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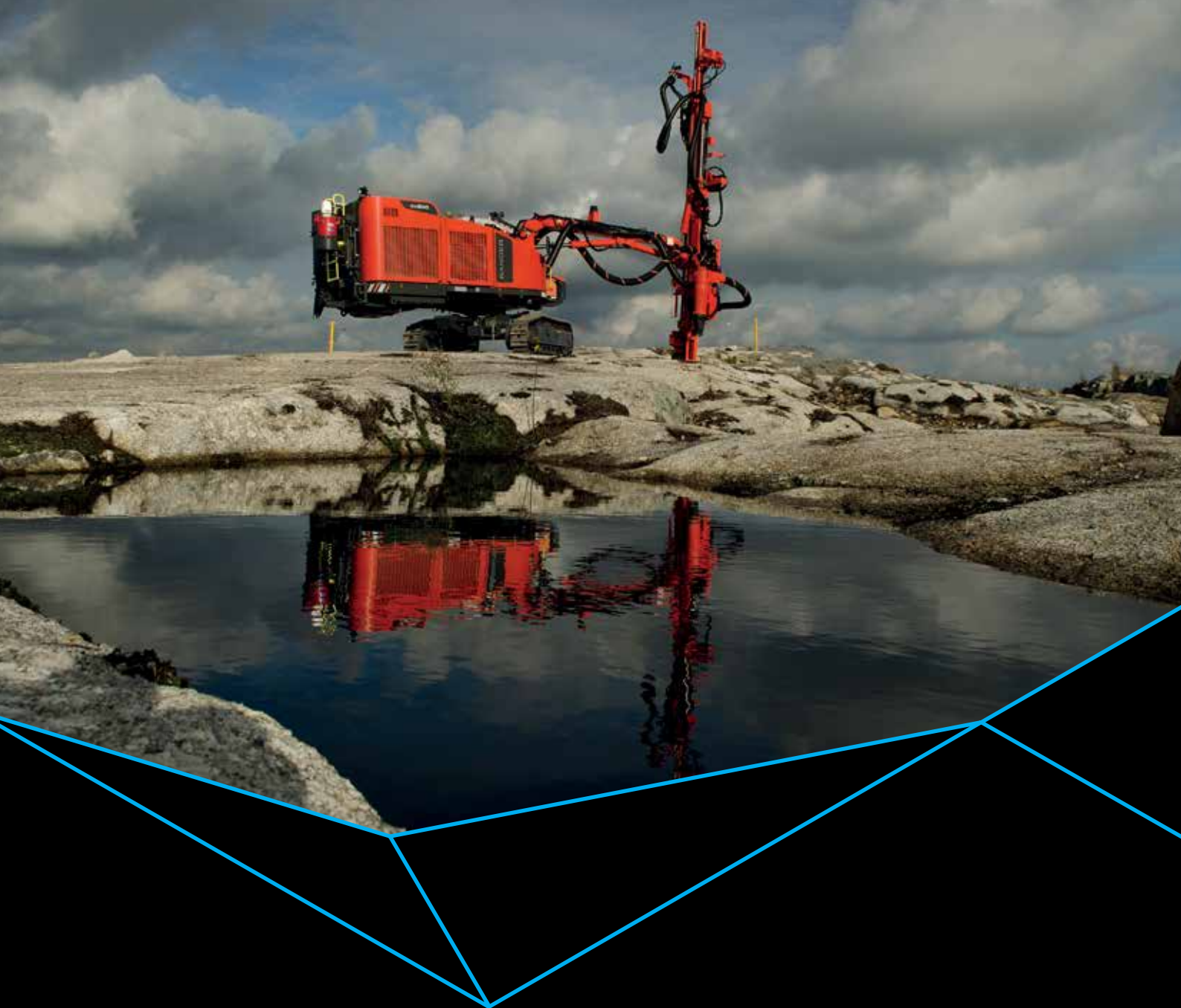
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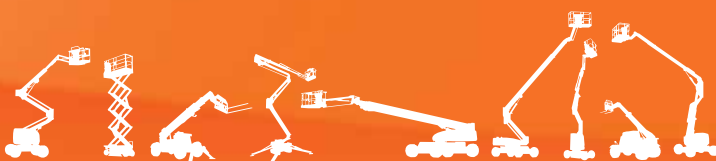
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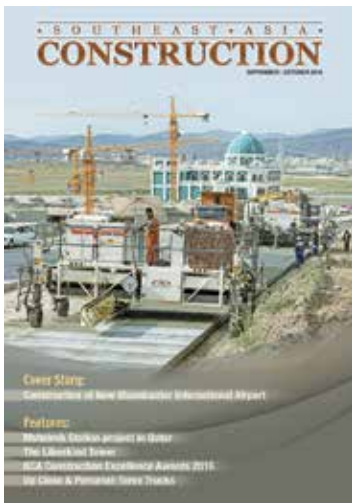
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Cover designed by
Fawzeeah Yamin

Publisher
Steven Ooi
steven.ooi@tradelinkmedia.com.sg

Editor
Fabia Sugandy
seac@tradelinkmedia.com.sg

Group Marketing Manager
Eric Ooi
eric.ooi@tradelinkmedia.com.sg

Marketing Manager
Felix Ooi
felix.ooi@tradelinkmedia.com.sg

Marketing Executive
Leong Xin Pei
xinpei.leong@tradelinkmedia.com.sg

**Head of Graphics Department/
Advertisement Coordinator**
Fawzeeah Yamin
fawzeeah@tradelinkmedia.com.sg

Graphic Designer
Siti Nur Aishah
siti@tradelinkmedia.com.sg

Circulation
Yvonne Ooi
yvonne.ooi@tradelinkmedia.com.sg

Any other matters : info@tradelinkmedia.com.sg

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INTERNATIONAL SALES OFFICE:

T. Asoshina/Shizuka Kondo, ECHO Japan Corporation
 Grande Maison Rm 303, 2-2, Kudan-Kita 1-Chome, Chiyoda-ku, Tokyo 102, Japan
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Myanmar's construction industry 'to record rapid growth'

The construction industry in Myanmar is forecast to record rapid growth in the next five years, at an annual average rate of 10.37 percent, according to a new report by Timetric's Construction Intelligence Centre (CIC). In real terms, the industry's value stood at US\$8.2 billion in 2015, and is anticipated to value US\$13.5 billion in 2020.

Based on the report, the growth will be supported by the country's improving economic conditions, but will mainly depend on government investments in residential, energy and utilities, and public infrastructure projects, as well as a rise in foreign investments.

"Government flagship programmes, such as the National Transport Master Plan, National Export Strategy (NES) and National Electrification Plan, will promote industry growth over the next five years. However, the underdeveloped regulatory and financing environment and a lack of transparency in the tendering process will prevent the construction industry from expanding at a faster pace," said Danny Richards, lead economist at Timetric's CIC.

Residential construction was the largest market in Myanmar's

construction industry during the last five years, accounting for 49.9 percent of the industry value in 2015. The market rose from US\$3.6 billion in 2011 to value US\$5 billion in 2015, recording a CAGR of 17.89 percent in nominal terms. This growth was driven by government investments in its affordable housing programme. During the next couple of years, the market is forecast to remain the largest in the industry, to value US\$9.7 billion in 2020.

Infrastructure construction was the second largest market in the construction industry during the review period, accounting for 19.4 percent of the industry's total value in 2015. The market rose from US\$1.3 billion in 2011 to US\$1.9 billion in 2015, at a CAGR of 20.13 percent, in nominal terms. Over the forecast period, infrastructure construction is expected to maintain its position, supported by the ongoing government efforts to improve this segment. Accordingly, the government will invest US\$26.8 billion under the National Transport Master Plan, allocating funds to road, rail, water and air transportation projects until 2030. As a result, infrastructure construction is expected to reach US\$4.2 billion in 2020. ■

Skyjack appoints new dealer in Indonesia

Skyjack is expanding its Asian presence with the appointment of a new dealer in Indonesia, Multicrane Perkasa. Based in Jakarta, Multicrane Perkasa has also invested in a number of Skyjack boom and electric scissor lifts. The company has four locations on three different islands, providing equipment for projects in infrastructure, oil and gas, mining and logistics.

"The AWP market in Indonesia has a lot of potential," said Simon Cracknell, Skyjack's business development director for Asia. "As the standard of work safety rises, we educate the market on how much more effective and efficient AWP equipment can be. We believe the take up for Skyjack will increase significantly."

He added, "Skyjack products are designed to be simple and reliable to operate and maintain, making them attractive to equipment users and owners. Skyjack's core values of easy to do business are significant in emerging and geographically challenged regions, which make them perfectly placed to support Asia's growing infrastructure." ■



Multicrane Perkasa is now a Skyjack dealer in Indonesia.

Arup to work on Singapore's Smart Urban Habitat Masterplan

Arup has been selected as one of the vision partners working with the Housing & Development Board of Singapore (HDB) to develop the Smart Urban Habitat Masterplan (SUHMP). The SUHMP aims to enhance sustainability, liveability, efficiency and safety in HDB town estates through the use of digital technology. This project builds on one of the six key domains from the 'Smart Nation Programme' - 'Smart Urban Habitat' and is expected to impact more than 80 percent of Singapore's population who currently live in public housing.

The NCS-led partnership comprising AECOM Singapore, Arup Singapore and Samsung SDS Asia Pacific will be identifying and recommending a series of 'smart initiatives' with which HDB can consider for deployment into HDB towns.



These initiatives can include a variety of estate enhancing services, such as smart community services and implementation of gamification tools to engage residents and foster closer community living.

During the initial phase of the SUHMP consultancy, Arup and the partners will help define the vision, goals and strategies of the SUHMP through various working sessions and workshops with HDB as well as various government agencies. The masterplan will outline how

HDB can harness technology to improve the quality of life for the community and establish a framework of technological initiatives within the estates. ■

HDB-NCS contract signing ceremony on the development of Smart Urban Habitat Masterplan and Smart Hub.

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Alstom's new SVP for Asia Pacific



Alstom has appointed Jean-Francois Beaudoin (left) as its senior vice president for Asia Pacific. In this role, Mr Beaudoin will also become a member of Alstom's executive committee.

Based in Singapore, Mr Beaudoin will lead the Asia Pacific region that includes 12 active markets covering India, Australia, China, Singapore, Indonesia, Malaysia, Thailand, Hong Kong, Vietnam, Taiwan, Korea and the Philippines.

Alstom develops and markets systems, equipment and services for the railway sector. The company manages a wide range of solutions – from high-speed trains to metros and tramways, plus customised services and infrastructure and signalling solutions.

Mr Beaudoin joined Alstom in France in 2007. Prior to his current appointment, he was the managing director of the Rolling Stock (RS) business for Alstom Transport Asia Pacific. Before moving to Asia Pacific, Mr Beaudoin was acting as SVP Finance for the Alstom Transport sector.

