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Customer Magazine

CONCRETE CONNECTIONS

1/2013

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Peikko Group Corporation
Voimakatu 3
FI-15101 LAHTI, FINLAND
peikko@peikko.com

EDITOR-IN-CHIEF
Molli Nyman
molli.nyman@peikko.com

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ON THE COVER:
Kastelli multipurpose hall and school, the largest construction project by the City of Oulu, Northern Finland, will be completed in August 2014. Professionals working on the project, together with the extensive use of computer modelling technology, have played a key role in managing the project. Peikko's on-time deliveries have also been integral to the success of the project.

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At your service,

Topi Paananen
CEO, Peikko Group Corp.
topi.paananen@peikko.com

TEST PROVEN RELIABILITY

At Peikko we want to do things right. We do 3D design, we make FEM analysis, we make real-size steel samples of the products and study them further. And at the end of the day, we need to be sure about the functionality of our products and for that purpose full-scale concrete tests are often required.

To plan a testing is a science itself. And actually, the plan is much more important than the breaking of the concrete or the steel itself. The test has to really demonstrate a real-life situation of a column, floor, balcony or other object in the building. Last year, we tested our upcoming versions of our products at the University of Greenwich, the **United Kingdom**.

There is a need to test products not only when we are creating new products. In 2012, we proved new calculations referring to EN-standards with regards to our punching shear to work in real life situation at Ecole Polytechnique Fédérale de Lausanne (EPFL), **Switzerland**. You can read more about this on pages 18–23 of this issue of Concrete Connections.

Sometimes we also want to make sure products we have been selling for a longer time really work and that our conventional wisdom still hold true. For this reason we have, for example, done extensive testing of Lifting Anchor products range with interesting results at the Technical University of Darmstadt, **Germany**.

To expand the use of products to extreme cases, we also do further analyses like three-dimensional FEM thermal analysis for PCs Corbel in Centre Technique et Industriel de la Construction Metallique (CTICM), **France**.

In order to prove there are weaknesses in EN-standards and certain sections of them need an update, we have done tests at the Technical University of Zilina, **Slovakia**. Sometimes it is better to prove that we are right not only with calculations, because physical parts can lead to faster conclusions by the authorities.

Last year we were faced with an absurd accusation by one of our competitors. The competitor told both our customers and the local approval body in a given country, that one of our connection products was unsafe. This was the first time in our 48-year history that Peikko was accused of selling unsafe products. Again, the successful tests on the product at the Technical Research Centre of Finland, VTT, **Finland**, proved these claims technically baseless and simply convinced the authorities' trust on Peikko as a reliable partner and manufacturer.

These were the tests done last year. In 2013, we will have further development programs, such as Deltabeam tests to be done in North America. Peikko remains committed to make our industry more safe and reliable – now and in the years to come.

Work is still under way on the auditorium.

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PEIKKO SOLUTIONS CONTRIBUTE

TO A MULTIPURPOSE HALL AND SCHOOL PROJECT IN NORTHERN FINLAND

Text & Photos: Vesa Tompuri

Kastelli multipurpose hall and school, the largest construction project by the City of Oulu, Northern Finland, will be completed in August 2014. Professionals working on the project, together with the extensive use of computer modelling technology, have played a key role in managing the project. Peikko's on-time deliveries have also been integral to the success of the project.

The Kastelli project being constructed in Oulu is a classic example of the benefits of smooth cooperation between construction site personnel, structural engineers, and manufacturers of the main structural components. The use of advanced computer modelling software has helped to eliminate the potential for human errors in a geometrically challenging design.

"The quality of the design of the 200 load-bearing interior cladding panels we ordered from precaster VB-Betoni for the project, has been very impressive," says Production Engineer **Mikko Mäläskä** of Lemminkäinen Talo. "Only two of them had some small design issues, and that is a very good achievement for such a demanding project. We got the plans in time, despite the tight schedule, and production has been running without a hitch so far. The decision to use building information modelling software from the start of the project has played an important part in this."

Mäläskä says the inclusion of a scheduling component in the 3D model has been a critical factor, as it has enabled the designers to use the model for dimensioning purposes and site personnel to use it for planning how to optimise on-site work.

Overall responsibility for the project lies with Lemminkäinen PPP. As the project includes a 25-year maintenance contract, particular attention has been given to maintenance issues during the procurement process. The capital costs of the project represent approximately MEUR 42 of Kastelli's total budget of MEUR 86; MEUR 44 has been allocated to cover maintenance-related expenditures between the summer of 2014, when the building is due for completion, and year 2039.

AN ELEMENT-BASED STRUCTURE THE BEST SOLUTION

The 24,500 m^2 building will house two schools, classrooms for evening and adult education classes, a day care centre, a library, an auditorium, a youth club, and gym facilities. Commissioned by the City of Oulu, the goal is to offer facilities for a range of different age groups close to where people live under one and the same roof.

"Scheduling is central in a project like this, which is why it has been very important our main material suppliers have been flexible," says Lemminkäinen Talo's Procurement Engineer **Hanna Keskiaho**.

Peikko's speedy deliveries of PETRA Hollow-Core Slab Hangers were critical in enabling the floors of the building to be completed on-time, says Hanna Keskiaho.

»

The location of the lifting anchors on the elements is the outcome of detailed dimensioning work.

Jarmo Sallanko of Nostokonepalvelu lowering a white concrete cladding element into place.

Thanks to the use of building information modelling (BIM) software, design issues have been minimized, enabling everyone to stay on-schedule.

"BIM software has really been put to good use on the Kastelli project. Although it's primarily helped the designers, it's also benefited our element and fixing component suppliers as well," says Keskiaho.

The project has already generated a number of cost and time-saving ideas, says Mikko Mäläskä. One of these was the work done on optimising the lifting anchors used for the building's 12-tonne, double-storey interior cladding elements.

"We would probably have replaced the auditorium's elements with in-situ cast concrete if Peikko had not stepped up to the mark so quickly. First, Peikko worked out the basic idea for how these massive elements could be safely lifted into place and then confirmed by calculations that it could be done," explains **Pauli Sutinen**, Managing Director of VB-Betoni, which has supplied the elements in question.

In-situ casting has been used in some places, however, such as the entrance area and the air raid shelter space underneath the building. Element-based construction has been used elsewhere because of the cost benefits that it offers.

SMOOTH SERVICE FROM PEIKKO

Toni Metsi, Peikko Finland's Regional Sales Manager for Northern Finland, emphasizes the importance of the quality and the timing of customer service in ensuring that everybody gets the information they need when they need it in a project like this.

"This is an important principle for us at Peikko," he says. "When the customer asks us to clarify a product-related issue for them, we aim to respond as quickly as possible, both in terms of technical customer service and production. One of the issues that we were asked to investigate for the Kastelli project was how best to carry out the most demanding hoisting needed. This is what comprehensive service is all about, not just booking orders and delivery product."

Hanna Keskiaho says Lemminkäinen has very much appreciated Peikko's approach, particularly solutions that were realized with the use of Anchor Bolts, PETRA Hollow-Core Slab Hangers, and smaller steel parts.

Peikko also provided detailed dimensioning calculations for the Lifting Anchors needed for the interior cladding elements supplied by VB-Betoni, which enabled precast panels to be used here safely.

The solution worked out between Peikko and VB-Betoni meant that the elements could be transported to the site horizontally and erected into their final vertical position with a minimum of difficulty.

Peikko's expertise has also benefited the project's structural engineers, WSP Finland, as it freed up a lot of their time to concentrate on the main aspects of the design and the detailed engineering needed. This has proved particularly valuable, given the very tough timetable that everyone has been required to work to and the geometrical complexity of the design, which won a specially organized architectural competition.

The size and scale of the site has been a challenge for both Hanna Keskiaho and Mikko Mäläskä.

> When the customer asks us to clarify a product-related issue for them, we aim to respond as quickly as possible.

MASSIVE NUMBER OF CUSTOM PARTS

The unusual shapes characteristic of the design presented their own challenges in specifying the building's elements and dimensioning Peikko's products.

"Peikko was a natural choice for us, as we've worked with them successfully for many years," says Hanna Keskiaho. "In fact, we wouldn't have chanced giving such a big contract to some small supplier."

Keskiaho is particularly impressed by Peikko's ability to deliver its products to the site in only a week, despite the customised nature of the parts in question. Ensuring construction never halts because of Peikko is obviously a priority for the company, she says.

"Even when we put in an order for a big delivery of Bolt Connections, Peikko was able to deliver enough of these items in about a week to get things off to a good start."

Around 2,000 Anchor Bolts were ordered from Peikko, together with around 650 TS Joint Reinforcements. All of these, together with the custom Lifting Anchors described above, were supplied by Peikko's plant in Lahti, which also supplied the PETRA Hollow-Core Slab Hangers.

"The Hollow-Core Slab Hangers were a particularly critical delivery, and Peikko handled this very well too," says Lemminkäinen Talo's Structural Foreman **Kimmo Similä**.

Peikko's steel components played an important role in ensuring the smooth production of the building's elements at VB-Betoni's plant in Vaala, Eastern Finland, which never had to halt work while it waited for a delivery.

"We got everything we needed on time. That's quite an achievement, as the number of parts needed proved a lot larger than the original estimate," says Pauli Sutinen. "But that's what I have come to expect from Peikko."

Peikko Finland's Business Manager for Connections, **Antti Rousku** stresses that customers need to be able to rely on Peikko's scheduling, even when deliveries are made up of large number of custom parts.

