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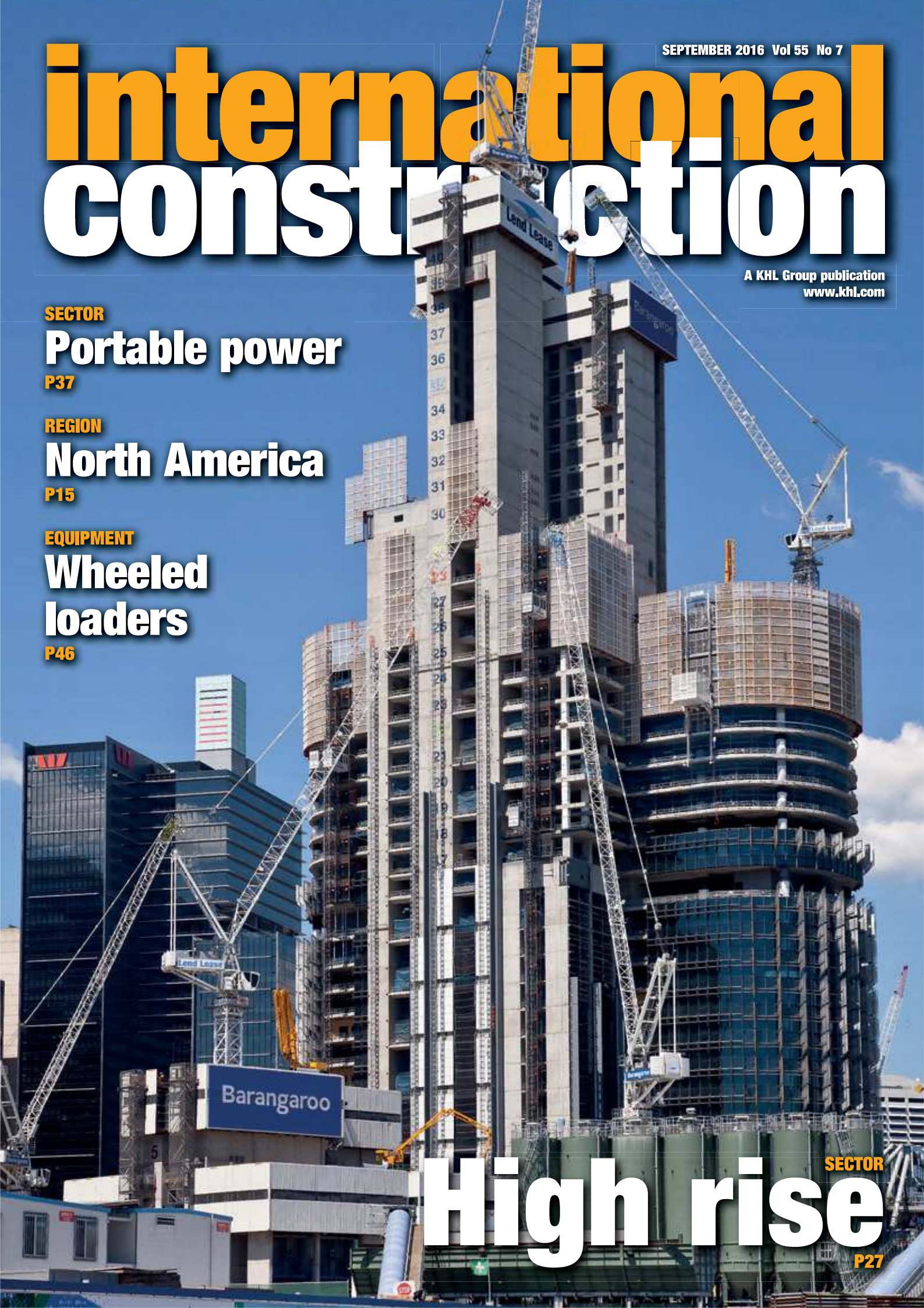