“The Asia Pacific transport market is witnessing enormous growth spurred by the stable economic outlook of the region and its growing urban population,” said Mr Beaudoin. “With our expanding presence and footprint in India, the prestigious projects that we are executing in Australia, India and East Asia, Alstom in Asia Pacific is well placed to continue successfully delivering for our customers.” ■

New innovative eco homes in Malaysia

Tropicana Corporation Berhad has entered into a strategic collaboration with PanaHome Malaysia Sdn Bhd, a local subsidiary of PanaHome Corporation based in Japan, to build 272 semi-detached innovative eco homes at Tropicana's latest township, Tropicana Aman, in Malaysia.

Covering a 38.5 acres land, the new Cheria Residences is expected to be completed in 2019. The development will be designed to be energy efficient and environment-friendly. Construction methods utilising reinforced concrete panel technology aim to ensure high and consistent quality building structure. PanaHome also offers air ventilation and heat insulation technology that supplies effective flow and circulation of natural cool air whilst at the same time, minimises the heat transmission from the ceiling. ■



The new Cheria Residences will be designed with energy efficient and environment-friendly features. ■

Terex CC 6800 crane goes to Thailand

The Crane, a subsidiary of Chu Kai, has taken delivery of a new Terex CC 6800 lattice boom crawler crane. This new unit will help strengthen the company's position in Thailand and Southeast Asia as a premium provider of the largest cranes in the region. “We are anticipating growth in our markets over the next few years,” said Janejira Praerangsi, managing director of The Crane.

The Terex CC 6800 has a 1,250-t lifting classification, a maximum load moment of 13,952 mt and is designed for industrial operations. A simple assembly process for short setup times, a main boom variable offset for SW and SWSL configurations, and both a Quadro drive and hydraulically assisted boom section pinning are standard features on the crane. It is also equipped with redundant drive units, resulting in increased reliability on the job site: if one of the two drive units fails, the other one takes its place. Finally, if the power supplied by both motors is not required, it is possible to save a considerable amount of fuel by simply using only one of them. ■



The Crane has acquired a CC 6800 lattice boom crawler crane from Terex. ■

Imer Oru supplies fully automatic building precast system to Gamuda

Imer Oru Far East Pte Ltd has supplied its Oru concrete batching plant with flying bucket system to Gamuda Industrial Building System Sdn Bhd in Malaysia. Imer Oru was also involved in the installation and commissioning of the plant.

According to Imer Oru, this is the first and most advanced fully automatic industrial building precast system in Malaysia with only 40 personnel working for the entire factory, from concrete batching to transporting concrete to the casting station and automatic curing chamber. It took Gamuda 10 months to complete the entire building construction and equipment

installation until it is fully operational.

The concrete is ordered through the Order Box located at the casting station, using a pre-programmed concrete panel that sends the requirements to the batching plant control panel for automatic production while waiting for the flying bucket to arrive, park in position and load the bucket then travel towards the fully automatic flatbed casting mould for eventual casting. The whole process takes about 10 minutes and only requires a single-handed operation, as opposed to the traditional operation that would need four to six people, said Imer Oru. This new automation process is expected to



Representatives from Imer Oru and Gamuda.

significantly boost productivity and increase the quality and reliability of the finished concrete products. ■



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CDL and SEAS launch Singapore Sustainability Academy

City Developments Limited (CDL) and the Sustainable Energy Association of Singapore (SEAS) have launched the Singapore Sustainability Academy (SSA) - it is believed to be the first major People, Public and Private (3P) ground-up initiative in support of the national goals to tackle climate change articulated in the Sustainable Singapore Blueprint and recently-released Climate Action Plan. This is also said to be the first time a local private property developer and a non-profit organisation have teamed up to create a major training and networking facility on sustainability. The SSA aims to promote a low-carbon economy, resource efficiency and sustainable practices among businesses and the community, in particular, youths. Located at the roof terrace of CDL's City Square Mall, the SSA will consolidate all of SEAS' operations for Asia and serve as the platform from which the organisation will implement its plans under its existing mission.

Expected to be completed in March 2017, the SSA is supported by the Ministry of the Environment and Water Resources, the National Environment Agency, the Urban Redevelopment Authority and the Building and Construction Authority. The academy will focus on the key areas of advocacy, building capacity and collaboration, education and training, information and resource as well as user engagement.

SEAS, operating from the new SSA, will continue to work with local industry and business as well as key initiatives with the Asian Development Bank and International Enterprise Singapore, to provide policy makers in the region with insights and share experiences on policy, technology and project financing in the areas of energy efficiency, renewable energy and energy access. It will invite senior policy and decision makers to share on these subjects and explore other crucial sustainability topics pertaining to the banking, power, building and infrastructure sectors.

The SSA will also look into offering a suite of education and mentorship programmes for students from tertiary educational institutions, focussing on energy efficiency, solar power, climate change and sustainability. It will further forge partnerships with relevant educational institutions to provide high quality and practical education to build knowledge capacity, foster understanding and promote adoption of sustainability.



Located at the roof terrace of CDL's City Square, the SSA is a zero energy building that features extensive solar technology and monitors to track real-time energy generation and consumption.

The 4,300 sq ft academy will comprise classrooms, a veranda, an office and an exhibition gallery. Jointly designed by CDL and Ong&Ong Pte Limited, and built by Woh Hup (Private) Limited, the SSA will be the first in Singapore to have its construction materials, Cross Laminated Timber (CLT) and Glued Laminated Timber (Glulam) verified by the Nature's Barcode system as coming from responsible sources. This entails scientific tests like DNA analysis, to reduce the risk that the wood comes from illegal logging.

For the SSA, the use of CLT is expected to increase productivity by more than 30 percent and save around 130 man days. A zero-energy building, the SSA will also feature solar technology with 3,230 sq ft of photovoltaic panels and monitors to track real-time energy generation and consumption. The solar panels, which are designed and built by REC, are expected to generate an annual energy yield of over 60,000 kWh.

Ahead of the Paris Agreement adopted in December 2015, Singapore has pledged to reduce its greenhouse gas emissions intensity by 36 percent compared to 2005 levels by 2030. It is also working towards stabilising its emissions with the aim of peaking around 2030. ■

Black & Veatch wins PUB contract

A joint venture between Black & Veatch and Tritech has been awarded the contract to evaluate the feasibility of an Underground Drainage and Reservoir System (UDRS) in Singapore. Commissioned by the national water agency PUB, the study will also involve the development of a first stage conceptual design by the joint venture.

The study will look into the feasibility of constructing an underground stormwater conveyance and storage system to mitigate the impact of climate change and flood risks, and strengthen the overall drought resilience of Singapore's water supply.

James Currie, Black & Veatch's project director, explained, "Highly developed tropical cities like Singapore are often challenged with a combination of too much or too little water. The study will allow us to rethink this scenario and explore a system that would leverage existing technologies in new ways to meet multiple requirements - flood mitigation, storing water for other uses and even generating power by taking advantage of water flows

within the system."

Mr Currie added that a major part of the work will involve hydrodynamic modelling to determine the hydraulic characteristics of the system. The team will draw on best practices in hydraulic engineering and drainage management from past project experience on the Western Catchment for its modelling work in this project.

"Clearly, global warming and climate uncertainties are changing mindsets in how governments and water utilities are planning for the future," commented William Yong, managing director of Black & Veatch's water business in Southeast Asia. "With today's challenges, we need to explore alternative thinking and technologies; the UDRS study represents such innovative planning."

It is envisaged that the UDRS will comprise three components: Underground Reservoir Caverns (URC), Stormwater Tunnel System (STS) and Pumped Storage Hydropower System (PSH). The duration of the study is 24 months. ■

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Thailand's tallest building on track for completion

At 314 m high, the MahaNakhon Tower is set to be the tallest building in Thailand. It is located in the Silom/Sathon central business area of Bangkok, featuring a hotel, residences and retail establishments. Construction of the project is expected to be completed in late 2016, with the building scheduled to open shortly thereafter.

The tower's developer, PACE Development Corporation, enlisted the help of Aurecon to undertake peer review work on the building's design and construction. Aurecon helped PACE achieve a higher level of confidence that the design will meet the client's high standards for building performance and statutory requirements on safety and speed of construction. Given the building's unique pixelated design, the designs were also run through a value engineering review to ensure optimum structural efficiency.

The work involved a comprehensive review of MahaNakhon's engineering details, covering structural and mechanical, electrical and plumbing (MEP) designs as well as the construction method statement.

Wind and seismic loading

One of the first areas Aurecon turned its attention to was the soil-structure interaction, given Bangkok's soft soil conditions. For this, Aurecon worked with both the developer and main contractor, Bouygues-Thai, to investigate the effect of Bangkok's soft soil on

the performance of the main tower, especially under wind and seismic actions. The aim was to find the best solution to enhance building performance – with a focus on understanding lateral vibration levels and ensuring tenant comfort levels complied with international standards and guidelines.

Aurecon's Tall Buildings leader and technical director - Buildings, Dr Andy Davids, spent extensive time with the project team to understand the predicted wind loadings on the building. Together with the Aurecon team in Thailand, he provided advice based on detailed analyses on the anticipated wind loadings.

In particular, close attention was paid to the building's distinct design that features a pixelated exterior shape and sharp corner edges, which meant higher wind forces would be induced than with a smoother, curved structure. These stronger forces not only impact the cost of materials required for the building's construction but, if not properly addressed, they can also affect tenant comfort should lateral sway in the building become too strong.

Adding to the complexity of the wind load calculations is the asymmetrical design of the MahaNakhon, which meant lateral sway may also be caused by gravitational forces. To ensure this was mitigated, Aurecon ran a detailed check on the building's vertical structure members. In total, the peer



At 314 m, the MahaNakhon Tower is set to be the tallest building in Thailand.

review for MahaNakhon was completed in several months. ■

James Barr heads Terex AWP in Asia Pacific



Terex Aerial Work Platforms (AWP) has appointed James Barr (left) as its new general manager and vice president for Asia Pacific. He is now based in Singapore and will manage all countries in the region, except greater China.

Mr Barr has been with Terex AWP for 32 years, and over the past 20 years he has been directly involved in the leadership, growth and development of countries throughout Asia Pacific. Most recently he joined Terex AWP in greater China.

"I love being in this region! Asia Pacific is very dynamic - there are mature markets, emerging markets, and many stages of growth," he said. "The region is currently in a tipping point, where everything is coming together and going through a major shift, from scaffoldings to ladders and now aerial platforms."

Mr Barr led the Terex AWP team that entered Asia Pacific in 1996, with the task of educating the market, developing a dealer network and driving the growth of the rental opportunity across the region. Together with his team, Mr Barr developed the required infrastructure to support the growth and needs of its customer base.

Today, Terex AWP has about 150 commercial team members in Asia Pacific - including sales, service and inside supports – with 12 offices.

"We've seen an incredible change in Asia Pacific since 1996 – we were only a small team back then, with a minimum amount of revenue, and there was less acceptance from the market as many of end users preferred scaffoldings and ladders. There were not many rental companies in the region either," explained Mr Barr.