"In projects like this, we always set up a project organisation to guarantee our delivery," he says. "This enables us to ensure that we have the capability on hand to handle detail engineering work associated with how our products are used. We have to be able to see the big picture and see the customer's needs in terms of that big picture." ■

FACTS – KASTELLI SCHOOL AND MULTIPURPOSE HALL

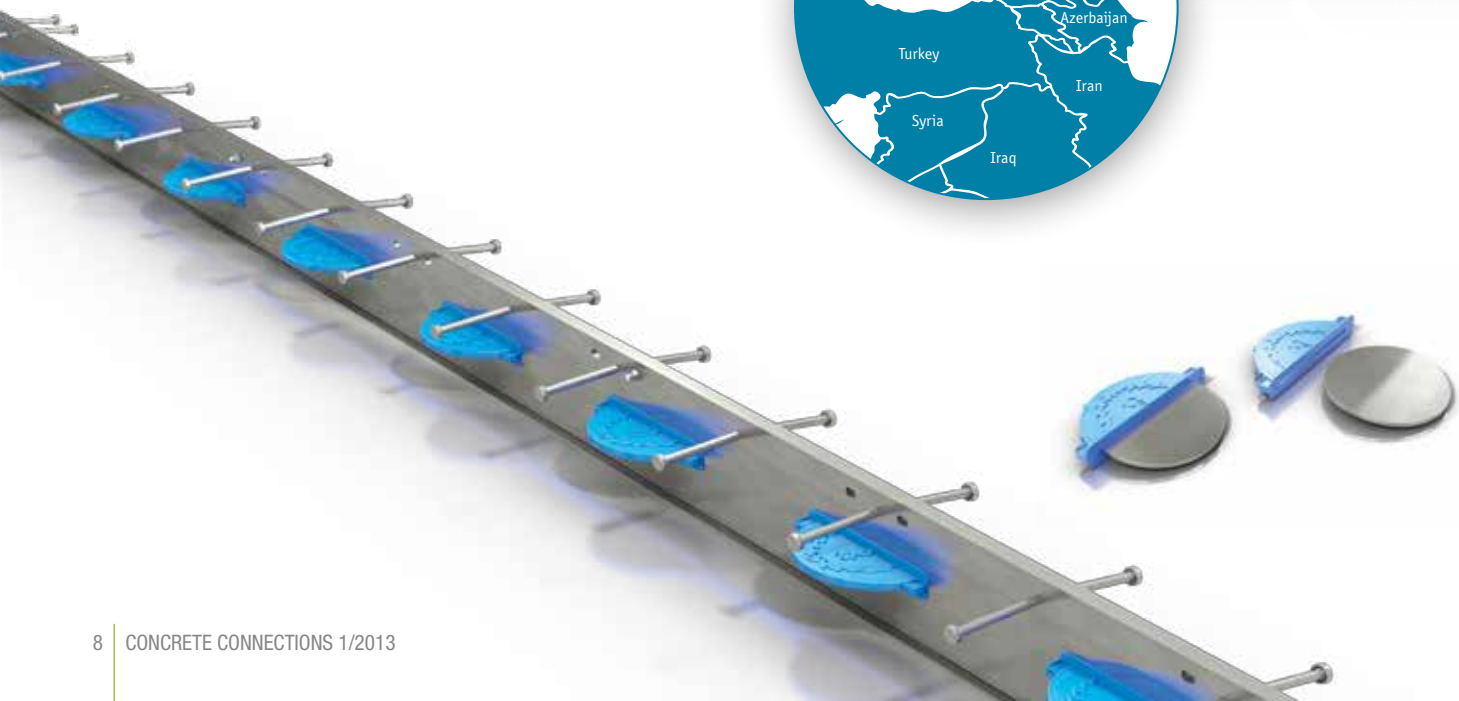
- Commissioned by the City of Oulu
- Floor area: 24,588 m^2
- Construction timetable: spring 2012 – spring 2014
- Total cost: EUR 86 million
  - Construction: EUR 42 million
  - 25-year maintenance contract: EUR 44 million
- Lead architect: Lahdelma & Mahlamäki Architects
- Lead contractor: Lemminkäinen Talo Oy
- Maintenance contractor: Lemminkäinen PPP Oy
- Structural engineer: WSP Finland Oy
- Interior cladding element supplier: VB-Betoni Oy
- Steel component supplier to VB Betoni: Peikko Finland Oy

PEIKKO ENTERS CAUCASUS MARKET

- DAGESTAN'S LARGEST PRODUCTION PLANT BUILT USING TERA JOINTS

Text: Reeta Paakkinen
Photos: Construction Company INRI, Caspian Flat Glass

A new float glass factory in Makhachkala, Republic of Dagestan in Russia, will become operational by the end of 2013. The factory is the largest project in the Dagestan construction industry to date. For Peikko, it is the first time the company has delivered its products to the Caucasus region – the flooring of the plant will be made using Peikko's TERA Joints



The Kaspiysky float glass factory, which is expected to be fully operational by late 2013, will manufacture tinted, stained and reflective types of glass, that is, glass with a reflective coating, prepared applying the float method. The factory is expected to provide employment for hundreds of locals and give a boost to the local economy. Total production capacity of the factory will be 600 tons of sheet glass per day, of which slightly less than half will be exported to Kazakhstan, Turkmenistan, Iran, Azerbaijan, Turkey and Armenia.

The general contractor of the Kaspiysky float glass plant is Palmira Group of Turkey. Peikko's partner in the project is Inri, a Moscow-headquartered company, acting as the subcontractor of the industrial floor slabs in the shops of the plant. Construction of the Kaspiysky factory started in October 2012.

QUALITY GUARANTEES SMOOTH CONSTRUCTION PROCESS

Peikko Russia supplied INRI its standard TERA Joints for the industrial floors of the plant. The order consisted of approximately 2,900 meters of contraction joints for 250 mm thick concrete slabs. The products were delivered from Peikko's production line near St Petersburg in Russia and its manufacturing plant in Kralova nad Vahom, Slovakia. Three people in Peikko Russia worked on the production of TERA Joints at Peikko Russia.

Alexander Merkulov, Managing Director at INRI, said his company chose Peikko's products because of their high quality and because the firm's staff has plenty of experience in mounting TERA Joints in its other projects. INRI has been using Peikko's products in several of its projects since 2010. The companies' previous projects include, among others, a Kostorama hypermarket in Moscow, premises for truck firm Transval also in Moscow, and a warehouse in the town of Chekhov.

"We are loyal to Peikko's products because their quality is guaranteed. By now we also have enough experience in using the leave-in-place floor joints. All our site employees are able to mount these joints. In these circumstances there would be no point to bring in some other products and change our routines," Merkulov said and added: "Besides, if something goes wrong in a construction project, it negatively affects delivery timetables and that can mean penalties and the loss of reputation. We prefer to keep the process uncomplicated."

For the TERA Joints INRI used installation device TFX. "It is a very practical solution for the installation as the joints are exposed to the desired level using the foot screws. Anchors are not hammered into the ground," Merkulov noted.

ENTERING AND EXPANDING IN THE CAUCASUS A BIG DEAL FOR ALL

The Kaspiysky glass factory is an important project for Inri because of its size and the potential it offers. "This is a big project for us: it means a lot of effort already because the concrete slab floor at the factory is 250 mm thick. We also carried our own equipment for the production from Moscow to Makhachkala, a distance of nearly 2000 kilometers. Naturally we had to give up some of our projects in the metropolitan area in favor of this larger project," Merkulov explained.

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Despite huge geographical distances, the construction process progressed smoothly, Merkulov said. “Decking delivered on time although Makhachkala is far away from Moscow, and even more so from St. Petersburg.”

Peikko has been involved in similar factory projects in Russia before, but supplying TERA Joints to the Kaspiysky glass factory is the first time the firm operates in the Caucasus. “We have experience in similar projects with the same volumes from before, for example, when we were involved in the construction of the first full-scale assembly plant for Komatsu in Yaroslavl some 250 km Northeast of Moscow in 2008,” **Vladislav Kosmachev**, Sales Manager at Peikko Russia, said. Komatsu is a Japanese manufacturer of construction and mining equipment, utilities, forest machines and industrial machinery.

Kosmachev noted the popularity of TERA Joints in the Russian construction market is growing each year. “Contraction joints for industrial floors, TERA Joints, are a relatively new product on the Russian market. These products are used in the construction of factories, logistics centers and large retail stores. Typically, these products are used by constructors, who consider durability of industrial floors a priority and want a long-term cost-effective solution. This simple solution can significantly extend the life cycle of an industrial floor and cut down on maintenance and repair costs, and I have no doubt the Dagestan deal is just the beginning for Peikko in the Caucasus,” he concluded. ■

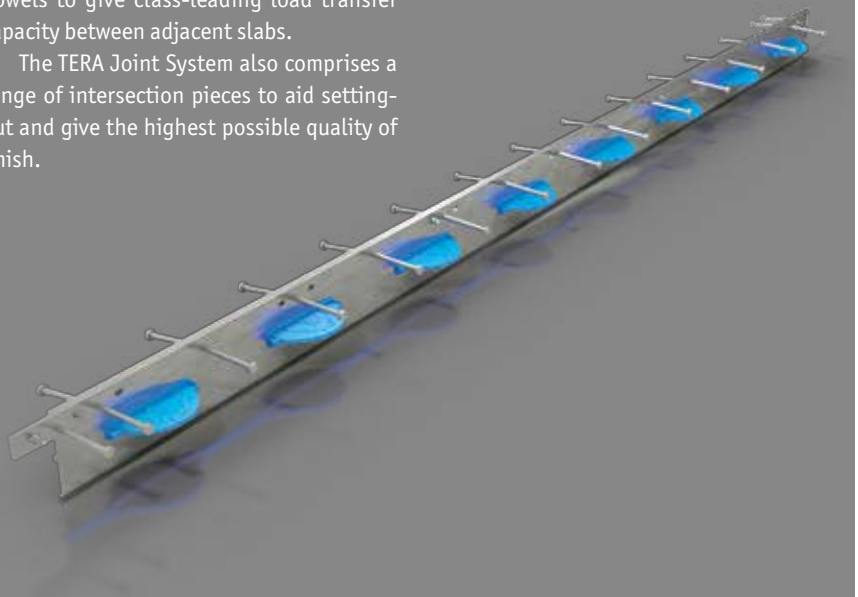
DURABLE INDUSTRIAL FLOORS WITH TERA JOINT

The TERA Joint leave-in-place floor joints allow very fast and precise casting of high quality concrete floor slabs, essential in demanding applications.