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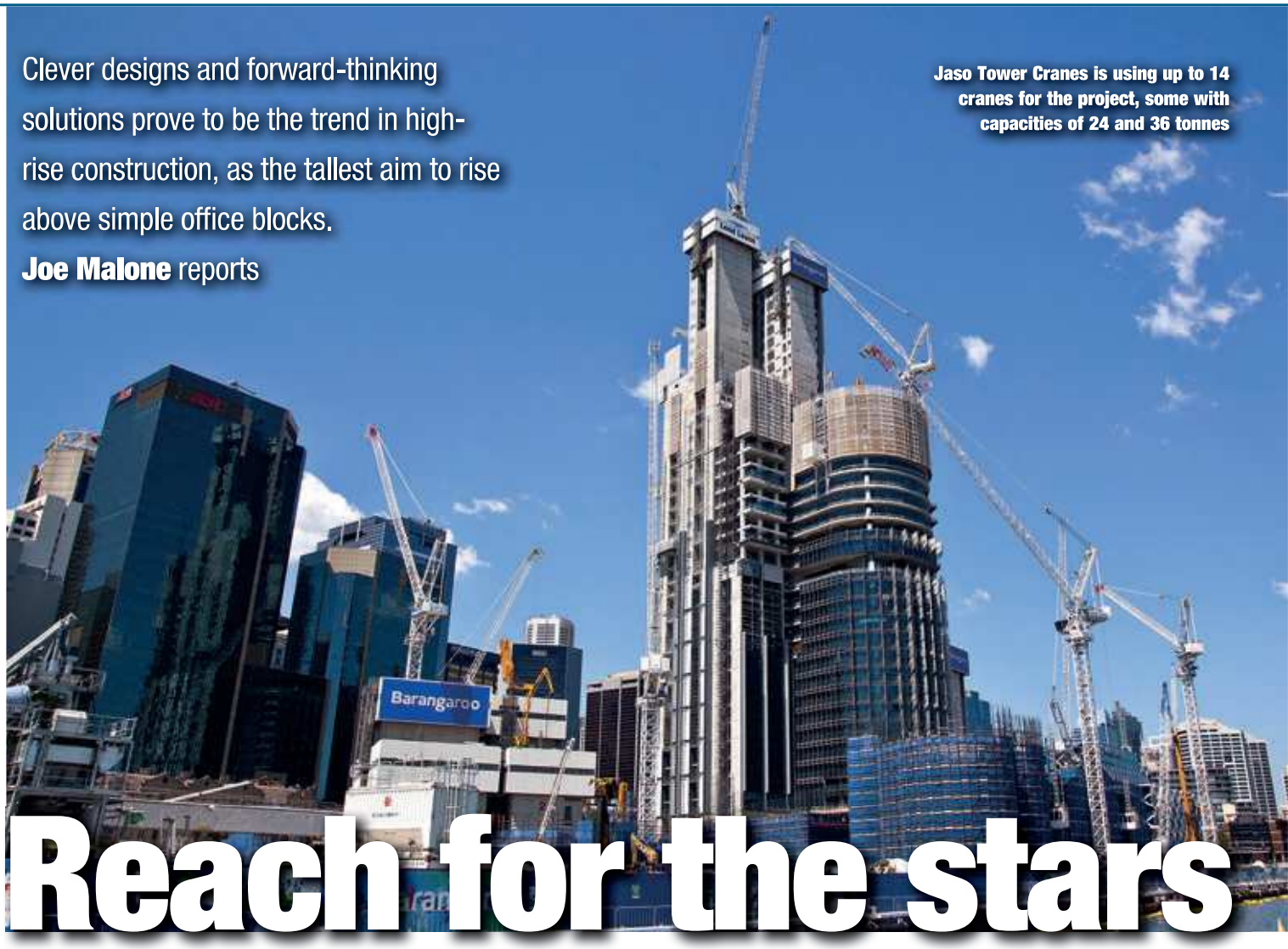
Clever designs and forward-thinking solutions prove to be the trend in high-rise construction, as the tallest aim to rise above simple office blocks. **Joe Malone** reports



Jaso Tower Cranes is using up to 14 cranes for the project, some with capacities of 24 and 36 tonnes

Reach for the stars

High-rise construction presents itself with tremendous challenges and opportunities. It's a chance for crane, formwork and concrete pump manufacturers to bring new ideas to the table, among many others, to ensure buildings are constructed in the safest, and also most impressive way.