"But 20 years on, our Genie brand is now a strong leader in Asia Pacific. This success is driven by a great value proposition, regional presence and experience in working with individual projects and countries, as well as a dedicated team with tenure, tied together through relationships, partnerships and success through the true test, over time."

Looking ahead, Mr Barr is optimistic about the future of the aerial platform industry in the region. "We will continue to work closely with rental companies - which are truly the driver of the industry - and expand our rental network, and we will invest in technological advances and play a significant role in safety operations. We have to be in the forefront of the industry." ■

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Surbana Jurong acquires SMEC Holdings

Singapore-based Surbana Jurong has acquired Australian engineering company SMEC Holdings for approximately S\$400 million, establishing a global consultancy group with deep combined expertise in urban and infrastructure sectors. The joint entity will have a combined revenue of S\$1.1 billion, with a global workforce of almost 10,000 employees in over 95 offices across 40 countries in Asia, Australia, the Middle East, Africa and the Americas.

SMEC specialises in major infrastructure projects. It was formed in 1949 to undertake a major integrated water and hydroelectric power project in New South Wales, Australia, called Snowy Mountain Hydroelectric Scheme, one of the largest and most complex hydroelectric schemes in the world. The project was considered an engineering feat and recognised by the American Society of Civil Engineers as one of the seven civil engineering wonders of the modern world. It took 25 years to complete and included 16 major dams, seven power stations and one pumping station, over 225 km of tunnels and aqueducts and 2,000 km of roads.

Today, SMEC has a talent pool of almost 6,000 people working within a global network of over 75 offices across Asia, Africa, Australasia and North and South America. In 2016, the company has just been ranked 48 (2015: 51) amongst the top 225 International Design Firms and 69 (2015: 76) amongst the top 150 Global Design Firms.

Andy Goodwin, SMEC's CEO and managing director, said the partnership with Surbana Jurong is expected to further accelerate and support SMEC's growth ambitions. "This partnership is a reflection of the strategic value of our business and its potential to further deliver solutions internationally. It also signifies recognition of the professional skills at SMEC."

"The combined entity will not only benefit our clients, but importantly deliver enhanced growth opportunities for our employees and our partners."

Both companies also mentioned that they will focus on emerging markets for now. "A large part of Asia and other emerging countries have to catch up with their deficit in urbanisation and infrastructure development in order to grow and support their economies. According to a report by PwC, infrastructure spending is expected to grow from US\$4 trillion per year in 2012 to more than US\$9 trillion per year in 2025,



Wong Heang Fine, group CEO of Surbana Jurong (left), and Andy Goodwin, SMEC's CEO and managing director.

of which 60 percent will be in the Asia Pacific market," explained Liew Mun Leong, chairman of Surbana Jurong.

"In addition to financing and funding, wide and deep technical expertise in urbanisation and infrastructure development will be needed. Singapore and Australia have successfully done many major showcase national development projects through Surbana Jurong and SMEC. Besides their complementary strengths, both companies have very similar corporate cultures and core values."

Mr Liew added that Surbana Jurong/SMEC aims to be the largest development consultancy group based in the Asia Pacific region.

Surbana Jurong has played a major role in shaping Singapore's public township and industrial landscape, before going on to achieve significant international success. As part of its urbanisation model, the company provided the technical expertise to design over a million homes in the country and continues to be involved in rejuvenating most of the public Housing & Development Board (HDB) townships, where over 80 percent of residents in Singapore live. Surbana Jurong is also the technical consultant behind most of Singapore's industrial developments. In addition, the company has developed masterplans for more than 30 countries and developed more than 50 industrial parks worldwide.

"SMEC's experience and strength in major infrastructure projects in the urban transport, energy and water sectors such as hydroelectric power plants, Mass Rapid Transit (MRT) and Light Rail Transit (LRT) systems, bridges and highways, coupled with Surbana Jurong's track record and

expertise in urban planning, township and industrial development, will enable us to offer unique complete value chain services in urban and infrastructure solutions to our clients globally," said Wong Heang Fine, group CEO of Surbana Jurong.

"As a company with a worldwide presence, global experience and expertise with local knowledge, we will be able to assist our clients to solve complex challenges in different markets. We will also be able to use our wide network of clients to find synergistic development and business opportunities across various sectors and geographies. Together, the company will be in a unique position to capture opportunities in the global market, and I believe this will put us on a path to accelerated growth." ■

Exchange Square in full swing



Exchange Square (above images), a new mixed-use development in Phnom Penh, Cambodia, has topped out and is scheduled for completion by the end of the year. Developed by Hongkong Land, the building will initially offer 39,700 sq m of office and retail space, as well as some 650 parking spaces. The development is located in the centre of Phnom Penh's emerging financial district, and surrounded by major boulevards. ■

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Wacker Neuson to open new factory in China

Wacker Neuson plans to build a new manufacturing facility in Pinghu, near Shanghai, China. The company said it will make compact excavators for the local market to begin with, and other products will follow at a later stage. The first compact excavator is expected to roll off the production line in early 2018.

“We are continuing our strategy of internationalisation with this step. In the largest construction machine market in the world we underline our commitment towards our Chinese customers and trading partners,” said Cem Peksaglam, chief executive officer of Wacker Neuson SE.”

The new plant will include manufacturing facilities, research and development, quality management, logistics, service and training, located on approximately 135,000 sq m of ground with approximately 30,000 sq m of building space. Construction is scheduled to start in the second quarter of 2016, with completion slated by the end of 2017. According to Wacker Neuson, the plant will initially serve the Chinese and subsequently the Asian markets, with products tailored to the local requirements.

Wacker Neuson has sold construction equipment in China for over 20 years. The product portfolio for the Chinese market was extended in 2015 to include compact equipment. An increasing need for improved infrastructure, plus the extension and modernisation of the road and rail network while trending towards more efficient



The signing of the contract in Pinghu, China, between Cem Peksaglam, CEO of Wacker Neuson SE (left) and Diming Zhou, director of the Administration Committee of Pinghu Economic-Technological Development Zone.

and environment-friendly compact construction equipment offer attractive growth opportunities for Wacker Neuson. ■

Mott MacDonald plays role in Macau and Hong Kong projects

Mott MacDonald has been commissioned by Macau International Airport to design overlay for its single 3.36 km concrete runway, which will improve its strength and cater for rapidly increasing aircraft traffic.

Mott MacDonald's services on the runway overlay project include providing the full detailed design and quantity surveying services, undertaking condition surveys and preparing tender documents for construction. The company will also offer technical support during both the construction and the defects liability periods. The project is due to be completed in 2018.

“As Macau is a 24-hour airport, the improvement works will be carried out between flights during the night when traffic is less frequent,” said Jason Wong, Mott MacDonald's project director. “The runway will then need to be restored to full runway operations in time for peak daily aircraft movements, leaving only a short window for the contractor to carry out their works.”

In addition, Mott MacDonald has served as independent consultants on the T-Park project in Hong Kong, reviewing and

certifying all designs, drawings and methods of construction produced by contractor Veolia.

T-Park is reportedly the first self-sustaining sludge treatment facility in Hong Kong, which is capable of treating up to 2,000 t of sewage sludge per day. Located in the city of Tuen Mun, it comprises power generation, desalination, educational and ecological facilities to showcase the benefits of the waste-to-energy approach to waste management. Apart from hosting exhibitions and guided tours to enhance environmental awareness and education, T-Park also features a rooftop garden and spa services that are open to the public.

The facility is now incinerating the sludge produced at Hong Kong's 11 sewage treatment works, reducing the volume of waste that would otherwise be dumped in landfill by approximately 90 percent. The heat generated during the incineration process is recovered for electricity generation to meet on-site operational needs, while excess electricity is exported to the public power grid, providing power for up to 4,000 households at maximum capacity. ■

FinalCAD and Syspro Corporation bring digital mobility to construction sites in Japan

Syspro Corporation has been appointed as an authorised general reseller of FinalCAD in Japan. Both companies are now working together to introduce the use of mobile apps and smartdata solutions at construction sites across the country.

Syspro Corporation is a distributor in Japan for CAD and BIM products as well as field management and visualisation solutions for the construction industry. Its customers include major general

contractors, sub contractors and design offices.

FinalCAD provides mobile apps and predictive analytics to contractors, architects and owners. The company has seen increasing business development in the Southeast Asia region since 2013, and has been working with major Japanese contractors including Shimizu Corporation, Takenaka Corporation and Fujita Corporation. ■

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As of April 1st 2016, Kobelco Construction Machinery and Kobelco Cranes merged their management organizations to form Kobelco Construction Machinery Co., Ltd.

Terex AWP expands Changzhou facility

Terex Aerial Work Platforms (AWP) has opened its Phase II manufacturing plant in Changzhou, China. This new expansion enables the company to build more product lines to meet the demand from its customers locally and globally. Terex launched its facility for the production of aerial work platforms in Changzhou in 2011.

“Along with the opening of Changzhou Phase II, Genie China team is committed to provide local supports in terms of the best valuable products, prompt service response and the product life-cycle solution,” said Harry Zhu, general manager of sales and service, Terex AWP Greater China. Terex AWP established a sales and distribution office in China in 1998.

“Genie is celebrating its 50th anniversary this year. We are very proud of what we have accomplished in our first 50 years and we intend to use our experience to build a better future,” added Matt Fearon, president of Terex AWP. “As we look forward to the next 50 years, we see the Chinese market as having the greatest potential.”

Clint Weber, general manager of Terex AWP Greater China, commented, “For 50 years, Genie has been working on the product development efforts, focusing on what customers need to be successful in their industries and applications. We will continue to increase the competitive advantages of the Changzhou plant with



The opening ceremony of Terex AWP Phase II manufacturing facility in Changzhou.

localised product lines, as well as sustain the leadership in the market. This is just the beginning; the future is right in our hand.” ■

MTU enters Japanese crane market

Rolls-Royce has won an order to supply MTU engines to Japanese crane manufacturer Kato. The SL-500Rf Premium rough-terrain lifting crane, which weighs in at 50 t, will be fitted with a six-cylinder in-line Series 1000 engine delivering 254 kW of power. Equipped with an SCR unit, the MTU engine meets the new Japanese Heisei 26 emission level requirements that came into force in 2016. The MTU brand is part of Rolls-Royce Power Systems.

“Winning Kato as customer is our first foray into the Japanese crane market,” said Bernd Krüper, head of the Construction & Agriculture business unit at Rolls-Royce Power Systems. “Japan is a high-tech market for industrial vehicles, whilst MTU already has a foothold in applications such as wheel loaders. We’re predicting continued growth for MTU in this segment over the next few years.”

With an overall width of 2.75 m, the SL-500Rf Premium is permitted to be driven on Japanese roads. The rough-terrain lifting crane has a boom length of 40 m and can work with weights of up to 50 t across a 37 m radius. Equipped with four-wheel drive, the crane is also able to move over rough ground. ■



Kato’s SL-500Rf Premium rough-terrain lifting crane (right) will be powered by the MTU six-cylinder in-line Series 1000 engine (left).