The Joint sections are 3 meters long and manufactured to extremely close straightness tolerance so they can define the surface level of even the most accurate cast slabs. Once cast-in the joints are designed to allow concrete shrinkage to take place with minimal restraint so virtually eliminating the main cause of early stage cracking in concrete floor slabs.

The concrete joint edges of the finished slab are then protected by extremely strong 10 mm x 40 mm steel strips with sharp edges to minimize the possibility of spalling. The joints are fitted with either 6 mm or 12 mm dowels to give class-leading load transfer capacity between adjacent slabs.

The TERA Joint System also comprises a range of intersection pieces to aid setting-out and give the highest possible quality of finish.



EUROPE'S BIGGEST PRECAST WATER TANK

BUILT USING PEIKKO'S CONNECTIONS

Text: Reeta Paakkinen

The largest precast underground water tank in Europe will be completed in Madrid, Spain, this spring. Two Spanish companies, precaster Grupo Berma and engineering and architecture company Arquing, are building the tank for Canal de Isabel II, the public body managing the entire water cycle of Madrid. Peikko's Column Shoes, Anchor Bolts, and PCs Corbels are being used to construct the MEUR 42 facility.

What makes the Madrid water tank project particularly important for Peikko, is the magnitude of it: the tank is 265 m x 100 m in size and once complete, it will have the capacity to supply water to half a million people in Madrid. The work involves the demolition and removal of existing water storage facilities that are out of service and replacing it with a new underground water tank with 157.000 cubic meters capacity consisting of six interior modules made using precast columns and beams.

Approximately 1400 pcs of Peikko connections were used in building the tank. More than 350 columns were connected to a slab foundation by standard column shoes and short anchor bolts. PCs Corbels were used to connect precast beams with the perimetral in-situ walls in some parts of the water tank. In addition, a few PETRA Slab Hangers were used to make openings in hollow core slab floors.

The project is important also because of the leading role Canal de Isabel II has played in the development of Spain's water infrastructure since the establishment of the company in 1851. Today, the company manages the water infrastructure for more than six million residents in Greater Madrid; it, among others, manages 14 reservoirs, some 270 water tanks, 150 wastewater treatment plants and has a distribution network of nearly 15.000 kilometers.

Massive project comes with multiple challenges **Fernando Martínez**, Managing Director of precaster Grupo Berma, said the Madrid water tank project was a particularly demanding one because of its magnitude. Grupo Berma manufactures, transports and erects structures, slabs and other precast concrete products with more than two decades of experience.

"The Madrid water tank project really challenged us because of its massive size, the tight schedule and the difficult accessibility to the site, as well as the number of companies working on it at the same time," Martínez said.

Adrian Liste, Sales Engineer at Peikko Spain, said Peikko convinced the companies involved in the project to choose Peikko's products underlining the system's ability to ensure reliability, safety and the fast assembly of the structure so that construction could be completed within a very short timeframe.

There were many trucks passing through the construction site, so Peikko's immediate rigid column connection system was more suitable to the conditions than other in secure and non-rigid connection systems.

Adaptability of Peikko's products also attracted the precast concrete company.

"With standard Peikko Column Shoes, the production of columns at the factory was effective and their assembly at the building site fast and easy. Peikko's system offers complete rigid connections so there was no need for additional bracings which would make internal movements at the building site difficult," Martínez added.

SITE VISITS AND CLOSE COOPERATION

Peikko Spain visited the building site, the precast factory as well as the Canal de Isabel II offices several times during the project to supervise and coordinate all the people involved in the building work.

"Peikko's team visited the building site in several times to assist and train all parties involved in the project. We are really satisfied with the collaboration we have had with Peikko throughout the project," Engineer **Luis Casas** of Arquing engineering and architecture company noted.

"We did not only calculate the connections of the project and teach the customer how to do it independently, but arranged visits to the building site and were thus actively involved in the design and development of the project," Liste added.

> "With standard Peikko Column Shoes, the production of columns at the factory was effective and their assembly at the building site fast and easy. Peikko's system offers complete rigid connections.

The project had a tight schedule – the structure of the water tank had to be built in only 12 months – but thanks to the quick delivery of the products and the fast and safe assembly process, all parties were able to keep to the agreed timetable.

Enrique Hernández, Managing Director of Peikko Spain, admits the Madrid water tank project was a massive challenge also for Peikko, and is already proud of the outcome. "We are really satisfied with the results of this project and the positive feedback from our customers"

"Peikko systems offer large infrastructure projects like this numerous advantages. In Madrid water tank project hundreds of columns were manufactured 200 kilometres away, transported to the site and assembled. The whole process was fast, safe, and easy, and had no effect on the neighborhood. Savings in excavation, concrete, reinforcement, assembly teams and cranes, generated by the use of Peikko system were significant. We are sure we will do many similar water tank projects in the future", Hernández added. ■

KEY BENEFITS OF PEIKKO'S PRODUCTS IN THE PROJECT CANAL DE ISABEL II

Adrian Liste, Sales Engineer at Peikko Spain, lists the key benefits of using Peikko's products at the precast underground water tank in Madrid:

- When using the Peikko short bolt type /L, there is no need to increase the thickness of the slab foundation as is with traditional methods. This keeps costs incurring from extra excavation, concrete and reinforcement as well as construction site labor force at check.
- Interference between Peikko's bolts and reinforcement of the slab foundation, which is often very heavy in this kind of projects, is minimum compared to other traditional connection systems for precast columns.
- The thickness of the slab foundation is less than in traditional systems. When making the foundation of the project this saves materials (concrete, reinforcement, formwork, etc.) and time (fewer hours of excavation, concreting, auxiliary work). The bigger the project, the more important cost savings described above are.
- Faster assembly system for precast structures compared with traditional systems, which involves shorter periods of assembly and cost savings in specialized workers and cranes, which in the case of big capacities are very costly.
- Safer system during and after installation of the columns compared to traditional systems. This greater safety is very important in large scale projects where there are many jobs and movements in the building site at the same time.
- The connection of the columns using Peikko's system is rigid immediately after tightening the nuts, so it is not necessary to brace the structure during the assembly of the columns, or during the process of grout mortar sets. This brings savings in braces and installation labor costs, and eliminates the need for auxiliary elements on site, which would complicate the access of cranes and lorries, slowing down the pace of construction work.
- The system allows assembling the column quickly and easily and leveling several centimeters in height in relation to the height of the project (-2 cm, +3 cm depending on anchor models used)
- Total adaptability to all types of meteorological factors; not affected by cold weather or rain when being assembled.

TAUNUSTURM – RAPID CONSTRUCTION WITH PRECAST CONCRETE ELEMENTS

INNOVATIVE CORBELS FOR IMPROVED EFFICIENCY

Text: Claudia El-Ahwany

Frankfurt's skyline is growing. The TaunusTurm, a skyscraper which will stand 170 m tall, is currently under construction at the heart of the banking district. Ed. Züblin AG, based in Stuttgart, Germany, was commissioned to build the structure. In order to complete construction within 14 months, whilst ensuring safe construction and a high build quality, the company is using precast concrete elements produced and assembled using innovative products from Peikko Group.

Frankfurt, the city with the most skyscrapers in Germany, will soon gain another one. Joint venture partners Tishman Speyer and Commerz Real AG plan to complete construction of the TaunusTurm by the end of 2013. Located on the corner of Neuer Mainzer Straße and Taunustor, between the banking district and the historical city wall, the office tower will offer a total of about 60,000 square meters of office space over 40 stories.

The cornerstone was laid on 18 January 2012. The global Ed. Züblin AG Group is responsible for execution planning of the TaunusTurm project as well as coordination and turnkey construction of the building. The company is active in all areas of construction and brings with it decades of experience. Its employees are open to innovative solutions, a fact which has been demonstrated by the TaunusTurm project.

A major challenge in the project was the limited space available on the building site. Firstly, the building is located in the middle of the densely populated city-center. Secondly, the available surface area and thus the storage capacity in the upper floors of a tall building is generally very limited. In order not to make the work more difficult

with space consuming formwork, a better solution was sought to solve the problem. Ed. Züblin AG Group wanted to use prefabricated elements as much as possible to build the project. Therefore, their aim was to make the production and the installation of the prefabricated elements as easy as possible and complete the building work as fast as possible.

INNOVATIVE PRODUCTS IN ACTION

The requirements were met very well by Peikko's innovative PCs Corbels. The PCs Corbels have been in use in many European countries, but they do not yet have a German product approval. A process for attaining a German product approval is underway. However, Züblin's team were so impressed with the product that they decided to obtain a project specific approval and planned to use a total of 1 200 of PCs Corbels in the TaunusTurm project.

PCs Corbels connect load-bearing concrete components and ceiling girders. Even though PCs Corbels are compact and allow low construction height, the project representatives appreciated more a completely different aspect: PCs Corbels enabled building and concreting of center lift shafts with climbing formwork by slipforming method, saving time and money and satisfying high quality requirements.