Once completed, such buildings stand above others around them, providing manufacturers and architects with an even bigger incentive to innovate impressive new machines and materials.

Beginning down under, Jaso Tower Cranes says it's working on one of Sydney's most important projects on the city's waterfront, Barangaroo, which it describes as Australia's gateway to the world.

The company has designed a unique lift shaft climbing system and a 2 m square mono block tower leg to reduce climbing stages, as the project required shorter break-out times to maximise time-efficiency on the job. Jaso Tower Cranes says the need for cranes with a high-load capacity, which are corrosion resistant, will make this possible, hence the company's new design.

Jaso Tower Cranes is working on Barangaroo, which it describes as 'Australia's gateway to the world'

The project is using up to 14 cranes, some with capacities of 24 and 36 tonnes.

The company notes that due to site constraints, as well as accelerated time schedules, it had to come up with solutions to ensure expectations were met. For example, grillages cantilevered from basement slabs were used to locate the external cranes, which allowed intricate basement works to proceed without problems by tower crane bases.

Another solution the company used was the need for electric tower cranes to work to the highest environmental standards on such a high-profile project. Jaso says that its cranes met and exceeded such requirements.

A final solution was to use a single line pull of 9 to 12 tonnes to ensure the required components could be raised to their full height in the fastest time possible. Jaso says this involved designing a bespoke winch system. >

The Liebherr 1000 EC-B 125 Litronic tower crane erecting the Enercon wind turbine

Tallest turbines

Meanwhile in Europe, wind energy company Enercon used a Liebherr 1000 EC-B 125 Litronic tower crane to erect a wind turbine with a hub height of 149 m in Germany. The company says the project included the largest turbine erection ever made by the crane.

The turbine - with a rotor diameter of 115 m - was erected at an altitude of around 800 m in the Prechtaler Schanze Wind Farm in the Black Forest, Germany, on the hills between the towns of Gutach and Mühlenbach. The 1000 EC-B, with its small footprint, had never before been assembled to such a height for Enercon.

With its 31.5 m jib and a hook height of 164 m, the crane was still able to hoist 100 tonnes reeved with four falls of rope. The capacity of this crane is 125 tonnes on six falls of rope and 100 tonnes on four.

The area required for erecting a complete flat top tower crane is approximately half of the normal standing area of other crane systems, Enercon said. The jib used in this case was very short, which is why no additional site clearance work was required for its assembly.

In addition, the logistics required to transport the 1000 EC-B 125 are much less than for comparable crane systems since the various components of the tower crane are supplied in small packages. The jib components of the large crane can be inserted into the tower elements, transported on a truck and assembled on site.

A 200 tonne capacity Liebherr LR 1200 crawler crane was used to assemble the tower crane to its initial hook height of

The Upper West tower will measure 188 m and will be distributed across 33 storeys, resulting in one of Berlin's tallest buildings.

39 m. From there the tower crane erected the wind turbine and climbed the turbine tower as it rose using its own climbing equipment.

It was climbed to a hook height of 110 m and guyed to the wind turbine at a height of 100 m. Using this single guying, the crane climbed to a final hook height of 164 m. Both free standing and also fully climbed and guyed, these represented hook heights that Enercon had never achieved before.

Height of reliability

Staying in Germany, Schwing Stetter says its stationary concrete >

Schwing Stetter says its stationary concrete pumps and separate placing booms have once again proved their reliability on the Upper West project in Berlin

The 120 m-high Kista tower will comprise 362 buildings

pumps and separate placing booms have once again proved their reliability under extreme conditions, during the construction of the Upper West in Berlin.

The tower will measure 188 m and will be distributed across 33 storeys, resulting in being one of Berlin's tallest buildings.

