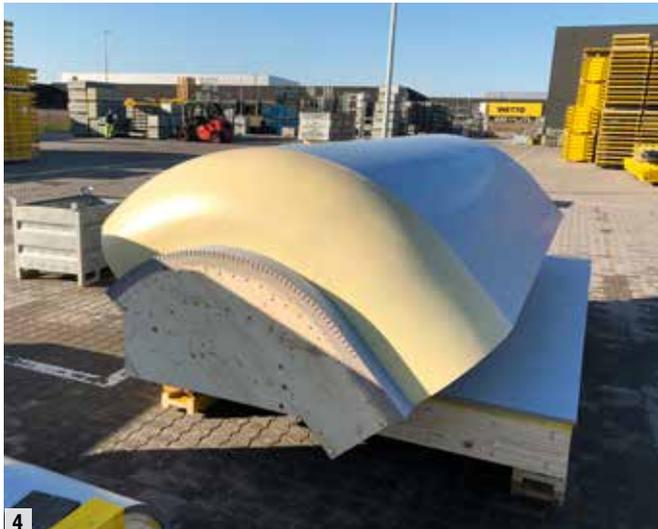
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## Næsseskoven

Züblin A/S is in the process of constructing a three-storey extension for a private developer on a beautifully situated plot near a forest and lake in Holte. The extension is 750 m<sup>2</sup> and will be joined together with the existing villa. The project was started in November 2018 and was completed in November 2019.





- 1 Næsseskoven – Xface sheets with extraordinary concrete surface
- 2 Trekroner church – Largest Ready to Use project in Denmark
- 3 Næsseskoven – Slab construction in showroom
- 4 Critical corner elements with curves in all directions

## Facts

### Number of R2U molds in total:

20 3D modelled molds  
78 2D designed molds

### Total technical hours:

2,290 hours

### Number of m<sup>2</sup> R2U molds in total:

390 m<sup>2</sup>

The extension consists of a basement to exhibit the developer's cars as well as a function room and technical room. The ground floor contains a spa bath, fitness area and access to the existing buildings, and on a fitted deck between the living room and the first floor there is a "man-cave".

The construction consists mainly of casting concrete with high demands on the surface, and the architectural expression is unparalleled due to its beautiful, curved concrete forms.

The very strict requirements for the wall surfaces and the challenges led Züblin A/S to choose Doka's Ready to Use (R2U) molds. The molds are 3D modelled and built in Austria and transported to Denmark, and the project has employed up to 11 formwork technicians during the period.

In terms of surface requirements, the award-winning Xface veneer, which provides a silky surface, was chosen. And additional requirements that the developer did not want to fix the anchor holes in the wall, was solved with a combination of support arches and SL1 steel profiles that

could absorb the casting pressure without deflections and satisfactory casting solutions. The rounded corners, along with rounded wall-to-ceiling transitions, were resolved with specially adapted CNC cut rails. DokaFlex and Staxo 100 are used for the different deck solutions, and again with Xface veneer to achieve the same uniform appearance of the concrete.

A very exciting project where both Doka and Züblin's competences have been challenged by a developer with a clear picture of his unique finished building. And this has only been possible through a very close collaboration with Züblin, Doka Denmark and Ready to Use in Austria.

This project is one of a number of challenging projects with high requirements for formwork and finished surfaces, such as the Trekroner Church and the Sydhavn Recycling Centre. And in the extension of the Næsseskov we have just started on a hanger and terminal building in Billund with similar tough surface requirements and again Ready to Use molds from Austria. ■

# Helsinki Olympic Stadium – Facelift for a Shrine of Sports

The ongoing renovation and new construction of Helsinki's Olympic Stadium is the largest project ever undertaken by Doka Finland. After several years, the work is nearing completion and the Grand Opening of the new stadium is scheduled for autumn 2020.