"When building the TaunusTurm, we only considered construction using Peikko's PCs Corbels. There's no equivalent system available in Germany, which would allow us to construct the TaunusTurm as quickly and economically as when using the PCs Corbels," said a member of the the Züblin planning team. ■

TAUNUS TURM FACTS

Height: 170 meters, 40 floors
Rentable space: 60 000 m^2,
1500 m^2 office space per floor,
350 parking spaces
Ready: December 2013
Developer: Tischman Speyr,
Commerz Real AG
General Constructor: Ed. Züblin AG
Architect: Gruber + Kleine-Kraneburg

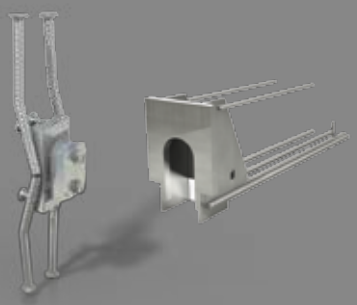
PCs CORBEL SYSTEM

The PCs Corbel is a modular hidden column corbel where the cast in part enables straight mould walls and bolted bracket offers superior adjustability and high resistances. PCs Corbels can be used in precast concrete columns, round and rectangular, with PC beam shoes, and also with steel beams and composite beams, like Peikko's Deltabeams, with suitable end plates. There is a special PC Lock available for hindering negative support reaction.

PC Beam Shoes are used as the counterpart for PCs Corbels for easy installation of both pre-stressed and non-pre-stressed precast concrete beams to columns.

In the TaunusTurm project the joints were ungrouted and sealed with fire-resistant compression strip and fire protection plates. This way 120 minutes fire resistance was reached.

The PCs Corbels system is flexible, providing connections from walls, rectangular and round columns to 2 – 5 beams from same level.



TRANSPARENT IN DESIGN AND PURPOSE

PEIKKO'S PCs CORBEL SYSTEM USED IN BUILDING A CHAMBER OF COMMERCE IN BELGIUM

Text: Reeta Paakkinen

Voka, Chamber of Commerce and Industry of Flanders, Belgium, started operating in a new building in the autumn of 2010. The new premises in the city of Kortrijk near the French border have a sleek and stylish design. Peikko's PCs Corbel System enabled constructing a building with a transparent glass edifice.

The Voka office was constructed on a precast concrete system. Its columns and beams were manufactured in the factories of Valcke Prefab Beton in South Belgium. The columns are multi-floor and PCs Corbels support the beams in between. Peikko Benelux delivered the customer 248 pieces of PCs Corbels including Beam Shoes.

TRANSPARENT DESIGN

Voka represents the interests of more than 65% of private employers in Flanders and transparency is one of its key principles. For Valcke Prefab Beton, Voka office was an important project because of the role it plays in local economy and employment relations. "Voka's office building is also located in the heart of the economic centre of West Flanders," said **Jim Deryckere,** Sales and Project Manager at Valcke Prefab Beton, the precast company constructing the premises. Deryckere found information on Peikko's solutions on the internet and contacted Peikko's Benelux office.

The building was designed to emit the spirit of transparency. "The exterior and edifice of the building was very important. People should be able to see the transparency of the building literally and figuratively," Deryckere said. "The concrete structure does not have the usual concrete consoles. It looks like as if the beams float

between the columns, which give a very light touch to the building," he added.

Wim Zwaan, Managing Director at Peikko Benelux, said the project is significant also for Peikko because of its unique design and because Peikko has been trying to promote the product already for many years in the Benelux countries. "It was challenging to design and build a smooth concrete structure where floors are visible to outside after the building is taken into use. It was therefore not possible to use large concrete corbels for supporting the concrete beams. This was our first project in Belgium where a large amount of PCs Corbels were used," Zwaan said.

Most products used in the project were from Peikko's standard range but also some parts were tailor-made. Some concrete columns were cast with steel HEM profile and there was no space for standard rebars of the PCs Corbel System. "Therefore we designed and manufactured special parts to fulfill these requirements. Some ribbed plates of the system needed to be weld to HEM steel parts," Zwaan explained.

BENEFITS OF THE PCS CORBEL SYSTEM

The PCs Corbel System has multiple benefits. For structural designers the system is clear; mainly transferring support reactions from the beam to the column. Capacities from several PCs Corbel types are specified the new Technical Manual of Peikko. Less reinforcement is also needed compared to traditional concrete corbels, where space in the mould for reinforcement is often limited. For architects, the benefits of this system are also obvious - hidden corbels are more aesthetically pleasing and enable achieving maximum space between the floor slabs," Zwaan said.

Using PCs Corbel System also saves time from precasters as columns are cast in one shift, whilst manufacturing traditional concrete corbels often takes two working shifts; one shift casts the column and the next day the second shift casts the corbel.

"When using PCs Corbels also the mould is more economical because the sides of the mould are flat and no special mould for concrete corbel is needed. Installing beams with the corbels at the building site is easy also in the winter as workers can continue with the mounting of the beams while grouting the joint can take place at later phase," Zwaan explained.

TROUBLE-FREE INSTALLATION

The components for the Voka office were manufactured at Peikko's plant in Lahti, Finland, and reached the factory of Valcke Beton within two to three weeks of the order. Peikko Benelux visited Valcke's factory several times during the building process in order to assist in the installation of the products. Construction of the building started in the winter and ended before the summer of 2010, lasting some six months. The premises were complete in September 2010.

"Thanks to a very good engineering, preparation and prefabrication work, building work progressed very well. Peikko's idea to put different types of PCs Corbels in different colours helped a lot in moving these up the facility, made the process speedier and prevented errors from happening," Deryckere said and added: "Since Voka office, we have been using Peikko's products, also Deltabeams, in our projects." ■

PERFORMANCE OF SLABS REINFORCED BY PEIKKO PSB STUDS

DEMONSTRATED BY FULL SCALE TESTS AND VALIDATED BY ETA APPROVAL STARTING APRIL 2013

Authors: Aurelio Muttoni (Professor), Ecole Polytechnique Fédérale de Lausanne, ENAC-IBeton, Lausanne, Switzerland
Jan Bujnak (PhD), R&D Manager, Peikko Group Corporation

Figure 1 Peikko PSB Studs

INTRODUCTION

Double headed studs (e.g. Peikko PSB Studs - Figure 1) are one of the most efficient systems for the reinforcement of concrete flat slabs against failure by punching. The studs are the most typically used to reinforce floor slabs, foundation slabs or column footings. This reinforcement technique has become almost a standard in Central Europe over the past 20 years; it is nowadays becoming increasingly popular in other parts of Europe as well.

One of the main arguments for the application of studs as punching reinforcement is that they enable the slab to reach resistance levels that are significantly higher than resistances of slabs reinforced by traditional techniques (opened or closed stirrups) and they enhance the deformation capacity of the member. A series of full scale tests of slabs reinforced by Peikko PSB Studs has been performed during year 2012 at the Swiss Federal Institute of Technology (EPFL) in Lausanne in order to support this argument. The results of these tests have been used as the basis for the development of the European Technical Approval (ETA) for Peikko PSB Studs. These design concepts of the ETA approval calibrated on the basis of the results of tests will now enable to take account of the benefits of the studs in the design of the slab (the maximum resistance of the slab may be up to 30% higher than the resistance of slabs designed according to Eurocode 2). The details about the tests and background of the design concepts of the ETA approval are presented in this paper.

The legal status of Peikko PSB Studs within the framework of Eurocodes as well as tools for the design of Peikko PSB Studs will be defined by the ETA starting from April 2013. The main motivation of this paper is to provide further added value to the potential users of PSB Studs (designers, contractors, investors) by presenting transparent and unambiguous information about the background of the ETA approval and tests performed on slabs with Peikko PSB Studs.

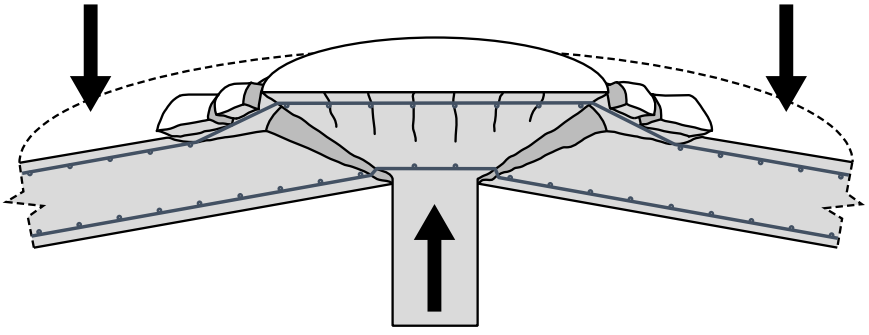


Figure 2 Failure of a slab by punching

REINFORCEMENT AGAINST PUNCHING

Punching is often one of the decisive failure modes that limit the load bearing capacity of reinforced concrete flat slabs (floor slabs, column foundations, footings). It is a particularly dangerous failure mode since it is a brittle phenomenon that happens suddenly without visible signs of warning (extensive deformations, cracks...). Moreover, the failure of one column may impact on adjacent columns and lead to an in-chain failure of the whole reinforced concrete floor. Failure usually occurs so that a concrete cone is separated from the slab, bending reinforcement is pulled away from concrete and the slab collapse due to gravity forces (Figure 2).

The resistance of the slab against this type of failure may be increased by using shear reinforcement designed and detailed in order to prevent the development of such concrete cone. One of the most efficient punching reinforcement systems for flat slabs currently available on the market are double-headed studs (refer to Figure 1).

Some of the most advanced models for the assessment of the behavior of reinforced concrete flat slabs under punching loads have been developed at the Concrete Structures Laboratory (IBeton) of the EPFL during the last 15 years. The research on this topic is of particular interest also for Peikko Group. It is thus somehow natural that Peikko and IBeton found common interest and agreed to cooperate within a research program focused on demonstrating performances of concrete slabs reinforced by Peikko PSB Studs by full-scale testing. Besides being used for the purpose of ETA approval of PSB Studs, the database of test results will also be used to validate other advanced conceptual models for the assessment of the behavior of slabs reinforced by double headed studs in future.