Schwing Stetter says the last storey has now been completed. Motel One, which will dominate most of the building, will comprise of 18 floors with 580 rooms. The current plan is for the building to also offer several floors of office space in addition to hosting a sky bar.

The company says that Ed Züblin AG relies on the equipment and specialists from Godel-Beton when it comes to its concrete-pumping needs, which in turn uses one of Schwing's stationary concrete pumps and separate placing booms. Cemex Deutschland AG was responsible for producing and transporting the concrete used for this project, delivering types of concrete with various strength classes.

Schwing says that C 30/37 concrete was used to concrete the ceilings and core walls. The columns of the skyscraper are made of C 80/95 concrete up to the 15th floor, and C 50/60 concrete was used beyond that.

Timely delivery

Over to Sweden, construction company JM Sverige is about to finish the Kista Tower – a residential building located in the district of Kista, in Stockholm, Sweden. The complex is formed by the 120 m-high Kista tower – which is 35 storeys – and the smaller K2 building –which is 15 storeys – which, together, will comprise of 362 apartments.

For the construction of the Kista tower, Edins Byggkranar provided JM Sverige with two brand new Linden Comansa tower cranes in September 2013. The first crane to arrive to the jobsite was a Linden Comansa 21LC750 48t, erected with 50 m of both radius and height. JM Sverige says the flat-top tower crane helped to assemble the second Linden Comansa tower crane, a 16LC185 8t, with a 35 m radius and height of 32 m.

The cranes were first used to help construct thick concrete walls in the basement of the building. From there, the 21LC750 48t started with the rising and positioning of the prefab walls that shape the building.

From floor 8, both walls and floors were prefabricated, allowing the crane to build each floor very fast, says the company. JM Sveridge also say that the 21LC750 worked three floors ahead of a team of workmen, who set the electrical and pipe installations, and used a concrete pump to fill the floors, leaving two empty levels between the tower crane and the workforce for safety reasons.

Reviewing other major high-rise projects around the world, Cemex LatAm Holdings (CLH) has begun work on a tower >

RMD Kwikform plays key role

Company puts Abu Dhabi's Al Jazeers Tower project on fast track

RMD Kwikform played a key part in the residential and commercial Al Jazeers Tower, in Abu Dhabi.

As a fast-track project, the contractor required multiple solutions to form the walls, columns and slabs of the building. RMD Kwikform's Prop Tableform slab system and Rapidclimb climbing formwork was used on the project, along with wall formwork using superslim soldiers and GTX beams, and KwikColumn for the Columns formwork.

As the slab support was constructed into tables, the onsite team could simply move tables from one floor to the next with no dismantling or re-erection required, reducing the slab construction cycle time, and speeding up the construction process.

With the availability of crane support, the cores of the towers could be cast using the integrated Rapidclimb climbing formwork system, with second fixing safely conducted using the trailing access platforms.

Due to the compact nature of Rapidclimb, the onsite team opted to follow the core construction casting slabs as soon as the core section was completed. With site assistance technicians from RMD Kwikform supporting the erection teams, the time needed to complete a core and slab section was reduced by up to 50% from the initial phases of the project to the top, 40th floor.

Ahmed Atalla of RMD Kwikform, said: "The key to this project was to deliver the most time and cost-effective solution to the contractor that would allow the team onsite to meet its very demanding programme time.

"Because the business was familiar with our table formwork they recognised the benefits in using this system for the slab construction."

He added, "When it came to the core formwork, this was the first project in Abu Dhabi to use the Rapidclimb climbing formwork solution. As the project progressed, the team were able to reduce the time it took to complete pours, taking full advantage of the reusable wall formwork panels integrated into the Rapidclimb system."

RMD Kwikform played a part in residential and commercial Al Jazeers Tower, Abu Dhabi

project that it says is bringing new construction methods to Colombia.

Atrio, in the capital, Bogota, is a multi-purpose development comprising two towers: one will stand at 201 m, with 42 storeys; the other will reach 268 m and have 58 storeys.