## Facts

**Original year of construction:** 1938

**Architects:** Toivo Jänntti and Yrjö Lindegren

**Spectator capacity (current):** 36,000 (record number of spectators for the Olympic Opening Ceremony in 1952, with extra spectator stands constructed from wood: 70,435)

**Renovation schedule:** 2016–2020

**Main contractor:** Skanska Oy

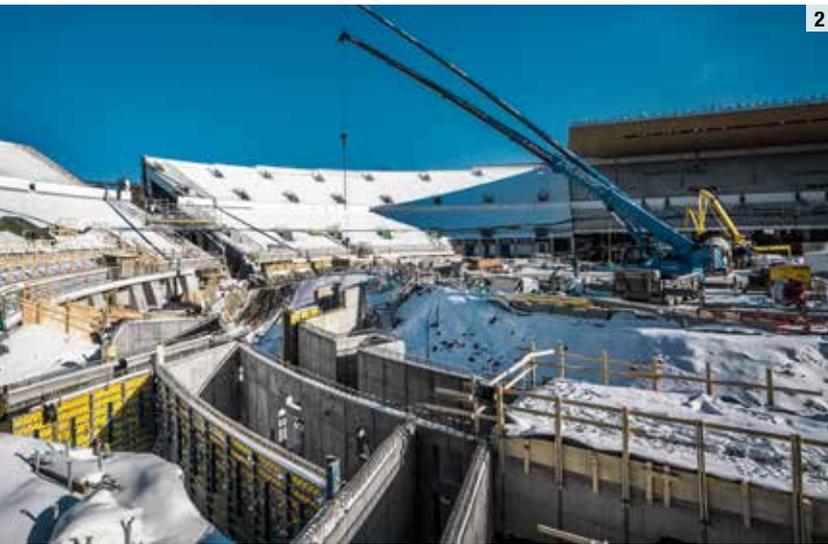
**Doka systems used:** Framax Xlife framed formwork, Staxo 100 load-bearing tower, Dokaflex timber-beam floor formwork, Framax Xlife plus wall formwork, and a variety of column formworks and Top 50 assembled large formworks.

## Historical moments

For Finns, Helsinki Olympic Stadium is not just any arena for sports and culture; it has a much greater significance. The stadium was completed in 1938 and its intention was to be the arena for the 1940 Olympics. However, the global situation was undergoing change and after finally surviving the war, Finland hosted the Olympic Games in Helsinki in 1952.

If the walls of the Olympic Stadium could speak, they would certainly have many stories to tell. Whether you are a passionate sports fan or concert lover, you have probably enjoyed your own Olympic Stadium moment. Indeed, Finns often discuss their personal memories of the Olympic Stadium over coffee. It is not at all wrong to say that for Finns the stadium is bigger than its physical walls.

Of course, there is nothing wrong with its walls, as the building also has great architectural significance. The Tower – originally constructed for marathon runners to find the finish line – has formed an integral part of Helsinki's silhouette from the day it was erected, and the Olympic Stadium is otherwise regarded as being a ground-breaking example of functionalism. It is also worth remembering that the organisation responsible for the construction is the very same organisation handling the current facelift.



A closer examination of the history of the Stadium surprisingly reveals that buildings in Finland with less cultural value have been protected, while a protection order for the Olympic Stadium was issued only in 2006. Previously, it would have been possible to repeat what happened in London, where Wembley Stadium, a local shrine to the Olympic Games and soccer, was demolished to make way for a new stadium.

### Heading for a new era

The renovation that started in 2016 and is scheduled for completion in 2020 is the largest restoration project in the history of the Olympic Stadium. In practice, everything possible is being renewed, but taking care to ensure that all protection order conditions are met. For example, all the spectator stands will be brand new, and even the grass for the event area was done by professionals.

Going beneath the surface of the Olympic Stadium, there is plenty that has been renewed. Massive castings with Doka formwork has been focused on new structures, such as gyms and the logistics centre. The modern infrastructure makes the Olympic Stadium a place that can be used on a daily basis. Just like the exercise centre, the gyms serve sportspersons and amateurs alike, while the new restaurant premises are adaptable to accommodate various events, and the logistics centre facilitates concert preparations for megastars.

### Doka's products are part of the change

Renewal of the stadium has also been an enormous task for Doka Finland. Massive castings has been conducted on the basement floors, so the Doka formwork has been used in places that are not that evident.

It should also be emphasised that a building like the Stadium is not just any kind of highrise building, rather a unique entirety, so a great deal of effort has also been put into designing. For the very first time in the history of Doka Finland, our own designers were working at the stadium construction site on a daily basis during the initial stages of the project. This facilitated the flexible travel of information between Skanska and Doka.