One of the most comprehensive physical models for the assessment of punching in concrete slabs is based on the Critical Shear Crack Theory (CSCT) developed by Muttoni [7], [8], [9], which has been adopted as the theoretical basis for the punching provisions of Model Code 2010 [4]. The model is based on the assumption that the punching resistance of a slab is limited by the capacity of a critical shear crack to transfer loads between the potential concrete cone and the slab. This capacity is principally governed by the roughness of concrete inside of the crack and by the width of the crack. While roughness depends on the material properties of concrete (aggregate size), the width of the crack is assumed to be proportional to the rotation of the slab times the effective depth of the member.

The principle of reinforcing the slab with vertical punching reinforcement consists in strengthening the load transfer mechanism in the crack with additional links. It is assumed that the shear reinforcement is activated after the shear crack is formed. The elongation of reinforcement links, and thus the force carried by the punching reinforcement, is proportional to the width of the crack of the slab. While directly carrying a certain part of punching load, the reinforcement also prevents excessive opening of the shear crack and thus enables concrete to carry a fraction of the acting shear. The strength and deformation capacity are thus increased with respect to members without transverse reinforcement.

The potential failure modes of a slabs reinforced by punching reinforcement that have to be assessed in the design of the slab are shown in Figure 3.

Failure modes a, b, d, e, f may be prevented by correct design and detailing of the punching and bending reinforcement. The failure mode c represents the crushing of the concrete strut between the support and the first row of punching reinforcement. The compressive resistance of this concrete strut thus determines the maximum value of resistance that can be achieved by reinforcing the slab with punching reinforcement. Within the CSCT it is assumed that the compressive strength of concrete in the strut among other influences depends also on the cracking state of concrete in the shear-critical region. It is also assumed that such cracking state is proportional to the opening of the shear crack. Control of cracking in the shear-critical region depends much on the bond, development and anchorage properties of each shear reinforcing system. Due to this reason, experimental validation of the maximum punching shear capacity (crushing of concrete struts) is required to suitably assess the performance of a specific system.

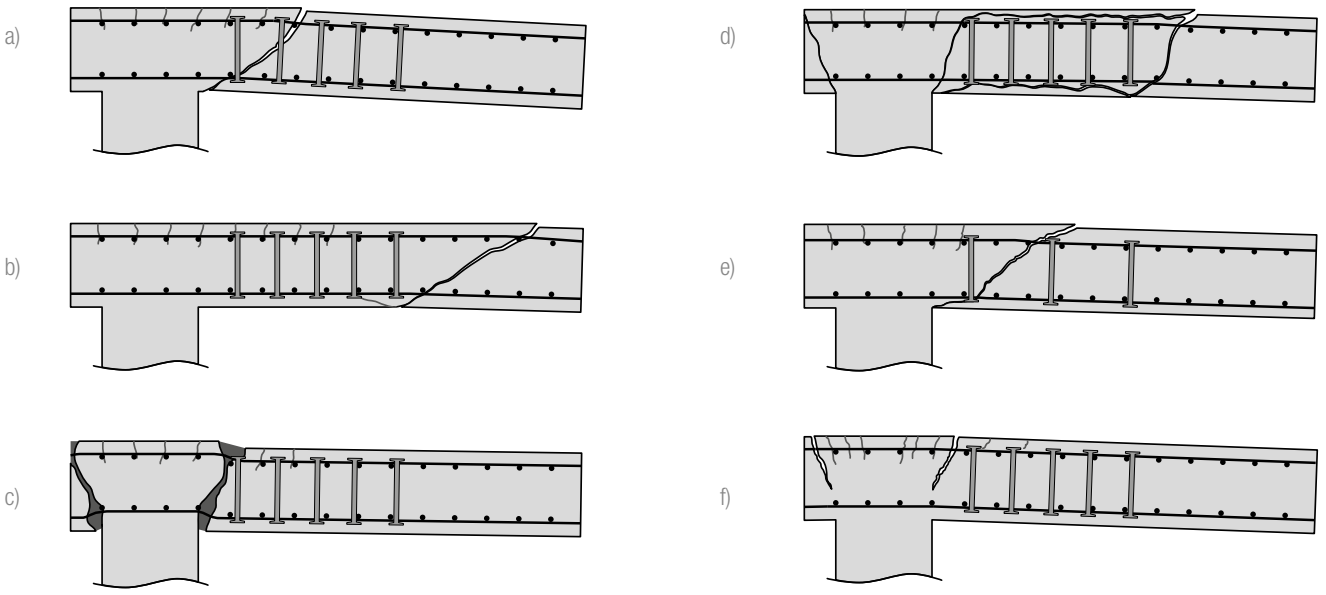


Figure 3 Failure modes of slabs reinforced with punching reinforcement [6]

		B	h	d	r_s	c	A_s	dA	f_c	$V_{R,test}$	ρ [%]
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[MPa]	[kN]	
Peikko	PP1	1700	180	136	765	180	Φ16/90	10	26,4	864	1,64
	PP2	1700	180	139	765	180	Φ16/90	12	54,8	1095	1,61
	PP3	3000	400	330	1505	440	Φ26/100	25	26,9	4754	1,61
	PP4	1700	250	211	765	260	Φ20/100	16	30,9	2076	1,49
	PP5	2300	250	205	1120	260	Φ20/100	16	31,5	1812	1,53
	PP6*	3900	250	203	1926	260	Φ20/100	16	32,7	1569	1,55
Ibeton	PL6*	3000	250	198	1505	130	Φ20/100	14	36,6	1363	1,59
	PL7*	3000	250	197	1505	260	Φ20/100	14	35,9	1773	1,59
	PL9	3000	320	266	1505	340	Φ26/100	18	32,1	3132	1,59
	PL10	3000	400	343	1505	440	Φ26/100	22	33,0	5193	1,55

*Slabs outside of the scope of CUAP

Table 1 Properties of slabs reinforced with double headed studs

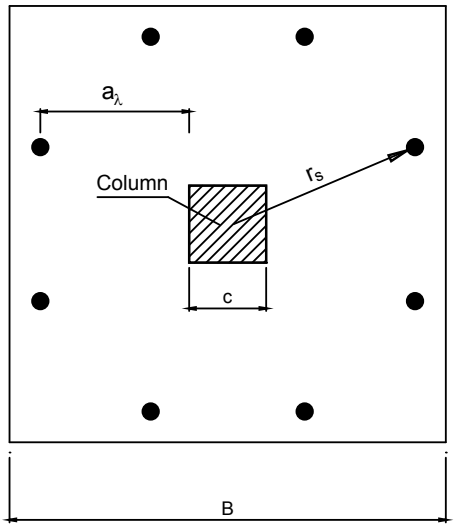


Figure 4 Schematic top view of the tested slab

DESIGN OF PUNCHING REINFORCEMENT

The influence of the anchorage properties of the reinforcement on the maximum resistance of the slabs is not represented in most of current codes of practice. For instance, EN 1992-1-1 [1] (Eurocode 2) assumes the maximum resistance of the slab to be proportional to geometrical and material properties of the concrete slab only:

$$V_{Rd,max}=0,4\cdot 0,6\cdot\left[1-\frac{f_{ck}}{250}\right]\cdot f_{cd}\cdot u_0\cdot d \quad (1)$$

It should be noted that in 2010 the corrigendum of Eurocode 2 [3] proposed to replace in Eq. (1) the value 0,5 by 0,4. A different approach, where the maximum resistance of the slab is defined as a multiple of the resistance of the slab without punching reinforcement, is used within the German national annex of Eurocode 2 [2] (DIN EN 1992-1-1):

$$V_{Rd,max}=1,4\cdot V_{Rd,c} \quad (2)$$

It has to be mentioned that EN 1992-1-1 approach is based on the beam analogy. Although this model has some safe assumptions (as neglecting the out-of-plane confinement of concrete), it does not account for the fact that strain localization occurs (refer to Figure 3c, contrary to beams with transverse reinforcement) and this may lead potentially to unsafe predictions of the strength. With respect to Eq. (2), it is based on the empirical formula of Eurocode 2 for calculating the punching shear strength of members without transverse reinforcement and thus inherits all its potential deficiencies and ranges of application.

The common understanding of assessment procedure [5] (CUAP) for double-headed studs has been published by the European organization for technical approvals (EOTA) in February 2012. The CUAP defines the framework for the elaboration of ETA approvals of double headed studs used as punching reinforcement, including Peikko PSB Studs. Among other requirements, the CUAP defines the necessity to demonstrate the maximum resistances of slabs reinforced by double headed studs by full scale testing. It also includes rather explicit definition of test specimen, test procedure and evaluation methods that have to be used for the development of the ETA approvals. The design model for the maximum resistance of slab reinforced by double headed studs is defined analogous to the empirical model of DIN EN 1992-1-1 [2] under the following form:

$$V_{Rd,max}=k_{max}\cdot V_{Rd,c} \quad (3)$$

where the factor k_{max} is to be defined by testing.

EXPERIMENTAL INVESTIGATION

As mentioned earlier, the principal objective of the experimental camping performed in cooperation between Peikko Group and IBeton was the development of a database of test results for the validation of a design model for the maximum resistance of slabs for the ETA approval of Peikko PSB Studs. Slabs reinforced with double headed studs analogous to Peikko PSB Studs have already been tested at IBeton previously [6]. Some basic parameters of slabs reinforced with double headed studs tested previously at IBeton are given in Table 1.

The geometric and material properties of slabs to be tested for the development of ETA approvals of double headed studs are explicitly defined by CUAP. Amongst others, CUAP deems sufficient to take account of slabs with slenderness $3,0\leq a_\lambda/d\leq 5,0$.