Gammon awarded office and residential building contracts in Hong Kong

Gammon Engineering & Construction has been awarded an approximately HK\$4 billion superstructure contract by Taikoo Place Holdings Limited, a subsidiary of Swire Properties, for the redevelopment of Somerset House in Taikoo Place, Hong Kong. The project involves redeveloping Somerset House into a 48-storey Grade A office building on top of a two-storey basement, covering a total gross floor area of around 94,000 sq m, as well as construction of the associated walkways.

Advanced construction methods such as Building Information Modelling (BIM) and 3D scanning will be adopted to enhance the project’s environment-friendliness and construction efficiency, said Gammon. Other initiatives include the use of self-climbing formwork for the core and a mini-table for the outer core slab on typical floors. Scheduled to commence in the second quarter of this year, the project is set to be completed in 2018. A workforce of 1,400 is expected to be engaged at the peak construction period. The project is targeted to achieve Platinum rating of Leadership in Energy & Environmental Design (LEED) for Core & Shell.

Gammon Engineering & Construction has also been awarded by Chinachem Group a building contract for a residential development at Tseung Kwan O Town Lot No. 93. The total value of the contract is HK\$2.6 billion. Located at the southern part of Tseung Kwan O, the project involves building six 12- to 18-storey residential towers, and five four-storey houses. The construction commenced in April 2016 and is expected to be completed by the end of 2017. Throughout the project, Gammon will be utilising a variety of technological expertise such as aluminium formwork instead of traditional timber formwork for the reinforced concrete structure construction; as well as 3D scanning and BIM to assist with clash analysis. The project will be adding 857 units for the housing supply. ■

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India to build 'longest river bridge'

The Asian Development Bank (ADB) has approved a US\$500 million loan to build a bridge across India's Ganges River. The 9.8 km road bridge in the northeastern state of Bihar is set to be India's longest river bridge and will provide vital transport links between the northern and southern parts of the state and with neighbouring Nepal.

The new Ganga Bridge, to be located near Patna, will span both channels of the Ganges River and serve as an alternate route to the existing Ganga Bridge, which has begun to deteriorate. Along with the bridge structure itself, the project will also build viaducts, embankments, and toll and service facilities, and will link to national highway networks. A key feature will be a year-round embankment access road for the 250,000 inhabitants of the Raghapur Diara river island, ending their reliance on boats and a seasonal pontoon bridge as their only links to Patna.

The bridge, using advanced engineering techniques, is said to be the first of its kind in India. The height and length have been designed to minimise impacts on the river itself and to ensure the bridge will be able to withstand climate-related stresses such as a rise in the water level.



© ADB

India plans to build a new bridge across the Ganges River.

Along with ADB's loan and US\$900,000 in technical assistance to improve bridge operation and management, the state government of Bihar will provide support equivalent to US\$215 million. The project will run for about four years with an expected completion date of the end of December 2020. ■

New Terex TR60 trucks for Oman Cement Company

Oman Cement Company (OCC) has added two Terex TR60 trucks to its fleet and put them to work at its quarry in Muscat. The machines were supplied by Oman's trading company Al Fairuz.

"Terex Trucks is a relatively new product line in Oman so to be awarded the tender over the global top two brands was amazing. The trucks fit the requirements perfectly and it was clear from early on their specifications would optimise the efficiency and productivity of the working day at the Oman Cement Company," said Neeraj Jha, senior sales manager at Al Fairuz.

Established in 1978, OCC was set up as part of the regeneration project initiated by His Majesty Sultan Qaboos bin Said. Almost four decades on, the company now boasts three kilns and four cement mills with an annual capacity of 2.6 mil t. In the fourth quarter of 2015, the OCC reported a net profit of US\$12.2 million.

The TR60 trucks will work three eight hour shifts per day collecting limestone, quartzophyllades, iron ore and kaolin from the quarry, and transporting the blasted raw materials to the crusher. "The machines will only get about two hours off in 24 hours, and that's only due to operator changeovers – otherwise it would be working all day," said Mr Jha.

Built at the Motherwell factory in Scotland, the 55 t capacity TR60 is designed to work in tough environments and move more materials in less time, with less fuss and burning less fuel. The truck is fitted with a Cummins six-cylinder 19-l engine that boasts gross power of 522 kW and maximum torque of 2,981 Nm. This power is down to a



Oman Cement Company has received two Terex TR60 rigid trucks and put them to work at its quarry in Muscat.

drivetrain gear reduction that provides excellent rimpull, powering the rigid hauler up the steepest inclines and when the going gets heavy. Transmission and rear brake retardation systems comes as standard, while a high capacity body with exhaust heating makes for excellent retention and cleaner dumping – thereby boosting productivity. In addition, the TR60 features a spacious and ergonomic cab for maximum operator comfort. ■

Leighton Asia secures Maker Maxity project in India

Leighton Asia, through its subsidiary Leighton India Contractors, has entered into an alliance agreement to deliver phases two and three of the Maker Maxity mixed-use development in Mumbai, India. The scope of work includes a retail development (including completion of structural works, mechanical, electrical and plumbing services, civil

works, lifts and escalators, facade, finishes and external works) and a hospitality development (civil and structural works, mechanical, electrical and plumbing services, lifts and escalators, finishes, external facade and external works). The works commenced in June 2016, with completion targeted for mid 2019. ■



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Aurecon and Calatrava team up on 'The Tower' project

Work on another iconic development in Dubai has started. Known simply as 'The Tower', this new structure is being designed by architect and engineer Santiago Calatrava who is leading its design and engineering work. Mr Calatrava has chosen Aurecon as the engineer/architect-of-record to collaborate with on a range of design and technical features for the project.

"The design is a perfect fit for our requirements and integrates not just design excellence, but also strong environmental and smart-tech considerations," said Mohamed Alabbar, chairman of Emaar Properties, the developer of the project.

The building's striking design includes a distinctive net of steel cable stays, which attach to a central reinforced concrete column that will reach into the skies. At the top of the tower is an oval-shaped bud that will house 10 observation decks, including The Pinnacle Room, which will offer 360-degree views of the city and beyond. In addition, there will be numerous balconies that rotate outside the facade of the tower, a boutique hotel and several event spaces. At ground level, The Tower's Central Plaza will serve as a bustling neighbourhood centre.

Design work for the project is already underway. Timing is one of the biggest challenges on the project and will call for close collaboration from all stakeholders. The Tower is planned to be completed in a period of approximately four years, so creating an efficient design and construction schedule will be vital. Aurecon has assembled its top global experts to contribute to the project, with work being led by the company's Middle East office with input from offices in Africa, Asia and Australia.

Mr Calatrava also designed the tower with a strong focus on energy efficiency and sustainability, including a highly efficient cooling



The Tower is scheduled to open in 2020.

system to mitigate the region's hot climate. The water collected from this system will also clean the structure's facade, for example. Elegant landscaping and vegetation on and around the tower will encourage solar protection. An integrated shading system and wing doors will contribute to its energy efficiency as well.

Located at Dubai Creek Harbour, The Tower is scheduled to open in mid-2020 to celebrate the start of Expo 2020 in Dubai. ■

Fehmarnbelt link to connect Denmark and Germany

The Femern Link Contractors joint venture has signed contracts with the Danish government in Copenhagen for the design and build of the Fehmarnbelt link between Denmark and Germany. The joint venture won three contracts, which include two contracts covering construction of the immersed tunnel and the tunnel element factory that will manufacture the precast tunnel elements, and a contract covering the building of the portal structures, toll buildings, bridges and ramps. The three contracts have a combined value of €3.4 billion.

The joint venture comprises Vinci Construction Grands Projets (lead company for the two tunnel contracts), Per Aarsleff Holding (lead company for the portal contract), Solétanche-Bachy International, CFE., Wayss & Freytag Ingenieurbau, Max Bögl Stiftung & Co, BAM Infra and BAM International.

The joint venture has appointed Dredging International (DEME Group) as dragging subcontractor for the tunnel contracts, and COWI as consultant for all three contracts.

The 18 km immersed tunnel connecting Denmark's Lolland Falster region with Germany's Schleswig Holstein region is set to be the world's longest immersed road and rail tunnel. It aims to shorten the journey between the German and Danish coasts to just 10 minutes by car and seven minutes by train compared to the current travel time of one hour by ferry or a 160 km detour via the Danish region of Jutland by car.

The Fehmarnbelt tunnel project is one of Europe's largest infrastructure projects to date. It is expected to foster trade and tourism in northern Europe. ■

Yanmar to buy Terex's German compact construction equipment business

Terex Corporation has agreed to sell its German compact construction business to Yanmar Holdings Co Ltd. The business manufactures and sells midi/mini excavators, wheeled excavators and compact wheel loaders. Included in the transaction is the manufacturing facility located in Crailsheim, Germany and the parts distribution centre located in Rothenburg, Germany. The sale is targeted to close in the second half of 2016. "We are pleased to enter into this agreement with Yanmar, as

they represent a strong strategic buyer for this business who values our quality designs, global team members and distribution partners," said John L. Garrison, president and CEO of Terex. "For Terex, the sale of the German compact construction business is another step in our strategy to focus our portfolio on those product categories where Terex has a significant presence in the market and that can provide the greatest returns for our shareholders." ■