The size of the construction site is also something quite exceptional. Placing the wooden beams used at the site end-to-end would cover a total distance exceeding a hundred kilometres. Similarly, the total area covered by wall forms would be enough to cover two entire football pitches.

- 1 The lightweight Frami Xlife formwork has been in use frequently in Olympic Stadium jobsite.
- 2 Massive amount of all work considering formworks are located below the actual surface.
- 3 The most commonly used formwork in Olympic Stadium jobsite is framed formwork Framax Xlife.
- 4 Wintery detail of Frami adjustable Clamp.



In order to support all these structures, a total of 13,000 Staxo 100 frames and over 10,000 arch supports were used. Additionally, an enormous range of different machinery was used. In the main, the Framax Xlife wall formworks are utilised, but special surfaces have also required use of the Top 50 formworks that were assembled at the construction site.

It is worth noting that our formworks, as well as our versatile and comprehensive supports, met all of our client's needs. It is no exaggeration to claim that the Olympic Stadium's construction site is an impressive showcase for the Doka product portfolio. No problems emerged that could not be resolved with the client. Indeed, the Helsinki Olympic Stadium contract has been a milestone beyond compare. It has really put all our activities to the test, from the sufficiency of formwork to the reliability of deliveries. Nevertheless, we can say that we successfully rose to the challenge.

Working for Doka, we can now all be proud of the renewal of the Olympic Stadium when it is opened to the public in autumn 2020. ■



Three track tunnel: This is one of the many projects that Doka Norway is part of on the Follobanen project.

**Follobanen - Norway's largest transport project to date**

Follobanen is the innermost part of the InterCity development southeast of Oslo, and the largest land-based project in Norway in recent times. When the first train is scheduled to depart in 2022, it is planned that the travel time between Oslo S and the public transport hub Ski can be halved from 22 to 11 minutes.



Project Follobanen

# On the right track with Concremote

The AF Group has started using Concremote on one of its projects on the Follobanen, the Three-track tunnel. This should prove to be very profitable.

**Building for the future**

The purpose of the development is to create an environmentally friendly and efficient transport link that makes it easier to live and work where you want, which in turn will remove some of the pressure from the expected population growth in the area surrounding Oslo in the coming years. According to ssb (Statistisk sentralbyrå), 370,000 more inhabitants are expected to be living in Oslo and Akershus by 2040.

Doka's capabilities have been very useful in the Follobanen project. Since the tendering process started in 2014, we have been involved in many of the projects on the Follobanen, including the Three-track tunnel project for the AF Group.

**Advances on the construction site**

Concremote has been used in the Three-track tunnel and has re-

ceived very good feedback from the AF Group. Amongst others, Bernt Kristiansen, who is one of the country's most knowledgeable and experienced concrete technologists.

The purpose of Concremote is to have control over the property development, so that the formwork can be taken down as quickly as possible. A total of 21 constructions have been cast with Concremote as a tool for strength control on this project, 11 with the truck "Julie" and 10 with the truck "Lina".

When the casting work was carried out in the Three-track tunnel, three sensors were installed on the formwork trucks, two on the bottom deck and one sensor in the middle of the interior wall. Notice of attained strength was distributed to operating personnel in AF and key personnel in Bane NOR by using automatically sent SMS and/or e-mail.

**One week saved**

Taking down the framework as soon as possible provides a time and financial gain. By using Concremote in the Three-track tunnel, the AF Group has been able to start taking down the framework when the supervisor in charge has received a notice of attained strength, at any time of day. The AF Group's estimate is that if they were to use traditional sampling to determine whether the desired strength was achieved, they could start removing the framework almost six hours later than when using Concremote.

This gives a savings of 21x6 hours = 5.25 days. In summary, the AF Group assume that total time savings for the Three-track tunnel represents one week's progress. This in turn results in a one week shorter rental of formwork materials, machinery and saved manpower time. ■



To sum up, we estimate that total time saving for the Three-track tunnel represents one week's progress.



AF Group's report on the use of Concremote



### Concremote

Doka's system for controlling the concrete's strength development in the concrete when measuring temperature development. The maturity development of the various concrete mixes is calibrated by casting cubes and storing them in Doka's proprietary insulated crates. Pressure strength is measured at various times and calculation models for the concrete prescriptions are prepared.