To develop a database of test results that would satisfy the recommendations of CUAP, it was needed to perform 5 more tests on slabs reinforced by Peikko PSB Studs in addition to tests previously performed at IBeton. The parameters of these slabs were strictly conditioned by the requirements of CUAP. In addition to these 5 tests, one further test with geometric properties outside of the scope of CUAP was tested (test PP6). The motivation of this test was to enlarge the database of test results relevant for the validation of advanced physical models based on the CSCT. The basic parameters of slabs reinforced with Peikko PSB Studs tested at IBeton are also given in Table 1.

The tested slabs were cast with normal strength concrete with a maximum aggregate size of 16 mm. The compressive strength was determined on cylinders with a height of 320 mm and a diameter of 160 mm at 14 days, 28 days, and the day of testing. The characteristic yield strength of Peikko PSB Studs and flexural reinforcement was determined by tensile testing. The summary of material properties may be found in Table 1.

The applied force was introduced by four hydraulic jacks underneath the strong floor Figure 5. Four tension bars running

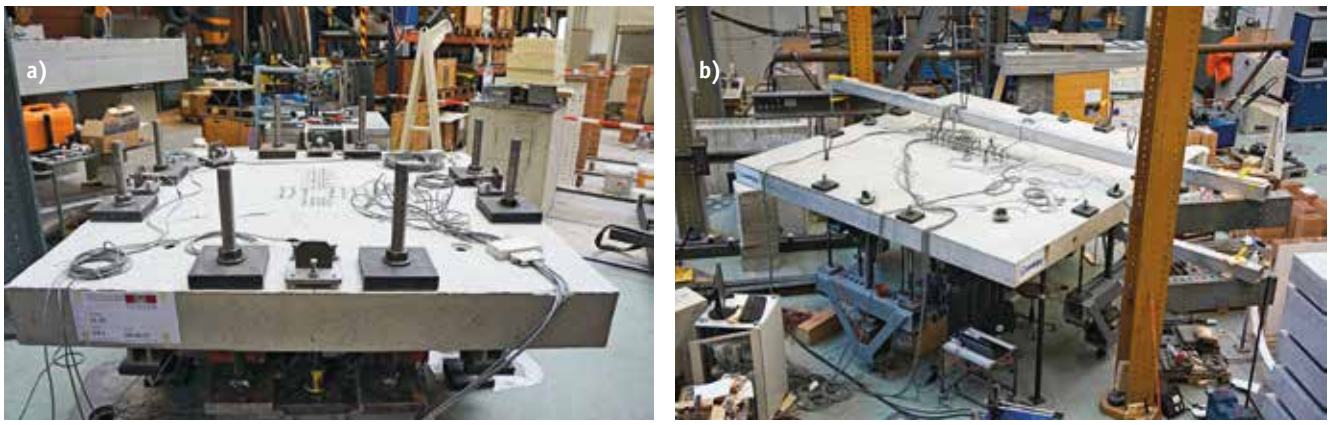


Figure 5 Test arrangement for a) small and b) large slabs

through the floor were connected to four steel spreader beams, which distributed the load to eight tension bars. These bars applied the downward force on the top surface of the slab. The slab was supported by a square steel plate corresponding to the column size. The test arrangement for smaller slabs is shown on Figure 5a, the test arrangement used for larger slabs is shown on Figure 5 b.

During the tests, various continuous measurements were recorded. Load cells measured the applied load at the hydraulic jacks and the reaction forces at the support. Rotations of slabs were measured by inclinometers. Vertical displacements of the slabs were measured using linear variable displacement transducers (LVDTs). Surface deformations on the bottom side of the slab were followed with omega-shaped deformation transducers. After the test, the slab specimens were cut in half to demonstrate the deformed shape of the slab after failure. The deformed shape of the section cut slabs after failure can be seen on Figure 6. In all of the tested slabs, failure of concrete occurred within the punching zone by crushing of concrete.

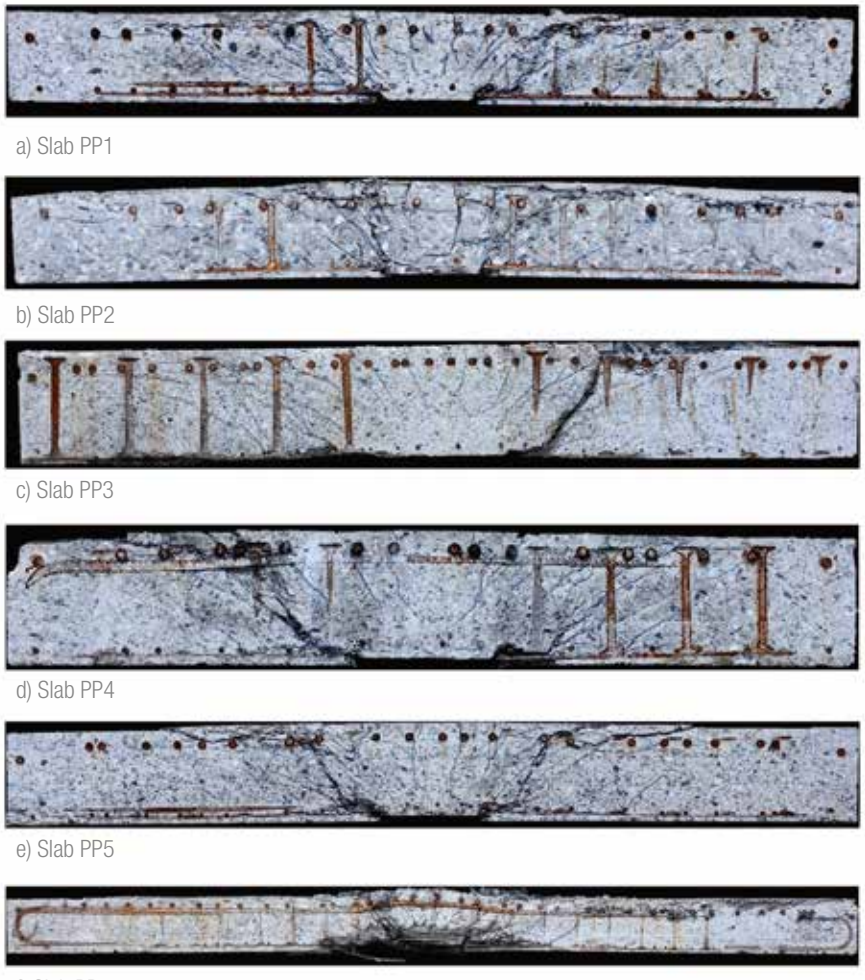
The testing procedure used for the slabs reinforced by Peikko PSB Studs is analogous to the testing procedure used for the slabs previously tested at IBeton. Comprehensive information about the testing series previously performed at IBeton may be found in reference [6].

EVALUATION OF THE TEST RESULTS

The maximum characteristic loads VR,test reached in the tests (both tests done with PSB Studs and tests performed previously at IBeton) are summarized in Table 2.

The evaluation of tests of slabs with properties within the scope of CUAP shows that a magnification factor k_{max}=1,96 provides sufficient level of safety (5% fractile equal to 1.0). This magnification factor is implemented in the ETA approval of Peikko PSB Studs.

Double headed studs are currently being produced by several manufacturers in Europe and thus are available on the market under different commercial names. At the same time, the material and geometric properties of the studs available under different commercial names are very similar, if not identical. Since the same assessment procedure based on CUAP has or will be used for the development of ETA approvals of all types of studs, the same magnification factor k_{max}=1,96 is or will be used in all ETA approvals of double headed studs no matter of their commercial name.



a) Slab PP1

b) Slab PP2

c) Slab PP3

d) Slab PP4

e) Slab PP5

f) Slab PP6

Figure 6 Saw cut sections of slabs with Peikko PSB Studs after failure

Table 2 Evaluation of test results and development of design model

							k_{max} = 1,96			k_{max} acc. to Eq. (4)	
	$V_{R,test}$	$V_{R,EC}$	$V_{R,test}/V_{R,Ec}$	a_λ/d	r_s/d		$V_{R,test}/V_{R,ETA}$	$V_{R,test}/V_{R,ETA}$		$k_{max,i}$	$V_{R,test}/V_{R,eq(4)}$
PP1	864	395,3	2,19	5,0	5,6	CUAP/ETA (1)	1,12	1,12	Complete test database	1,88	1,16
PP2	1095	535,8	2,04	4,9	5,5		1,04	1,04		1,90	1,08
PP3	4754	2076,9	2,29	3,9	4,6		1,17	1,17		2,02	1,13
PP4	2076	946,9	2,19	3,0	3,6		1,12	1,12		2,18	1,00
PP5	1812	922,5	1,96	4,8	5,5		1,00	1,00		1,90	1,03
PL9	3132	1491,8	2,10	5,0	5,7		1,07	1,07		1,88	1,12
PL10	5193	2350,1	2,21	3,7	4,4		1,13	1,13		2,05	1,08
PP6	1569	926,4	1,69	8,8	9,5			0,86		1,58	1,07
PL6	1363	689,6	1,98	7,3	7,6			1,01		1,70	1,16
PL7	1773	922,9	1,92	7,0	7,6			0,98		1,70	1,13
						AVG	1,09	1,05			1,10
						SDEV	0,05	0,09			0,05
						5%	1,00	0,90			1,01

(1) Slabs within the scope of CUAP

If all tests are considered with a constant value k_{max}=1,96 (including results of tests PP6, PL6, PL7 with geometric properties outside of the scope of CUAP), the evaluation leads to a 5% fractile of 0,90 meaning that the design model does not have a satisfactory safety level within the framework of Eurocodes (EN 1990). This conclusion is principally valid for slender slabs with span to depth ratio L/d>30. This deficiency of the ETA approvals results from a gap in the rules of CUAP, where it is deemed sufficient to take account only of tests performed on slabs with limited slenderness but the results can be extrapolated to any value of the actual slenderness. The conclusion is thus applicable to ETA approvals of all studs available on European market, no matter of their commercial denomination.