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Date	Events in Asia	Organiser & Contact
21 to 23 Sept 2016	Concrete Asia 2016 IMPACT Exhibition and Convention Centre Bangkok Thailand	Impact Exhibition Management Co Ltd Tel: +65 6702 3005 Email: theresa.gan@giec.biz Website: www.concrete-asia.com
18 to 20 Oct 2016	BuildTech Asia 2016 Singapore Expo Singapore	Sphere Exhibits Pte Ltd Tel: +65 6319 4037, Fax: +65 6319 6140 Email: buildtechasia@sph.com.sg Website: www.buildtechasia.com
3 to 5 Nov 2016	OneBuild 2016 Kuala Lumpur Convention Centre Kuala Lumpur Malaysia	One International Exhibition Sdn Bhd Tel: +603 8943 7488, Fax: +603 8943 7599 Email: info@oneinternational.com.my Website: www.oneinternational.com.my
9 to 11 Nov 2016	Konstruksi Indonesia 2016 Jakarta Convention Centre Jakarta Indonesia	PT. Infrastructure Asia Tel: +62 21 391 3037, Fax: +62 21 391 3349 Email: dwi@infrastructureasia.com Website: www.constructionindonesia.com
10 to 13 Nov 2016	Philconstruct 2016 SMX Convention Centre & World Trade Centre Manila The Philippines	Global-Link Exhibitions Specialist Tel: +63 2 893 7973, Fax: +63 2 550 1148 Email: info@gesi.com.ph Website: www.gesi.com.ph/philconstruct
22 to 25 Nov 2016	Bauma China 2016 Shanghai New International Expo Centre Shanghai China	Messe München GmbH Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bauma-china.com Website: www.bauma-china.com
1 to 3 Dec 2016	Myanbuild 2016 Myanmar Event Park Yangon Myanmar	AMB Tarsus Events Group Tel: +60 3 4041 9889 Email: darren@ambtarsus.com Website: www.myanbuild.net
12 to 15 Dec 2016	Bauma Conexpo India 2016 HUDA Ground, Gurgaon Delhi India	Messe München GmbH Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bcindia.com Website: www.bcindia.com
8 to 10 Jun 2017	Intermat ASEAN IMPACT Exhibition & Convention Centre Bangkok Thailand	Comexposium Tel: +33 1 76 77 11 27 Email: veronique.arnal@comexposium.com Website: www.asean.intermatconstruction.com
31 Oct to 3 Nov 2017	APEX Asia 2017 Shanghai New International Expo Centre Shanghai China	KHL Group Tel: +44 1505 850 043 Email: murray.pollok@khl.com Website: www.apexasiaashow.com
Date	Events outside Asia	Organiser & Contact
21 to 24 Nov 2016	PMV Live 2016 Dubai World Trade Centre Dubai UAE	DMG Events Tel: +971 4 445 3655 Email: FirasAbouLtaif@dmgeventsme.com Website: www.pmvlive.com
17 to 20 Jan 2017	World of Concrete 2017 Las Vegas Convention Centre Las Vegas, Nevada USA	Informa Exhibitions Tel: +1 972 536 6379 Email: info@worldofconcrete.com Website: www.worldofconcrete.com
22 to 25 Feb 2017	Samoter 2017 Verona Exhibition Centre Verona Italy	Veronafiere Tel: +39 045 829 8111, Fax: +39 045 829 8288 Email: info@samoter.com Website: www.samoter.com
7 to 11 Mar 2017	Conexpo-Con/Agg 2017 Las Vegas Convention Centre Las Vegas, Nevada USA	Association of Equipment Manufacturers Tel: +1 414 298 4167, Fax: +1 414 272 2672 Email: international@conexpoconagg.com Website: www.conexpoconagg.com

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Intermat to launch ASEAN edition

The first Intermat ASEAN will take place in Bangkok, Thailand, from 8 to 10 June 2017 at the IMPACT Exhibition & Convention Centre. It takes over the Constech show, which is already organised by IMPACT Exhibition Management attracting more than 300 exhibitors and 5,000 visitors from across ASEAN countries.

ASEAN is one of the world's fastest growing regions and the development of the infrastructure network is essential for the advancement of ASEAN countries. Power, transportation, telecommunications and water projects, among others, need to find sources of funding to ensure the economic growth. The ASEAN infrastructure market holds a huge potential over the next decade with a reportedly US\$60 billion needed per year until 2022 to fulfil all the infrastructure needs in the region.

Intermat ASEAN will present a complete range of products that suits the region's needs: production and use of construction materials, earthmoving, civil engineering, concrete manufacture, buildings and work sites, lifting, handling, drilling, boring, road infrastructures, mining and quarry equipment, vehicles and transportation, components and accessories, demolition, recycling,

etc. Supported by the Thai authorities, the show will also display the latest innovations in relation with the regional needs, as well as conferences in order to assist ASEAN countries in their development.

Mr Sangvorn Lipatapanlop, president of Thai Contractors Association, explained, "The construction industry in Thailand and ASEAN region is growing with a lot of mega projects ordered by the government and private sectors for the next few years. This is a key factor leading to rising operational costs and the arrival of migrant workers from other countries. Construction technologies will help contractors to save on operational costs and provide higher quality construction projects."

Intermat is an international trade show for construction machinery and materials, held every three years in France. It is organised by S.E. Intermat, a joint subsidiary of Comexposium and French trade organisations from the construction industry (CISMA and SEIMAT). The next edition will be held from 23 to 28 April 2018 at the Paris-Nord Villepinte Exhibition Centre. ■

Website: asean.intermatconstruction.com

BuildTech Yangon meets growing needs of Myanmar's construction industry

The third edition of BuildTech Yangon was held from 26 to 28 May 2016, drawing approximately 3,000 trade visitors and business professionals from the region. These included architects, developers, building and trade agency representatives, investors, manufacturers of machine and building, retailers, security, state-owned company owners, surveyors, trainers and wholesalers. The show also hosted about 80 exhibitors from Austria, China, Indonesia, Korea, Myanmar, Singapore, Thailand and Vietnam.

BuildTech Yangon is organised by Sphere Exhibits, a subsidiary of Singapore Press Holdings (SPH), and co-organised by the Myanmar Construction Entrepreneurs Association (MCEA). With a newly revamped exhibitor profile, this year's event featured four key areas: on-site construction machinery and equipment, building materials and architectural solutions, interior finishing, and facilities management. The show also organised a business seminar series and two tracked seminars on Workplace Safety and Facilities Management, with a variety of topics discussing construction safety, work at heights, as well as fire, safety and disaster management. The seminar focusing on introduction to facilities management addressed concerns on sustainability, energy efficiency in green buildings, security and town planning.

Moreover, MCEA's Golden 20 Jubilee Gala, an extension of networking opportunities from BuildTech Yangon, was attended by 250 guests on 26 May. Awards were presented to Myanmar's young construction entrepreneurs for their contributions to the economy and society. Aimed at encouraging local professionals to elevate construction industry standards and skills of the workforce, the awards honoured individuals who were able to incorporate the latest construction technologies into various stages of the supply chain.

BuildTech Yangon 2016 also saw the signing of a Memorandum of Understanding between MCEA's Mandalay Chapter and Sphere Exhibits to co-organise the inaugural staging of BuildTech Mandalay later this year. This extended collaboration further reinforces a stronger alliance between the two organisations in their efforts to extend the knowledge building and trade opportunities to industry



Above and left: BuildTech Yangon 2016 featured four key areas: on-site construction machinery and equipment, building materials and architectural solutions, interior finishing, and facilities management.

professionals in Myanmar.

BuildTech Yangon 2016 was supported by the International Facilities Management Association (Singapore Chapter), International Powered Access Federation, Malaysia Heavy Construction Equipment Owners Association, Myanmar Engineering Council, Myanmar Engineering Society, Myanmar Industries Association, Singapore Institute of Building Limited, Vietnam Electronics Industry Association, Vietnam Federation of Civil Engineering Association, World Evergreen Travel & Tours and WSH (Asia).

The fourth edition of BuildTech Yangon is scheduled to take place in May 2017. ■

Website: www.btyangon.com

More than 2,400 exhibitors gear up for bauma China

The upcoming bauma China, which will be held at the Shanghai New International Expo Centre (SNIEC) from 22 to 25 November 2016, will continue to serve as a presentation platform for many of the major players on the local and international stage. As of June 2016, more than 2,400 exhibitors have signed up to take part in the show, according to the organiser Messe München.

Collin Davis, project group manager at Messe München, said that “the situation in the Chinese market is complicated, which, of course, is also reflected to a certain extent in a trade fair. However, there’s no doubt that bauma China remains by far the biggest and most important sector event in the Asia region.”

The Chinese market is expected to recover significantly in the medium term. This is due to numerous new construction projects that stimulate machine production, as well as new emissions guidelines that necessitate new systems and machines. Based on a forecast by Off-Highway Research, the Chinese market for construction machinery will achieve a sales volume of US\$17.169 billion in 2016 - a slight upward trend.

And although the sales figures for construction machinery in China have been falling for a number of years, the VDMA confirmed that in 2015, 20 percent of all construction machinery sold around the world was still purchased in China. The Chinese market is the second-largest individual market after the US.

Companies wanting to gain access to the Asia region also



The outdoor area of bauma China 2014.

need to be present at bauma China, as the show is attended by international visitors predominantly from Asia. Taking place every two years on a 300,000 sq m of exhibition space, bauma China is the largest construction trade show in Asia. The 2014 edition attracted 3,098 exhibitors from 41 countries and 189,732 visitors from 149 countries. ■

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First IPAF seminar in Korea

IPAF held its first joint seminar with the Korean Occupational Safety & Health Agency (KOSHA) in July 2016 in Seoul, South Korea. Among the speakers were Lee Sung-Ju, head of Safety Certification Department, Occupational Safety Bureau, KOSHA; Rupert Douglas-Jones, IPAF Research & Development; and Raymond Wat, regional general manager of IPAF South East Asia. Topics covered included international standards, accident statistics and managing the use of mobile elevating work platforms (MEWPs).

South Korea saw 86 fatal accidents involving MEWPs between 2011 and 2015. The Korean MEWP fleet is estimated at 40,000 to 50,000 units, including 10,000 to 14,000 truck-mounted platforms. There is no formalised training for MEWPs, other than basic familiarisation to untrained operators on site.

The key health and safety legislation is the Korea Occupational Safety & Health Agency Act (1986), with the relevant articles being: Article 36 Inspection; Article 48 Risk Assessment System; Article 49 Chemical Plants; and Article 46 Inspection (as of August 2016, inspections were extended to include vehicle mounts. These inspections are to be conducted through the three official test centres). ■



Left and above: IPAF's first joint seminar with KOSHA in Seoul, South Korea.

Loxam Group joins IPAF

The entire Loxam Group has joined IPAF, signalling a boost for the Federation's activities in France and around Europe. With Loxam's core French business joining IPAF, a total of 11 Loxam companies have become IPAF members. The subsidiaries in the UK, Ireland and the Netherlands are already IPAF members, but this is the first time that the entire Loxam Group has committed to IPAF membership.

Loxam director Alice Henault said that Loxam believes it can work with IPAF and use IPAF's safety and technical expertise to help promote safety in France. "We see that IPAF is really helping the business in the UK and other countries where we are members," she said. "Now is the time to be an IPAF member in France. Safety is a challenge, and it is part of our job to promote safety. We have to work with IPAF to find the best way to promote safety."

IPAF CEO Tim Whiteman said, "We welcome the Loxam Group's commitment to



Signing for IPAF membership and safety (from left): Alice Henault, Loxam access division director; Stéphane Hénon, MD of Loxam; and Tim Whiteman, IPAF CEO.

sharing experience and information from its operations around Europe within the IPAF community. Together we can help improve safety around the world." ■

Abu Dhabi supports IPAF training

IPAF training has gained support in the UAE's capital with the publication of two codes of practice by the Abu Dhabi Occupational Safety and Health Centre (OSHAD): CoP 34.0 Safe Use of Lifting Equipment and Lifting Accessories, Version 3.0, July 2016; and CoP 36.0 Plant and Equipment, Version 3.0, July 2016.

CoP 34.0, section 3.10.1 on MEWPs states that: "The training given shall be specific to the type of equipment the person is operating and shall be in accordance with internationally recognised training, such as the International Powered Access Federation – Powered Access Licence (PAL) or equivalent."

Similarly, CoP 36.0, section 2 on training and competency states that: "Training given shall be specific to the type and classification of the plant and equipment being operated and shall be internationally accepted, e.g. International Powered Access Federation – Powered Access Licence or PAL Card or equivalent for the use of a MEWP."