### Facts

**Project:** Three-track tunnel

**Location:** Oslo S (Ekeberg)

**Construction type:** Three-track Tunnel

**Client:** Bane NOR

**Contractor:** AF Group

**Planned completion:** December 2022

### Doka in the project:

Delivery of formwork solutions, with technical design, project management, finished service, logistics, formwork instructor at the construction site and Concremote



We can conclude that tools like this work, and that the Client and the Contractor both gain financially and progressively.

AF Group's report on the use of Concremote



# E4 Bypass Stockholm

## Facts

**Length:** 21 km

**Length of main tunnel:** 2x18 km

**Number of lanes:** 3 in each direction in separate tunnel pipes

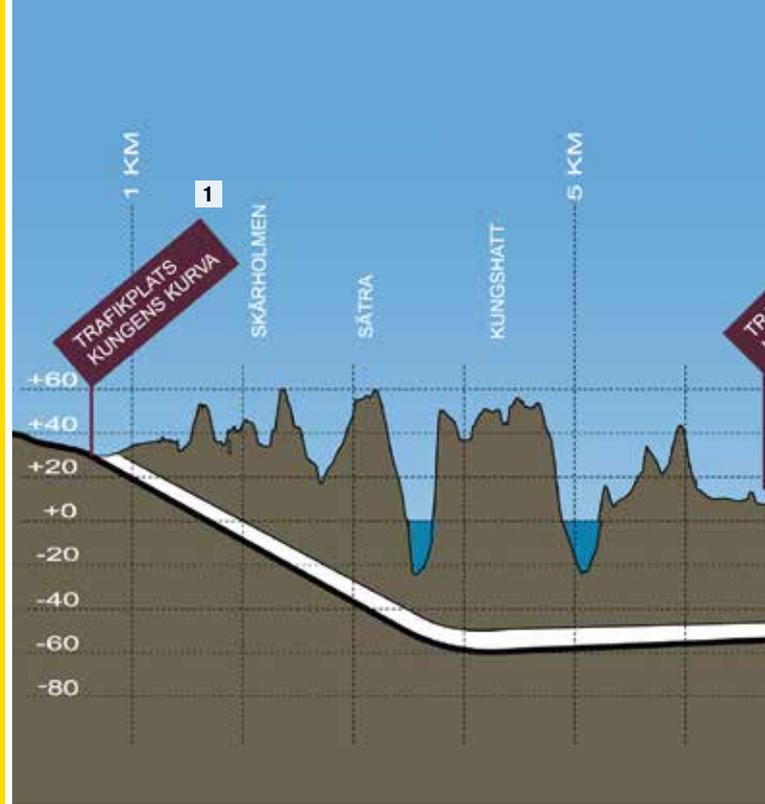
**Traffic areas:** 6

**Motorway bridge:** 24,000 m<sup>2</sup>

**Total rock volume:** 22 million tons

**Construction time:** finished year 2030

**Construction cost (2009 price level):** SEK 28 billion



Customer: Skanska

## FSE105 Kungens Kurva

26 meter long tunnel wagon for casting the tunnels at King's Curve.

## FACTS

**Rock excavation:** 300,000 m<sup>3</sup>

**Soil excavation:** 375,000 m<sup>3</sup>

**Concrete:** 78,000 m<sup>3</sup>

**Soil reinforcement:** 11,000 m<sup>2</sup>

**Concrete tunnel incl. trough:** 330 + 330 m

Customer: NCC

## FSE502 Hjulsta Norra

Top 50 as formwork for exterior wall to SL 1 tunnel wagon when casting tunnels at North of Hjulsta.