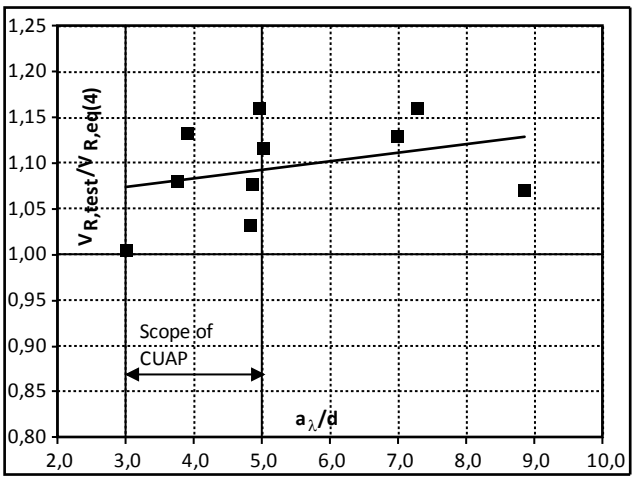
An improvement of the safety level for slabs reinforced by double headed studs may be achieved by introducing the effect of the slenderness of the slab in the design model. The improved design model is formulated as follows:

$$k_{max,i}=1{,}96\cdot\left(\frac{5\cdot d}{r_s}\right)^{1/3} \qquad (4)$$

where r_s is the location where the radial bending moment is zero with respect to the support axis. For regular flat slabs it may be approximated as r_s=0,22.L. The comparison of the results of complete test database with model using constant factor k_{max}=1,96 and improved model is on Figure 7.

CONCLUSIONS

The paper presents an overview on test series focused on demonstrating the maximum resistances of slabs reinforced with Peikko PSB Studs. The results of these test series, together with results of tests previously performed at IBeton institute of the Ecole Polytechnique Fédérale de Lausanne (Switzerland), have been used as the basis for the development of the ETA approval for Peikko PSB Studs. The design model formulated strictly on the basis of recommendations given by CUAP (model with constant factor k_{max}=1,96) and that is used in the ETA approvals of double headed studs (Peikko PSB or other studs available on the market under different commercial names) has a sufficient safety level only for slabs with a slenderness L/d<30. For slabs with higher slenderness, this model is potentially unsafe. A model with improved safety level is also proposed in this paper. Both design models will be available in the PSB module of Peikko's own design software Peikko Designer®.



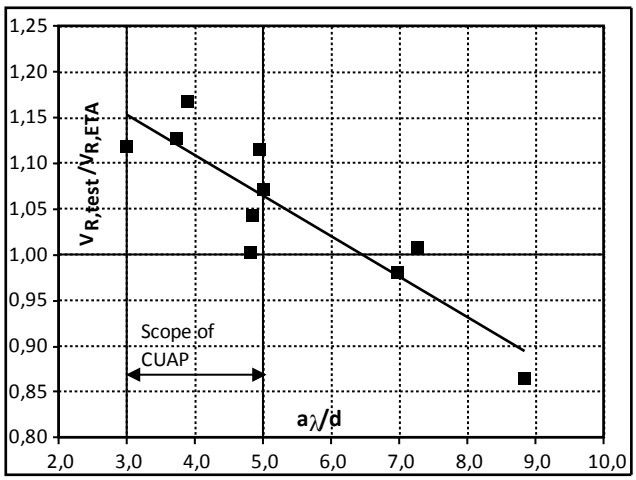
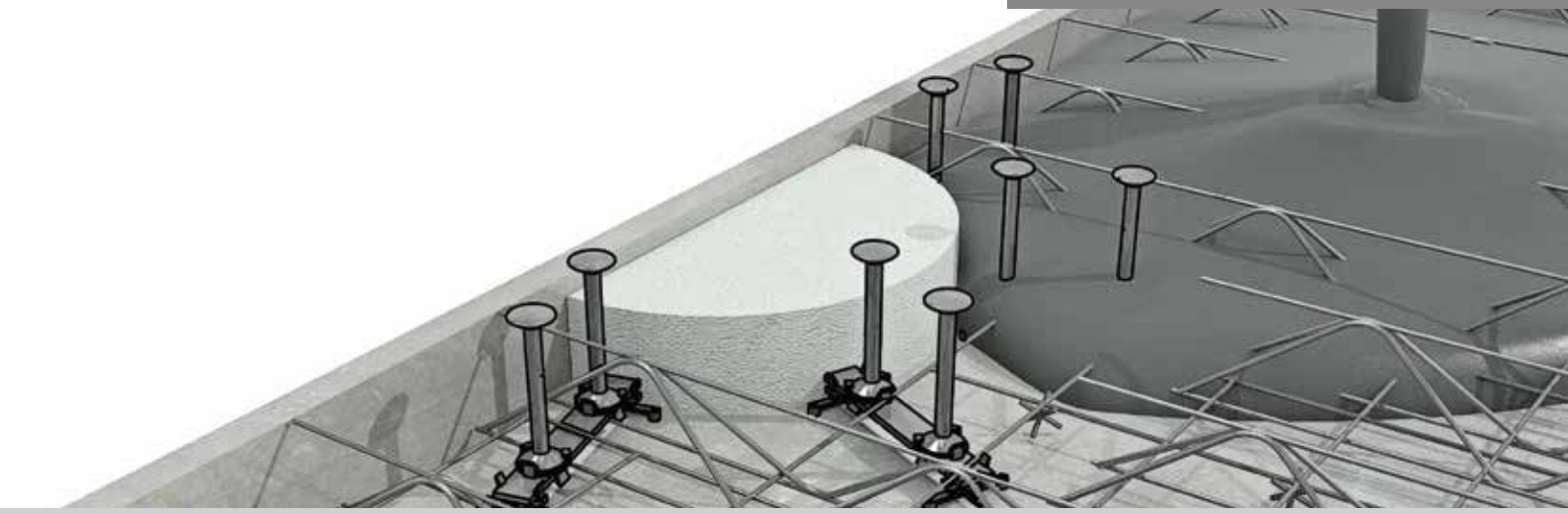


Figure 7 Safety level of a) Improved design model b) ETA design model

REFERENCES

[1] EN 1992-1-1, Eurocode 2: Design of Concrete Structures—Part 1-1: General Rules and Rules for Buildings, CEN, Brussels, Belgium, 2004, 225 pp.
[2] DIN EN 1992-1-1/NA:2011 Nationaler Anhang - Eurocode 2: Bemessung und Konstruktion von Stahlbetonund Spannbetontragwerken, Berlin, Germany, 2011,101 pp.
[3] EN 1992-1-1/AC: Corrigendum AC - Eurocode 2: Design of Concrete Structures—Part 1-1: General Rules and Rules for Buildings, CEN, Brussels, Belgium, 2010, 23 pp.
[4] fib Bulletin No. 66: Model Code 2010 - Final draft, V. 2, Lausanne, Switzerland, 2012, 370 pp.
[5] EOTA, Common Understanding of Assessment Procedure 03.01/05, Double headed studs for the increase of punching resistance in flat slabs on column, for European Technical Approval, Brussels, Belgium, February 2012, 29 p.
[6] Lips, S., Fernández Ruiz, M., Muttoni, A., Experimental investigation on the punching strength and the deformation capacity of shear-reinforced slabs, ACI Structural Journal, V. 109, No. 6, 2012, pp. 889-900
[7] Muttoni A., Punching shear strength of reinforced concrete slabs without transverse reinforcement, ACI Structural Journal, V. 105, No. 4, 2008, pp. 440-450
[8] Muttoni, A., Fernández Ruiz, M., The Levels-of-Approximation approach in MC 2010: applications to punching shear provisions, Structural Concrete, Ernst & Sohn, V.13, No. 1, 2012, pp. 32—41
[9] Fernández Ruiz, M., Muttoni, A., Applications of the critical shear crack theory to punching of R/C slabs with transverse reinforcement, ACI Structural Journal, V. 106, No. 4, 2009, pp. 485—494

a_λ	Distance from the edge of the support to the loading perimeter
c	Side length of a support
d	Effective depth of slab
f_c	Cylinder compressive strength of concrete
h	Depth of the slab
r_s	Radial distance from the center of the slab to the load application points
u_0	Length of column periphery
B	Side length of a slab
L	Maximum span of slab
dA	Diameter of the studs
ρ	Nominal flexural reinforcement ratio
$V_{R,test}$	Maximum punching load measured during the test
$V_{Rd,c}$	Design value of resistance of slab without punching reinforcement
$V_{Rd,max}$	Design value of maximum resistance of slab with punching reinforcement
$V_{R,ETA}$	Nominal value of maximum resistance in accordance with ETA
$V_{R,PSB}$	Nominal value of maximum resistance in accordance with advanced model



PEIKKO PSB TESTING IN LAUSANNE, SWITZERLAND

Text: Gatis Pocs

In December 2012 Peikko Group organized a customer visit to the Swiss Federal Institute of Technology (EPFL) in Lausanne, where Peikko's latest full-scale PSB tests for the ETA Approval were performed. It was a unique opportunity to have closer insight to one of the leading research centres in Europe with expertise around the punching phenomena of concrete, and to see how punching reinforcement is being tested.

The visitors were structural designers from several European countries. The day consisted of presentation of the testing process and full-scale testing setting, results of Peikko's latest tests, and open discussion with questions and answers. The visit was a good opportunity to discuss with experienced reserchers in order to receive answers to some tricky so far unanswered questions. The participants thus had the possibility to improve their knowledge of the punching phenomena in concrete slabs with and without shear reinforcement.

An update on Peikko's PSB testing and the ETA Approval procedure will follow in the next issue of Concrete Connections to be published in the autumn 2013.