IPAF's Middle East representative Jason Woods confirmed that IPAF is working with OSHAD to promote MEWP safety over the next three to five years. "Training figures are on a sharp rise and we expect to see 4,000 to 5,000 operators in the region trained each year," he said.

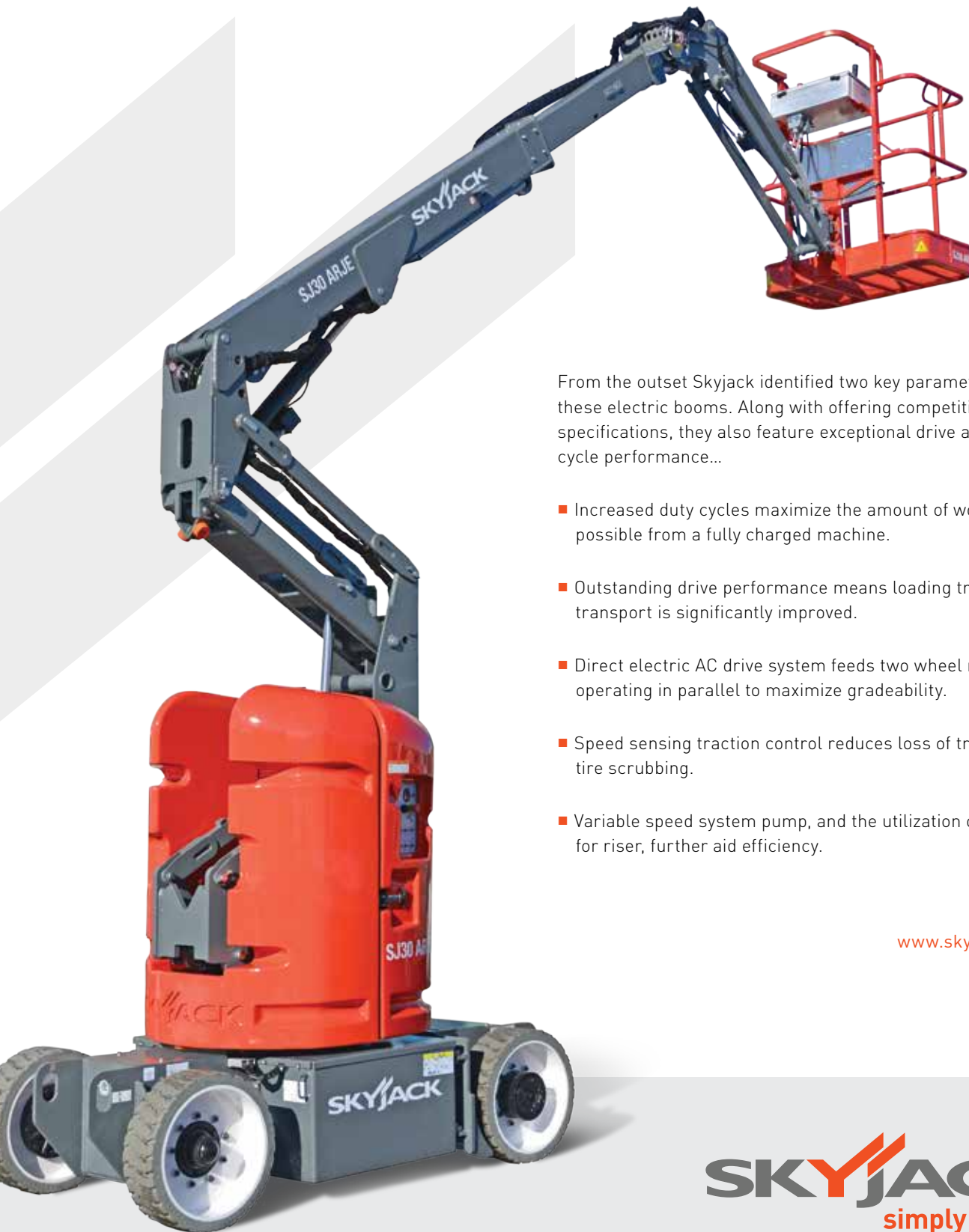
"The goal is to minimise accidents and fatalities, focusing mainly on the construction and facilities management sectors. The IPAF Middle East Regional Council is driving this change and opening up pockets of growth, with IPAF being recognised and the PAL Card accepted in Kuwait, Oman, Qatar, Saudi Arabia and the UAE." ■



Close to 100 people attended the IPAF Middle East Convention held in May 2016 in Dubai, UAE.

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Hydradig - JCB's innovative wheeled excavator

The JCB Hydradig is a new, innovative wheeled excavator that can be used for digging, lifting, loading and tool carrying in urban construction, highway maintenance and municipal operations. The machine features a sturdy all-wheel drive, four-wheel steer chassis, based on JCB's Loadall telescopic handler concept. This delivers three-mode steering for maximum manoeuvrability and stability when travelling at speed. Power comes from JCB's Ecomax Stage IIIB/Tier 4 Interim diesel engines, delivering 81 kW.

According to JCB, the engine is side-mounted, placing the centre of gravity up to 1.5 m below that of some competitive 10-t machines, with hydrostatic drive provided through a combination of a variable piston pump and a variable piston drive motor, to a central transfer box and then to both axles. This driveline layout offers a 0-40 km/hr speed range, with no requirement for multiple gears or a break in tractive effort as speeds increase or decrease. A 20 km/hr maximum speed model is also available to suit local markets.

Near 50-50 weight distribution between the axles and a longer wheelbase (2,650 mm) than competitive 10-t machines delivers improved stability, said JCB. The lack of forward and back 'nodding' when driving means that Hydradig operators can maintain higher travel speeds between job sites, improving productivity, with JCB's SRS boom suspension system available as an option to further improve ride comfort.

A front axle with +/- 8° of oscillation delivers excellent rough terrain traction and stability. An optional reverse steering button on the main console allows the operator to use all three steering modes while the cab is facing in either direction. The machine offers a tight turning circle of 3,946 mm on single tyres, rising to 4,511 mm when equipped with a front-mounted dozer blade.

JCB will offer a dedicated Hydradig trailer as an option, allowing a single machine to travel to site with a range of attachments. The machine's reduced tailswing allows it to rotate and change attachments within a single road carriageway. The upper structure has a reduced tailswing of just 120 mm, 29 percent less than any competitive machine, claimed JCB.

Bosch Rexroth electro-hydraulic controls allow the main valve block to be mounted beneath the side canopy and directly above the slew ring, so there is no hydraulic noise inside the cab. The closed loop hydrostatic transmission, with separate pumps for traction drive and boom power, make it easy to multi-function the dig-end. Customers can also choose between a monoboom or a triple-articulating TAB boom, with three dipper lengths of 1,650 mm, 2,000 mm and 2,250 mm to suit a range of applications.

The Hydradig can be used with a variety of tilt-rotator models and can be equipped with mechanical and hydraulic quick hitches from the factory. A high flow auxiliary circuit is standard and the machine can be equipped with two low flow circuits, plus dedicated hydraulic circuits for quick hitch operation.

The ROPS/TOPS cab features all-round 360° visibility. The operator can see within 1 m of the machine's footprint at ground level from within the cab, said JCB. The internal noise level is an automotive 69 dB(A), reducing operator fatigue.

All daily service checks and regular maintenance can be carried out from ground level. JCB said the Hydradig offers the best SAE service rating in its class (33 percent better than its closest competitor) and there is no requirement for operators to climb on the upper structure for regular maintenance. ■

Website: www.jcb-singapore.sg



Top, middle and above: The JCB Hydradig is a new, innovative wheeled excavator that can be used for digging, lifting, loading and tool carrying in urban construction, highway maintenance and municipal operations.

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JLG updates Toucan mast boom lifts

JLG has updated its Toucan 8E and 10E mast boom lifts with improvements that reduce the machines' total cost of ownership. In addition, the company has added lightweight 8E and 10E models to the Toucan lineup. These updated models are available globally.

For the EMEA (Europe, the Middle East and Africa) region, JLG increased the tilt angle on the updated Toucan 8E and 10E machines from 2 to 2.5 degrees. This improvement gives operators more freedom as to where they can operate the machines with respect to job site surface slopes.

The improved machines also weigh less - 20 kg less for the standard 8E two-person outdoor rating and 230 kg less for the 8E light option with its one-person outdoor rating; and 60 kg less for the standard 10E two-person outdoor rating and 400 kg less for the 10E light option with its new one-person outdoor rating. JLG said that the indoor rating for both the standard and light models remains at two people.

Like other models in the Toucan lineup, the 8E and 10E feature AC drive motors for energy-efficient performance and excellent duty cycles. A versatile articulating jib provides horizontal outreach and up-and-over height of 5.10 m and 6.51 m for the 8E and 10E models, respectively.

Furthermore, JLG has expanded its line of compact crawler booms with the new X15J Plus. This new lift offers a platform capacity of 230 kg, a 60 percent increase over the X14J, and an increased platform height of 15.4 m. Its stowed height has been reduced by 70 mm, making it even easier to move through doorways, gates and yards.



JLG Toucan 8E (left) and 10E mast boom lifts.

The new design of the X15J Plus also supports ease of transport with the introduction of forklift pockets and lifting hooks. It also features a tracked wheel carriage that climbs steps, non-marking tracks for use on sensitive flooring and landscaping, and auto-levelling outriggers that provide added stability on sloped

surfaces. The design of the carriage further increases productivity, allowing climbs of up to 40 percent. In addition, the X15J Plus has a combination of electric and combustion engines, which enhances the versatility of the machine, equipping it for indoor and outdoor use. ■

Website: www.jlg.com

JLG SkyGuard system

JLG has made the SkyGuard enhanced control panel protection system standard across its boom lifts. The company started in July 2016 with the boom lifts ordered in Europe, Australia and New Zealand. The system is expected to become standard equipment in the rest of the world as of January 2017.

When activated, the SkyGuard system stops all functions in use at the time, and then temporarily reverses most functions that were in use when the system was activated. ■

Website: www.jlg.com

Right: JLG SkyGuard system.



XCMG's new G-series cranes

The new XCMG XCA100E all-terrain crane is fitted with a new energy-saving hydraulic system, an intelligent boom design and a smart travelling control system. This model is one of the 17 truck and all-terrain cranes in the new G-series from XCMG, which are designed for greater efficiency, accuracy and safety.

The energy saving technology in the new G-series reduces the average MPG by 12 percent and increases energy utilisation by 15 percent, while improving the gradeability by 45 percent, said XCMG.

According to the company, the G-series has accomplished six technological breakthrough, including an intelligent crane boom technology; intelligent crane travelling control system; intelligent hoisting planning and implementation system; low-speed, high-torque power transmission system; new energy saving hydraulic system; and crane energy recovery technology. ■

Website: www.xcmg.com



The new XCMG XCA100E all-terrain crane.



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Liebherr's new LRH 600 piling rig and R 922 excavator

Liebherr's new LRH 600 piling rig is fitted with a new hydraulic free-fall hammer, the H 10 L. The machine is particularly suitable for tough piling operations with large radius.