## FACTS

**Construction method:** Monolithic

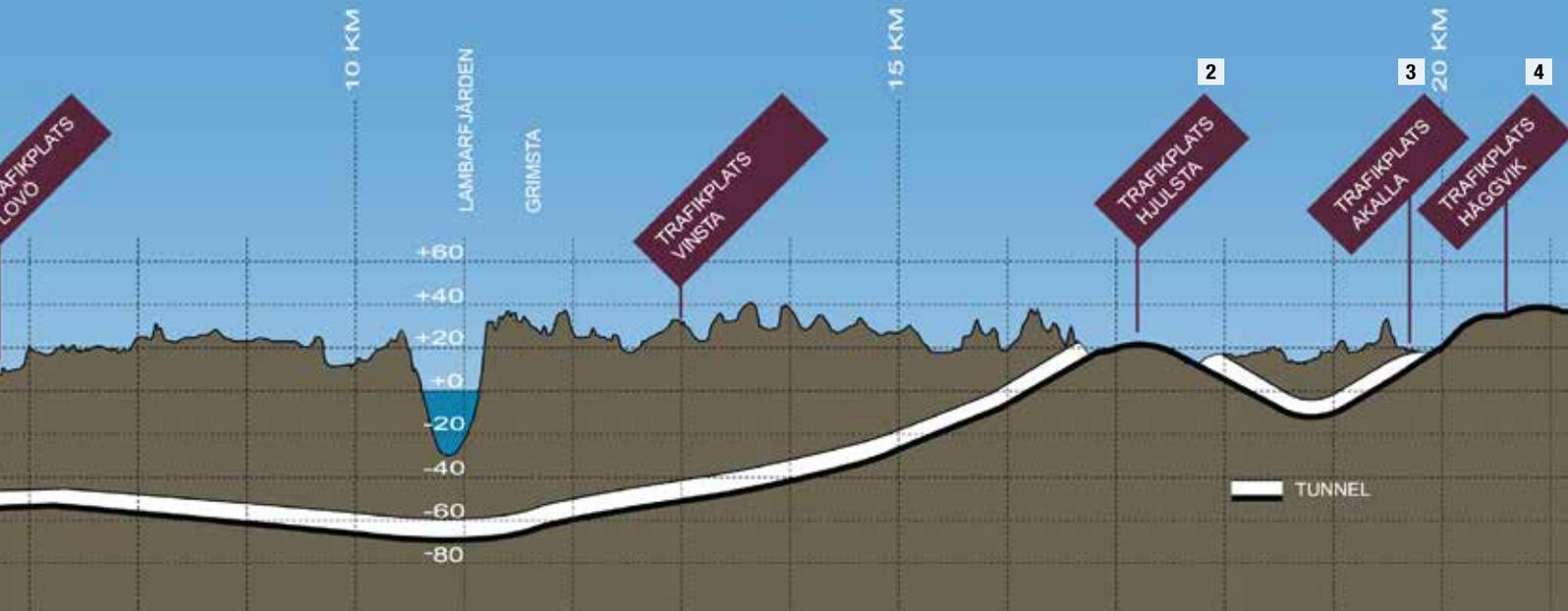
**Tunnel with formwork:** 2 x 370 m

**Length of concrete sections:** 10 m

**Number of concrete sections:** 2 x 38

**Trough:** 170 m





Customer: Züblin Scandinavia AB

## FSE61 Akalla

Overview image of tunnel and trough before the four SL 1 tunnel wagons are mounted.

### FACTS

**Reinforcement:** 11,600 tons

**Sheet pile:** 8,745 m<sup>2</sup>

**Soil and Rock excavation:** 715,000 m<sup>3</sup>

**Concrete:** 60,000 m<sup>3</sup>

Customer: NCC

## FSE62 Häggvik

Top 50 as formwork for exterior wall on both large and small tunnel before three SL 1 tunnels are put into operation.

### FACTS

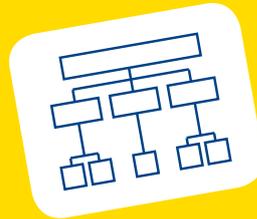
**Concrete:** 29,000 m<sup>3</sup>

**Rock excavation:** 320,000 m<sup>3</sup>

**Soil excavation:** 250,000 m<sup>3</sup>

**Sheet pile:** 3,500 m<sup>2</sup>



The **STOP** principle**S**  
ubstitution**T**  
echnical  
solutions**O**  
rganisation**P**  
erson

# Safety starts in the mind

**Safety is associated with a high level of responsibility.** Compared to other industries, construction sites are certainly among the most dangerous workplaces. However, occupational safety does not start at the construction site rather it starts much earlier.

Construction workers are exposed to high accident and health risks in their daily work, because construction projects grow and are continually changing the work environment. The site crew often has to work under considerable strain, in difficult weather conditions and under major time pressure. In order to avoid dangerous situations in the best possible way and to make construction sites a safe place to work, the appropriate measures must be taken. What exactly this means can be illustrated quite well by the inverted STOP principle.