CE MARKING AND PEIKKO'S PRODUCTS

Peikko produces composite structures (Deltabeams and steel structures) and concrete connections. These products are affected by different CE marking regulations according to the EU Construction Products Directive 89/106/EEC and the EU Machinery Directive 2006/42/EC. Currently there is no comprehensive and clear interpretation of these directives, and therefore practices how to implement regulations vary by country.

Only CE marked products are to be used in construction in Europe, if there is a way to grant CE marking for the product in question. However, many construction products are not covered by harmonized European standards (hEN) or European Technical Approval (ETA). For these products CE marking cannot be required.

GENERAL INFORMATION ON CE MARKING

CE marking means that a product is produced and controlled in accordance with a harmonized European standard (hEN) or a European Technical Approval (ETA). ETA can be used as basis for CE marking in cases where no harmonised EN standard is available. However, ETA is voluntary and not required by EU directives or legislation.

Manufacturers may use CE marking to declare that their construction products meet harmonized European standards or have been granted ETA Approvals. These documents define properties the products must have in order to be granted the right to use CE marking, and also describe how the manufacture of these products is supervised and tested.

CE

EU's Construction Products Regulation takes effect in full on 1 July 2013. Detailed building parts, such as connections used in concrete constructions, do not have any harmonized EN standards, excluding lifting items and devices, which are regulated in the EU Machinery Directive. For steel constructions CE marking will become mandatory as of 1 July 2014, as regulated in the EU Construction Products Directive.

PEIKKO'S PRODUCTS AND CE MARKING

Product Categories/Products in Peikko's product range stating current CE marking status:

EU Construction Products Directive 89/106/EEC

CE marked through harmonised EU Standard EN 1090-1

- Deltabeam
- Steel Structures

CE marked through ETA Approvals

Bolt Connections:
- HPM-L Anchor Bolts
- FatBar Anchor Bolts
- HPKM Column Shoes

to receive ETA Approval in Q4/2013

Punching Reinforcement:
- PSB to receive ETA Approval in Q2/2013

Products **not requiring CE marking**

- Bolt Connections
- Fastening Products
- Ties and Loops
- Flooring Products
- Hidden Corbels
- Hangers
- Rebar Coupling Systems
- Balcony Connections

EU Machinery Directive 2006/42/EC

CE marked products included in the directive

Lifting Systems
- Rapid Coupling:
  - KK System
  - RR System
  - WRA System
- Threaded Lifting Systems
  - JENKA System

CE MARKING GRANTED TO PEIKKO'S LIFTING SYSTEMS

Peikko Group starts to CE mark its Lifting Systems used in precast concrete elements as of 1.7.2013. The CE marking of the products complies with the regulations of the EU Machinery Directive 2006/42/EC. Peikko is among the first companies in the branch to provide CE marking for a full range of standard Lifting Systems.

Because the EU Machine Directive does not clearly take into consideration concrete anchoring, and there is no direct and harmonized EN product standard (hEN) for lifting systems, the following standards are included as considered documents for EU Declaration of Conformity.

- DIN EN ISO 12100:2011-03 Safety of machinery-Generals principles for design – Risk assessment and risk reduction
- DIN EN 13155:2009-09 Cranes-Safety-Non fixed load lifting attachments
- BGR106:1992 "Safety rules for transport anchors and –systems for precast concrete units"

Peikko's Lifting Systems already fulfill all technical requirements of the CE marking. The marking of the products is started gradually during spring 2013. The marking is attached to products or to documentation following the product. The CE marking applies to Peikko's complete range: Rapid Coupling (RR, KK and WRA Systems) and Threaded Lifting Systems (JENKA System).

During years 2011 and 2012 Peikko has made extensive testing arrangements of its Lifting Systems. The testing consisted of more than 700 individual concrete tests and it was made with the Technische Universität Darmstadt, Germany. More than 165 m^3 of concrete having a dead weight of 410 tons was used in the testing.

NEW AND UPDATED PEIKKO TOOLS FOR DESIGNERS

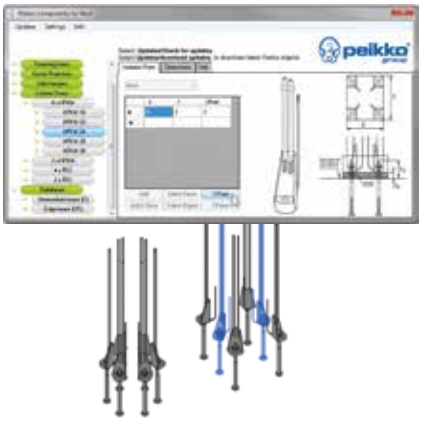
Peikko introduces some new Tools for Designers to make designing faster, easier and more reliable. All new tools, user instructions and installation instructions can be downloaded from www.peikko.com/software.

PEIKKO COMPONENTS FOR REVIT: DELTABEAM

Deltabeam has been added to the Peikko Components for Revit user interface. It enables the designer to insert intermediate beams (D) and edge beams (DR).

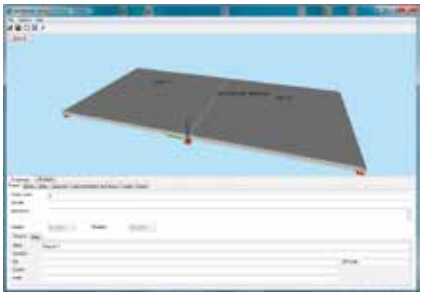
PEIKKO COMPONENTS FOR REVIT: COLUMN SHOES

HPKM and PEC Column Shoe families and respective Anchor Bolts have been added to Revit. This enables inserting groups of 2 or 4 Column Shoes and Anchor Bolts to the model.



DELTABEAM PRE-SELECTION SOFTWARE

With Deltabeam Preselection Software, the designer can check that the chosen Deltabeam type is suitable for the structure. Final beam design and individual dimensioning is done by Peikko.



DELTABEAMTOOL FOR FULL AUTOCAD

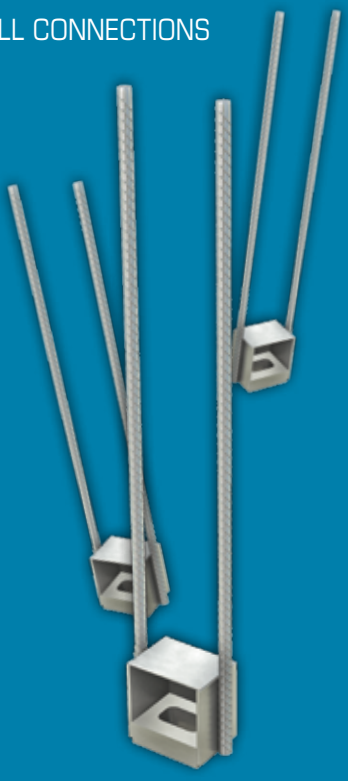
DeltabeamTool is an application for full AutoCAD to draw Deltabeams to general layouts and section drawings. The user can choose the beam type and view, and select the start and end points. The application has tools to modify the beam end angles and web hole locations. DeltabeamTool names automatically each Deltabeam with a unique number. The user can add beam schedules to the layout drawing or export it to Excel and generate single beam drawings of each Deltabeam in the layout drawing.

SUMO WALL SHOES

– NEW IMPROVED PRODUCT FOR WALL CONNECTIONS

Wall shoes are used in connections of stiffening wall structures like precast concrete core walls and elevator shafts. Peikko continues active development of its Bolt Connections product range. The new improved product family is called SUMO Wall Shoes and it will be available during autumn 2013.

SUMO Wall Shoes will replace current Wall Shoes PSK, HPEW and PPEW. The change clarifies Wall Shoe range and makes usage of the products easier and more clear. SUMO's are designed according to Eurocodes and their resistances correspond to resistances of Peikko's reliable and trusted HPM Rebar Anchor Bolts and Strong PPM Anchor Bolts. More information will be available in the next issue of Concrete Connections magazine, on www.peikko.com and on your local Peikko website.



PEIKKO PROJECTS FROM AROUND THE WORLD

Peikko Belarus has delivered Punching Prevention Systems, 120 000 pcs of PSB Studs, to the first **Kempinski hotel** in Belarus. The hotel is a complex of 3 buildings all with 14 levels. They are scheduled to be ready for the ice hockey world championships in Minsk in 2014.

Peikko Polska has received a substantial order to a large office building project **Atrium One** in the center of Warsaw. Peikko delivers 1.3 kilometers of Deltabeams, 2.000 pcs of column connections, and a large amount of rebar coupling systems to the site.

The Atrium One is a high office building of 14 floors and a gross floor area of 18.000 m². The building will be finished in 2014.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Peikko Spain delivered 130 tons of Column Shoes and Anchor Bolts, both standard and special designs, to **REPSOL pipe rack** 2013 project in Cartagena, Spain. This new pipe rack is a joint venture between REPSOL and SK from Korea. With an investment of more than EUR 250 million, the new pipe rack will be built beside REPSOL's Cartagena refinery, and it be operational in 2014.

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Peikko Finland has received a substantial composite structure order to the first phase of the **new office and retail center adjacent to the Tikkurila railway station** in Vantaa, Finland. 2.6 kilometers of Deltabeams and 260 tons of steel structures, mainly composite columns, will be delivered to the site during late spring 2013.

The train station office and retail center is a versatile complex that will comprise public transportation premises, offices, retail stores and parking spaces. The entire space of the complex is 56.300 m² of which the first phase accounts for 33.200 m². The first phase is a 12-storey building housing retail stores and offices and it will be finished in late 2014.


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Peikko Italy has supplied Punching Prevention Systems and Rebar Coupling Systems to the new project of **Bosco Verticale** in Milano. This project includes two residential towers of 110 and 76 meters height hosting 900 trees (each measuring 3, 6 or 9 m tall). On flat land, each tower covers, in amount of trees, an area equal to 10.000 sqm of forest. The building is going to be finished in 2013.

CONCRETE CONNECTIONS

visit **www.peikko.com**