The H 10 L is the first hydraulic free-fall hammer developed and manufactured in-house by Liebherr. It is currently the largest model of three in the new series and has a maximum impact energy of 225 kNm. A key advantage of the attachment is its modular weights, which allow the hammer to be perfectly adapted to the respective piling requirements. Thanks to the short and lightweight design, the hammer is also efficient and user-friendly in terms of transportation and maintenance. At the same time, the pile helmet is soundproof in the standard version.

The leader elements of the LRH 600 feature easy and quick assembly using pin connections. A high degree of stability is ensured through the lattice boom design and also by the fact that the kicker is secured via supporting tubes at the boom head. Two compensating cylinders guarantee that the leader always remains parallel to the uppercarriage, resulting in maximum transmission of the torque. Inclination and radius can be adjusted using another pair of cylinders.

With a fixed leader, the LRH 600 achieves a working length of 51 m and a maximum radius of 15 m. Thanks to the innovative leader kinematics, inclinations of up to 14° backwards and 9.5° forwards are possible. The pull force extends to roughly 120 t.

The LR 1300 - believed to be the most popular Liebherr crawler crane in the 300-t category - is used as a carrier machine. The unit is powered by a 530 hp Liebherr diesel engine. A significant benefit of the LR 1300 is its quick transport. The self-loading and self-assembly system, consisting of four fold-out jack-up cylinders on the undercarriage, an assembly cylinder in the A-frame for unloading, as well as two counterweight cylinders at the rear of the basic machine, also make a huge contribution. In addition, the machine's dimensions enable cost-effective transportation on standard low-loaders with a maximum transport width of 3 m.

Besides the LR 1300, the HS 895 HD duty cycle crawler crane can also be used as a basic machine. Only a slight modification is required with both machines, said Liebherr. Owing to the high engine power of these

basic machines, the hammer can be operated directly from the on-board hydraulic system, thus no additional power pack is required.

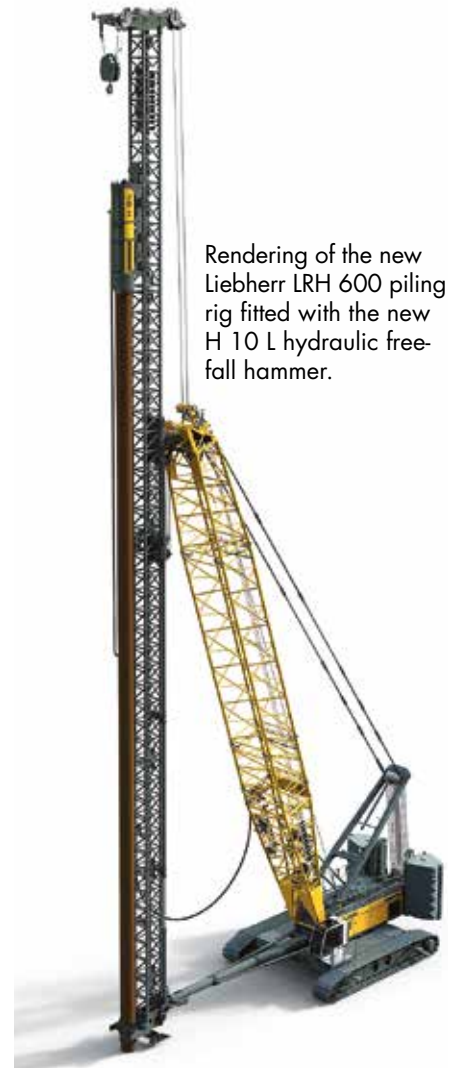
Liebherr has also developed the new R 922 crawler excavator for less regulated markets such as Southeast Asia, India, China, Russia and South Africa. The machine is powered by a 150 hp Cummins diesel engine that meets Tier 3/Stage IIIA/China III emissions standards. The six-cylinder common rail system is also compatible with diesel with a high sulphur content or with biodiesel B20.

The Positive Control hydraulic system makes the combined movements of the machine even more fluid, which in turn increases the breakout forces and breakaway torques. The robust travel mechanism, the optimised Liebherr Z tooth system for attachments, as well as the optional backhoe bucket in a heavy-duty version, ensure long and efficient use of the machine.

The new 22-t excavator is ideal for use in earthmoving, digging and drainage/sewerage work and has an output of 150 hp. According to Liebherr, the concept of the R 922 is based on European standards, with the aim of improving reliability and generating even higher productivity on the construction site, while lowering fuel consumption.

The market launch of the R 922 is accompanied by a complete renewal of all crawler excavator models for these markets between 20 t and 25 t. Apart from the R 922, it also includes the R 920 and R 924 models with operating weights of 21 t and 24 t respectively and outputs of 150 hp and 170 hp. ■

Website: www.liebherr.com



Rendering of the new Liebherr LRH 600 piling rig fitted with the new H 10 L hydraulic free-fall hammer.

Below: Liebherr's new R 922 crawler excavator is designed for less regulated markets such as Southeast Asia, India, China, Russia and South Africa.



Top Performance cone crushers from Weir Minerals

Weir Minerals has introduced its Trio Top Performance (TP) cone crusher range to the mining and construction aggregate market. These crushers operate at a higher speed than their predecessors, thus providing higher reduction with better shaped material, said the company.

The compact, robust crushers are built with advanced cone crusher automation technology to ensure continuous high performance and application versatility. All Trio TP cone crushers feature a steep crushing chamber angle, a large crushing stroke and optimum speed to deliver a finer product through increased inter-particle comminution.

The Trio TP cone crusher range is designed with self-protecting features to help achieve high levels of mechanical reliability under severe operating conditions, whilst ensuring the safety of both operator and equipment. The crushers are also equipped with a direct drive option, which can be combined with a Variable Frequency Drive to further optimise crusher performance, resulting in significant energy savings.

The Trio TP cone crushers' combination of high flow, high pivot point, large throw and large head diameters also results in excellent performance. In addition, the Trio TP cone crushers are fully instrumented with advanced lubrication and hydraulic systems, allowing customers to monitor vibration, motion, temperature, flow and pressure. ■



The Trio TP cone crushers are built with advanced cone crusher automation technology.

Website: www.trio.weir

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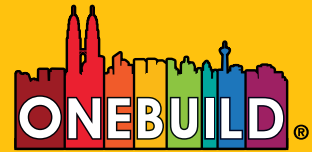
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Bomag BMF 2500 feeder for greater paving efficiency

Bomag has added a series of feeders to its paving product range. The new BMF 2500 feeder has a theoretical output of 4,000 t/hr, so the unit can handle a 27 t lorry load of crushed rock, sand or asphalt in only 35 seconds, according to Bomag. At the same time, the vehicle width of only 2.55 m is narrow enough for transport without special permit. EcoMode reduces the engine speed, depending on the job requirement, thus saving fuel.

The conveyor belt on the Bomag BMF 2500 feeder has a width of 1.2 m and gives optimum material flow with minimal segregation. In addition, the rubber belt is mounted on metal struts. These prevent the belt from stretching with hot asphalt. Retensioning the belt is no longer necessary and material feeding becomes safer, said Bomag. The BMF 2500 has a large material hopper with individually controllable wings for quick discharge and slewing bumper rollers to safely dock the supply truck.

The base model BMF 2500 feeder can be supplemented with a slewable belt, which allows lateral feeding. This way, one machine can supply two pavers. The offset belt can be readily mounted and removed.

Moreover, distance sensors allow the BMF 2500 to be operated automatically. Automatic steering using a guide wire is available as an option. The machine stays on course while the operator concentrates on the delivery truck. The seat can be swivelled out by 90 degrees, allowing clear visibility to the front and back. A second station for an operator at ground level is located on the sidewall.



Above: Using a slewing offset conveyor belt, the BMF 2500 can feed two asphalt pavers alternately. The belt can be fitted on site as required, for added flexibility.



Left: To allow the hopper to be emptied quickly, the wings on the BMF 2500 can be controlled individually. The front wings are also hydraulically operated to ensure that the hopper can be emptied entirely.

The Bomag BMF 2500 feeder is available in three versions: the BMF 2500 S is the base model, which can feed all pavers and can be supplemented with a slewable offset belt; the BMF 2500 S Offset, on the other hand,

offers the slewable offset conveyor belt as standard; and the BMF 2500 M, which has a longer, height-adjustable conveyor belt and can feed high additional paver hoppers. ■

Website: www.bomag.com



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Elematic's precast floor and wall production

Elematic's new FloorMES E9 is a hands-on tool for supervising and planning precast floor production. This automated system aims to enhance hollow-core slab production significantly by optimising and balancing the production plan and schedules. It also monitors the work process and compares it to the original plan.

The FloorMES E9 system offers one single point of access to planning and monitoring precast floor production with an easy-to-use graphical user interface. Automatic key planning functions, and the possibility to make manual adjustments if needed, make production planning easy and fast. Extensive up-to-date status information about the production is easily available, and because the production history is automatically stored, it can be easily used for further process improvement.

Automatic nesting places hollow-core slabs in the casting beds optimally, and the system improves the processes and reduces strand waste. The centrally controlled system also ensures efficient control over the production machinery in the factory. Moreover, fluctuations in production that consist of elements with different difficulty levels can be evened out.

According to Elematic, the FloorMES E9 is currently in the piloting phase and will be available from September 2016 onwards.

In addition, Elematic has introduced the new ATREX continuous crushing mixer to its Acotec non-load-bearing precast partition wall production line. Developed using Finnish technology by the equipment provider Megatex, the mixer offers a solution for raw material procurement in Acotec wall production.

The mixer enables the use of lightweight aggregate up to grade 30 in Acotec panel production. This means that the panel producers do not need to buy specific grades or store several different aggregate grades anymore. The mixer can bring considerable savings and simplify the production process, especially in market areas such as Russia and China, where fine-grained aggregate is not widely available, said Elematic.

Leca, a lightweight expanded clay aggregate used for cement mix, is manufactured worldwide from natural materials. Leca products may vary from country to country, and Leca particles are generally larger than the size needed for the fine-grained cement mix used in Acotec production.

ATREX is a new application in the precast industry, but it is a well-proven technology in many other industries that need continuous processes for grinding, mixing, crushing and dispersing, explained Elematic. The technology has been developed in Finland since the early 1990s, originally for the forest industry. Since the 2000s, ATREX has been introduced in other sectors such as the mining and biotech industries.

The collaboration between Elematic and ATREX developer Megatex started in 2014 when Elematic's Acotec production line was under development. Compared to the conventional batch mixer, the continuous operation of ATREX, combined with its simultaneous crushing and mixing properties, made it an interesting tool to improve raw material availability in Acotec production.

Non-load-bearing Acotec precast partition wall panels have been manufactured around the world on Elematic's Acotec production lines. The panels have various benefits, including excellent sound insulation, top-rate moisture resistance and an easy installation method. With Acotec panels, construction work proceeds up to six times faster than traditional brickwork and twice as fast as blockwork, said Elematic.



Above and left: Elematic's new FloorMES E9 is a hands-on tool for supervising and planning precast floor production.