The **person (P)** is at the centre of all goings-on and activities. Accidents on construction sites are often caused by behaviour. It is therefore important to know where dangers lie and to make the site crew aware of these dangers. The correct assessment of risks and estimation of consequences are essential skills.

The second aspect involves the **organisation (O)**. The issue of occupational safety must be anchored firmly in the corporate organization, and lived and supported by the entire company. Corresponding guidelines and people who drive the issue forward are critical to success.

The right **technical solutions (T)** are another point. The focus is on protective measures and facilities that make the workplace safe. On the construction site, falls can usually be prevented with the right safety devices, such as railings, protection screens or non-slip surfaces. Choosing the right products and the right safety features is the key. Formwork and safety systems must always comply with the latest standards and regulations, and may only be operated by trained personnel. Products that can no longer be used must be replaced in a timely manner. On the construction sites, Doka supports its customers with ergonomic solutions. For example, ease of use for formwork is of prime importance. Doka systems are designed to save both time and effort. Health is an indispensable prerequisite for performing safe, productive and high-quality work.

With **substitution (S)**, the primary objective is to prevent hazards and risks from arising in the first place. This is where the impact can be felt from regular safety checks and the proper maintenance of products, but above all also training and education. Well-trained employees are the best precaution for ensuring safe construction sites with high productivity.

Doka offers a comprehensive training programme that keeps construction companies up to date with the latest developments in formwork technology, construction-related topics and occupational safety. User information, operating instructions, safety data sheets and application videos, which can be downloaded from [www.doka.com](http://www.doka.com), also ensure the correct and safe operation of Doka systems on the construction sites. ■

**Did you know ...**

... that you can book Doka Special Training all year round? No matter which topic you choose, the focus on safety is integrated into all our seminars.



[www.doka.com/training](http://www.doka.com/training)



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# Systematic Safety

## Doka understands safety as a holistic concept.

Safety starts with product development and extends from safety consulting to a comprehensive range of formwork planning, safety products, and services.

Installation of safety systems at a construction site is often associated with an inhibition threshold due to the additional work required. For this reason, Doka has developed quick and easy-to-operate safety innovations for every type of forming assignment. Many Doka complete systems for slab, wall or column formwork already incorporate safety features such as working platforms with edge protection or access systems. This ensures safety right from the outset.

**The Protection screen Xclimb 60** carries out construction work in the top building-levels of highrise projects in great safety, and protects from the weather. It is a hydraulically climbed system that can also be quickly repositioned by crane if sufficient craneage is available.

**The Dokadek 30 panel slab formwork** ensures ergonomic, fast and safe forming of slabs. The panels are erected from a safe base, i.e. the construction workers do not have to enter the slab formwork. This en-



sure particularly safe working. The excavation safety device integrated into the Dokadek 30 head prevents elements from falling down accidentally.

**The edge protection system XP** is the universal safety solution for all edge protection needs. It fits in ideally with Doka systems – be they wall or floor-slab formwork – for safeguarding slab-edges or as fall-arrest barriers on the structure shell.

**FreeFalcon** is one of the newest products related to safety. It closes the gap in the area of flexible overhead anchor points on construction sites and is the perfect synthesis of safety and freedom of movement. This mobile personal fall-arrest system secures workers where the risk of a fall is most critical. This significantly enhances user safety without sacrificing mobility, helping to minimise the risk of falls from height. ■



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- 1 Doka's safety systems are flexible and easy to use.
- 2 Dokadek 30 panel slab formwork
- 3 Protection screen Xclimb 60
- 4 FreeFalcon
- 5 Edge protection system XP



Four smart tools making construction more economic

## In the digital fast lane

**More efficient. More productive. Working at ever-increasing speeds with no loss of precision.** These are the challenges that construction companies face today. At the same time, planning and execution are becoming increasingly complex.

To address these challenges, the construction industry is progressively integrating more digital solutions with the declared goal of implementing lean construction. The nucleus, where all the construction data is stored, is BIM (Building Information Modelling). New digital solutions designed to boost the industry's profitability on the basis of BIM are gradually emerging on the market. These four smart tools developed by Doka in cooperation with its customers illustrate what this can look like in practice.

As the 2019 bauma construction trade fair clearly showed, construction sites are becoming increasingly digital and more and more processes are being automated, from planning and execution to building management. The focus here is not on isolated solutions, but on a holistic network of integrated systems and applications that interact and effectively "communicate" with each other (Internet of Things, or IoT). This allows important but time-consuming and sometimes error-prone processes to be streamlined and simultaneously made more precise and transparent – including documentation.