When the US$ 415 million project is completed, the larger of the two towers will be the tallest building in Colombia.

The volume of concrete and equipment and the size of the team in place to install the first tower's foundation plate is on a scale not seen before in the country, according to CLH.

To deliver the required amount of material for the plate – made from a single 24,000 m2 slab with a height of 3m – an immense 7,380 m3 of concrete had to be delivered to the site before being pumped uninterruptedly for 38 hours.

To ensure the continuous flow of concrete, some 1,000 ready-mix concrete truck trips were made, with six ready-mix concrete plants in continuous use.

A team of more than 300 people worked around the clock, to complete the construction of the huge slab, which now sits 22 m below street level.

Carlos Jacks, CEO of CLH, said, "We are proud to participate in a project that will reshape Bogota's landscape and that delivers new construction methods to Colombia. This type of project demonstrates the company's human, logistical, and technical capabilities."

New York heights

Meanwhile, in New York, a new supertall tower is to be built by a joint venture consisting of Chinese and US developers.

The 472 m-high Central Park Tower is being developed by Extell Development and the US subsidiary of Shanghai Municipal Investment (SMI) and is set to become the tallest residential building in the western hemisphere.

The cost of the project is reported to be around US$ 3 billion, with Adrian Smith + Gordon Gill Architecture – architects of both the Burj Khalifa in Dubai and the even taller under-construction Jeddah Kingdom Tower in Saudi Arabia – responsible for the design.

Slated for completion in 2019, the tower will provide a combination of high-rise residencies and retails units.

Extell CEO Gary Barnett said, "We believe the superb location, views, design and quality of Central Park Tower will make it the most important residential building ever to be built in New York City."

As mentioned, Jeddah Kingdom Tower, in Saudi Arabia, will become the world's tallest building after a funding deal was secured to finance the last phase of construction late last year.

Work had already begun up to the 26th storey of the impressive tower, located north of Jeddah, and the new funding will allow the building to rise to its proposed 200 floors by 2020.

An EC Harris and Mace joint venture

High power

Heinz-Gert Kessel on new trends in high-rise construction

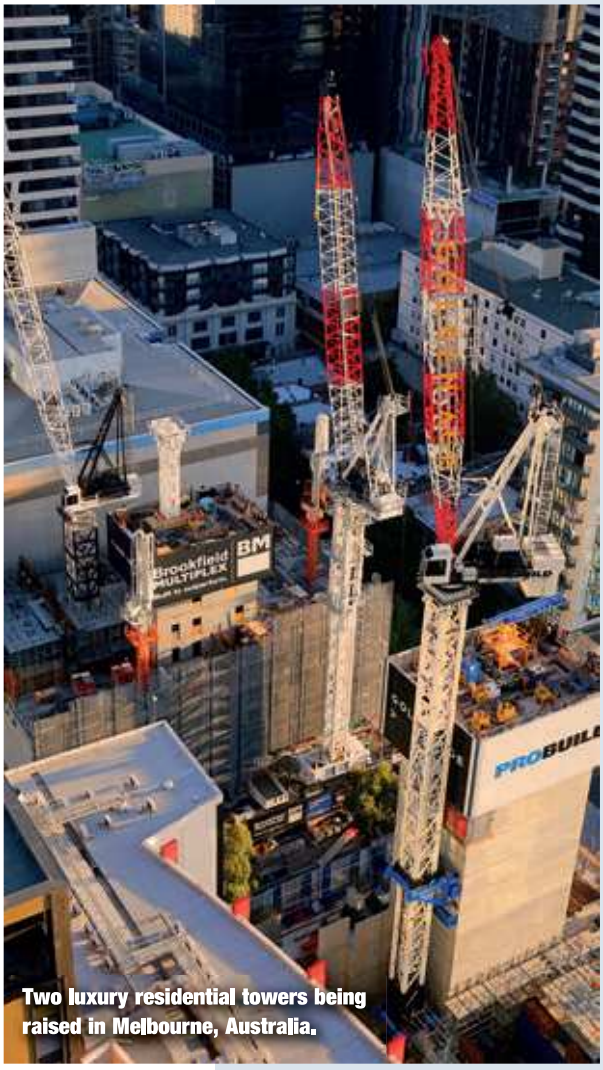
While the earliest skyscrapers were purely office towers, many of today's high-profile towers combine residential, commercial, leisure and even green space into a kind of vertical village. Another trend is for slender high rise luxury residential projects. These have an astonishing height-to-width ratio far beyond 9:1. An example is the breath taking 22.5:1 of the 438 m Steinway Tower in New York, US.