The solutions must not only be practical, however, but user-friendly and customer-oriented as well. There is no way they will become established and generate real added value unless they are developed with the everyday working routines in mind, without requiring lengthy technical training. This is why Doka has worked with its customers to develop a wide range of digital solutions designed to

tackle the construction industry's most common "gripes" in planning and implementing a project and to help it work more economically.

### **Contact: Precise daily cycle planning, clear assignment of tasks and target-performance comparisons**

How can you ensure that you have the most productive takt planning, team allocation and material disposition during planning and construction? In addition, how to ensure that the best solutions are systematically identified on construction sites and made available to everyone in the company during the construction of similar projects? The sensor-supported software solution Kontakt provides direct support during execution on the construction site. With it, foremen and site managers can plan, allocate and compare personnel at the takt level, and draw valuable conclusions from them. Sources for all the actual data to be recorded are a sensor unit

- 1 Kontakt:** Collecting and evaluating data to help foremen and site supervisors keep track of performance data on the construction site, allowing cycle planning to be coordinated much more efficiently.
- 2 Keeping track of the construction yard:** Use the cockpit function of the Yard Management application for a quick overview of the availability and whereabouts of company-owned and rental equipment.
- 3 Smart Pouring:** The entire in-situ concrete process being optimised by a mobile app.
- 4 DokaXact** is the first interactive sensor-based system for precise positioning of wall formwork elements for highrise cores.



attached to the formwork and the construction workers. It communicates independently with the software platform, on which all teams work much more productively. The teams benefit, among other things, from automatic progress reports and early detection of deviations.

#### **Digital yard management with the (upgradeable) myDoka app**

Good construction site planning starts with your own building yard: What materials are available and in what condition? What is on which construction sites for how long, i.e. when will which materials be available again? Which materials are owned by the company, which have been rented (and when do they have to be returned)? Construction companies will be able to see and manage all of this via the upgraded myDoka services starting in spring 2020. The basic version (managing the formwork rented from Doka) has been available since 2012, and this web app has now been upgraded to include two ver-

sions: myDoka+ can be used to manage both rental and company material, and myDoka top also offers KPI evaluation options for additional formwork optimisation (selection and capacity utilisation). The basic version myDoka is free; both upgrades are subject to a fee. In addition to project, construction site and product management, the platform also offers numerous other features, such as automated links to the online shop or to classic services such as freightage, reconditioning and storage, which can be selected as modules.

#### **Mix & Match: Smart Pouring ensures that the ordered concrete goes in the right component**

As of 2020, a mobile application will also be available to handle and document the entire order and delivery process for in-situ concrete. The idea for this was born from talks with construction companies, which revealed two fundamental problems: ordering by telephone repeatedly leading to misunderstandings and mix-ups sometimes lead to concrete being poured into the wrong component – which is an enormous problem for safety reasons alone. So Doka has developed Smart Pouring, a supplier-independent app that foremen can use to enter the key data for the concrete they need (compressive strength, exposure class, delivery site, etc.) and order it straight away. The supplier receives the order, checks it and sends an order confirmation. The driver receives all the necessary information, including the designated unloading site, as soon as the delivery is due. When the driver arrives at the specified delivery point with the ordered concrete, the team is notified and is ready to accept the order. Further down the process chain, the customer can use a digital comparison system to check whether they were pouring all their concrete into the correct formwork.

#### **DokaXact: Forming with pin-point precision**

DokaXact is a tool for surveyors and crews, which allow site teams to quickly and precisely plumb and align wall formwork used with core formwork climbing systems. It consists of a wireless centralised processing unit, which communicates with multiple sensors attached to defined surveying points of the wall formwork.

All these applications have the goal of streamlining workflows, improving clarity and boosting execution quality. Doka has therefore set up its own Digital Services business unit, which develops and markets solutions for more cost-effective planning, procurement, management and execution: upbeat construction – digital services for higher productivity. ■



# All-round safety

**doka**

**FreeFalcon** is the perfect synthesis of security and freedom of movement. The mobile fall protection anchor ensures that individuals are secured in just those locations where the danger of falling is greatest.



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**The Formwork Experts.**