Manhattan is at the forefront of the development of this kind of record-breaking condo tower. The apartments will each occupy either a full or a half floor. Far fewer elevators are needed than in an office building. A large glass area allows a spectacular view but requires design solutions that minimise the impact of structural elements on the already limited usable space.

Construction trends like the above directly influence crane application, says Heinz Kessel. In Melbourne, Australia, at the time of writing 75% of the city's tower crane fleet was engaged on residential tower sites. Choosing adequate lifting equipment is mainly a matter of space on site and the type and size of building materials to be handled. Climbing tower cranes working on inner city residential super tall projects have to cope with limited set up space as a result of surrounding infrastructure, neighbouring buildings and the narrow core and lift shaft size of the building under construction.

In addition, the wide application of concrete requires fast load cycles. Strong competition among tower crane manufacturers drives provision of special slim tower systems under 2 x 2 metres for internal climbing. In 2009 Favelle Favco delivered its compact 223.19 type 1.9 x 1.9 m tower for the London Pinnacle project. For the Melbourne Empire apartment tower project a step down to the even slimmer 1.6 x 1.6 m type 223.16 tower system was made.

A transition tower section provides adaptation to the standard 2.017 m slewing ring support of the upper crane. On the Favelle Favco M220DX luffing jib tower crane with 30 m boom a free standing height of still 40.6 m can be achieved with the 223.16 tower system. Access in very narrow lift shafts is afforded by a vertical connection device. It consists of six bolts per angle in the pockets of the reinforced main chords of the mast. Nothing extra has to be considered for removing horizontal connection devices when de-rigging the internal climbing tower crane after topping out the core.



Two luxury residential towers being raised in Melbourne, Australia.


Favelle M230D with 27.4 m short jib and 7.23 m tail radius in the shadow of nearby buildings raising a concrete core in Sydney

is project managing the £ 800 million (US$ 1.2 billion) job. Once completed, the 1 km skytower will be taller than the 830 m Dubai's Burj Khalifa building in Dubai and four times the size of The Shard in London.

The Kingdom Tower will have enough room to include a five-star Four Seasons hotel, Four Seasons serviced apartments, office space, condominiums and an observation deck that will be higher than the world's current highest – at 555.7 m, it's located at the Burj Khalifa.

Race to the top

Heading east once more, this time to Hong Kong, Gammon Construction – Balfour Beatty and Jardine Matheson's Hong Kong joint venture – has been awarded has been awarded two contracts worth GBP 599 million (US$ 847.91million) in total, to build a new office tower and a residential block.

The bigger of the two contracts – the redevelopment of Somerset House, in Taikoo Place, Hong Kong, China – is worth some HK$ 4 billion (US$ 513.61 million), and will see a redevelopment of the site in to a 48-storey office building on top of a two-storey basement.

The project will comprise a number of office buildings and is home to companies including AXA and JP Morgan. Swire Properties, which owns the site, also plans to redevelop two other buildings on the site – Cornwall House and Warwick House.

The project is expected to be completed in 2018.

The company added that a workforce of 1,400 will be in force during the peak construction period.

Jeddah's Kingdom Tower, in Saudi Arabia, will become the world's tallest building after a funding deal was secured to finance the last phase of construction late last year.

Thomas Ho, CEO of Gammon Construction, said, "We are delighted to have been selected by Swire Properties and to be involved with this landmark project in Taikoo Place.

"Gammon's advanced technological standards and expertise in building construction are key factors in the contract award." **iC**