Above and left: Elematic has also introduced the new ATREX continuous crushing mixer (left) to its Acotec precast wall production line.

The Acotec production line features three automation and capacity levels to meet the needs in different countries. The SEMI line, with a production capacity of 80 sq m per hour, is a simple line with practical combined restacker-handler and automated key functions. The PRO line offers a mid-level capacity of 100 sq m per hour with automated functions for all main processes, and the fully-automatic Acotec EDGE offers a top-rate capacity of 120 sq m per hour and needs only two operators to run. ■

Website: www.elematic.com

Rockmore's Vector Rod system enhances drilling

Rockmore International has developed a new thread design, XT, for the Vector Rod system (pictured). It incorporates new guided cylindrical contact zones between the male and female thread joints. These guided surface features are located in the nose and rear of the thread connections and serve various benefits and improvements over traditional threads.

The XT thread profile is based on the traditional trapezoidal 'T' thread design, which is compatible with industry standard thread types such as T38, T45 and T51. Thus, one can interchange and connect standard 'T' style threaded components with the new XT thread, although the guiding advantages aforementioned would be neglected, according to Rockmore.

In order to achieve the full engineered benefits of the XT thread, however, one must consider the drill string as a system of connections between the shank adapter, rods and the bit in extension drilling applications, added Rockmore. The dual cylindrical contact zones in the nose and rear of the XT threads significantly increase the lateral support between thread joints and stabilise the connections with more rigidity to provide better energy transfer. The enhanced thread support and geometry extends thread life and increases the overall component service life of the shank adapters, rods and bits with XT threads that

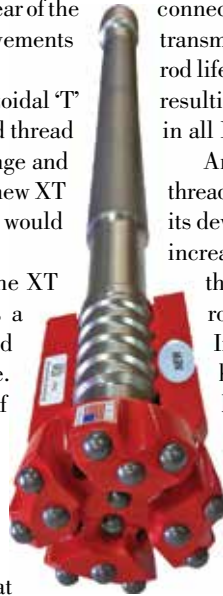
comprise the Vector Rod system.

Because the XT thread guide feature improves thread alignment, the impact duration when 'rattling' rods, as required in uncoupling connections, is minimised. This leads to lower wasted energy transmission, cooler couplings on rods, and ultimately to longer rod life. Thread grease is also better retained on the thread pitches resulting from the new XT geometry, further increasing thread life in all XT components.

Another key advantage of this rod system over traditional threaded components is providing straighter holes and minimising its deviation, explained Rockmore. The guided XT thread feature increases the rigidity and stability of the connections between the shank adapters, rods and bits so significantly that overall rod bending is minimised and hole straightness improved. In fact, this improvement allows for larger and deeper blast holes to be achieved using existing rod diameters, but only by converting to XT threaded components, said Rockmore.

The Vector Rod system is offered in multiple configurations of button bits, MF rods and shank adapters. These drill string components are available in XT38, XT45, XT51 and XT60 thread types, designed for use in surface and underground percussive drilling. ■

Website: www.rockmore-intl.com



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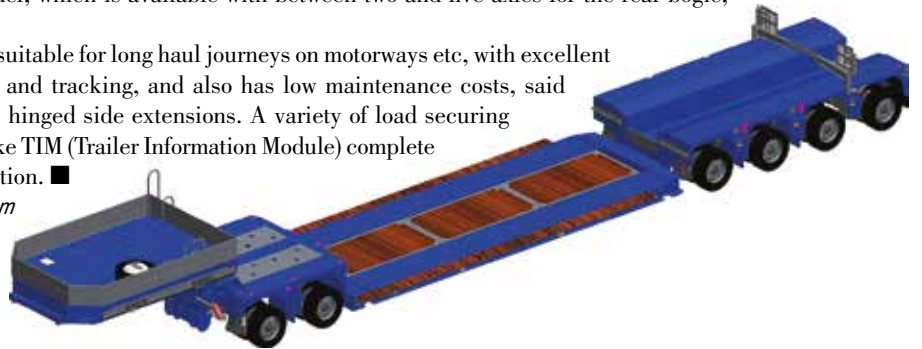
Goldhofer STZ-VP low loader semitrailers

Goldhofer's STZ-VP low loader semitrailers are light, low and agile. These compact vehicles, with an axle spacing of just 1,360 mm and short overhangs, are available with between two and eight axles and can be configured with a range of cargo decks, from flat beds to crawler decks and vessel bridges. Thanks to their low deadweight, the vehicles can also carry high payloads.

With fifth-wheel loads of between 17 and 45 t (depending on national regulations), an axle load of 12 t (at 80 km/h), two different vehicle widths (2,550 and 2,750 mm) and a flat deck height of between 200 and 350 mm, the Goldhofer STZ-VP series is highly versatile. A steering angle of 60 degrees and a total suspension stroke of 600 mm also make these vehicles manoeuvrable on difficult terrains such as construction sites. In addition, the low loader, which is available with between two and five axles for the rear bogie, features a wide and deep excavator recess.

The STZ-VP's pendular axle technology is suitable for long haul journeys on motorways etc, with excellent performance in terms of suspension, steering and tracking, and also has low maintenance costs, said Goldhofer. The flat bed is extendable and has hinged side extensions. A variety of load securing options and user-friendly monitoring systems like TIM (Trailer Information Module) complete the offering for efficient and economical operation. ■

Website: www.goldhofer.com



Right: The Goldhofer STZ-VP 6 drop deck vehicle features six axle lines.

Demag cranes return with improved power

The Demag AC 130-5 from Terex Cranes is a 130 t, five-axle all-terrain crane with a total length of 14.3 m and a carrier width of 2.75 m. The crane comes with a standard 60-m-long main boom, but can reach a system length of more than 86.5 m with additional main boom extensions. When travelling, the crane is designed to stay under the 12 t axle limit while still carrying a payload of up to 450 kg.

The Demag AC 220-5 all-terrain crane has a main boom length of 78 m, which can be extended to a full 99 m with boom extensions. This 220 t capacity class machine features a compact frame of 14.5 m long and 3 m wide for navigating in confined areas. The crane also stays under the 12 t axle transportation limit while carrying up to 600 kg.

The 250 t Demag AC 250-5 all-terrain crane features a total length of 14.5 m and a carrier width of 3 m. Its clean axle loads allow the crane to stay under the 12-t-per-axle road limit while still transporting up to 550 kg of payload.

All of the cranes use a single engine concept with an intelligent motor management system to reduce operational and maintenance costs. They can also be outfitted with the optional IC-1 Plus control system, which calculates lifting capacities for every position of the boom subject to the slewing angle of the superstructure. This enables users to use their maximum lifting capacity especially when lifting over the outriggers. In addition, the cranes have



Above: Demag AC 250-5 features a total length of 14.5 m and a carrier width of 3 m.

Left: Demag AC 130-5 comes with a standard 60-m-long main boom, but can reach a system length of more than 86.5 m with additional main boom extensions.

excellent manoeuvrability with all-axle steering, independent rear axle steering and dynamic launch control. ■

Website: www.terex.com/cranes

Hamm 3000 series compactors

The 3000 series compactors from Hamm are easy to operate and versatile, featuring excellent driving and handling characteristics thanks to the three-point centre pivot assembly. This series is targeted at customers in the Middle East, Asia, Africa and South America. The available options reflect the requirements of these markets, which include a compactometer, a canopy and a fuel prefilter. A wide range of lighting, tyre and comfort versions are also available.

Depending on the model, the engines of the compactors with operating weights of 10 t or above comply with the requirements of Tier 2/Stage II or Tier 3/Stage IIIA. The Tier 2 models, the 3410 (10.7 t) and 3411 (11.4 t) have been slightly modified; from now on they will offer more comfort and safety features in the standard version, and will be able to compact at full power in ambient temperatures of up to 50°C thanks to a modified cooling concept. ■

Website: www.wirtgen-group.com/singapore



Hamm 3410 compactor is one of the models in the 3000 series.

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Sandvik QJ341+ crusher and DT912D tunnelling jumbo

The Sandvik QJ341+ jaw crusher has a new pre-screen feature that provides high amplitude for excellent separation. This enables the removal of a large amount of fines, resulting in greater efficiency, higher productivity and less wear on the crusher. The QJ341+ is therefore ideal for quarrying applications where a high proportion of fines in the feed material are found, as the pre-screen function 'screens out' this material prior to entering the crushing chamber. Test results have already demonstrated increased productivity by as much as 38 percent in certain applications, said Sandvik.

To complement the pre-screen, Sandvik has designed a new telescopic natural fines conveyor, with a discharge height of 3.1 m to deal with the increased flow of pre-screened material. The dirt chute features a steeper angle to enable a faster transfer of material, whilst also increasing the ability to deal with sticky material. The three-position dirt chute allows all material passing the pre-screen grizzly to be diverted onto either the main conveyor or the natural fines conveyor. In the middle position it allows a screened product to be produced out from the fines conveyor. All of this is done by positioning the three-way chute without removing any media from the pre-screen.

The QJ341+ is also equipped with hydraulically adjustable CSS setting, reversible jaw and hydraulic drive enabling the crusher to start under load, thereby maximising uptime. Other benefits of the QJ341+ include a new improved self-locking hopper for quick and safe set-up from ground level, plus highly efficient bent axis and radial piston motors throughout, which will reduce hydraulic flow rates and increase fuel economy as well as improving durability.

In addition, the new Sandvik DT912D tunnelling jumbo is designed for limestone applications. This self-contained, high-reach, single-boom 24 t jumbo offers fast and accurate drifting and production drilling of 12 to 125 sq m cross sections. The unit has a 25 kW high frequency RD525 rock drill for excellent drilling performance and long lifetime.

As standard, the DT912D features an electric controlled drilling system with added automatic functions, including one-hole automatics. It is also fitted with an SB150 universal boom for large, optimally shaped coverage and full automatic parallelism. Apart from face drilling, the versatile boom may also be used



Sandvik QJ341+ jaw crusher (above) and DT912D tunnelling jumbo.



for crosscutting, bolt-hole drilling and extension drilling.

A 4 cu m onboard compressor, together with an extra-large 1,000 l water tank for air-mist flushing, enables the DT912D to operate independently from the tunnel or mine infrastructure, thereby guaranteeing a longer drilling period from one set up. This enhances the efficiency of the total cycle time and gives extra flexibility of use. The DT912D offers rapid, safe and balanced tramping thanks to its four-wheel-drive centre articulated carrier.

The FOPS/ROPS cabin is ergonomically designed and well insulated to minimise noise and vibration; the noise level remains under 73dB (A) at all times. As an option, the cabin is also available with a cabin lifting system delivering better visibility for tramping and

drilling. Furthermore, the Sandvik Intelligent Control system Architecture (SICA), with comprehensive built-in diagnostics and user-friendly controls, ensures ease of use and maintenance.

The DT912D jumbo offers different instrumentation levels to choose from to meet various needs. The silver package is for drilling angles and depth monitoring, while the gold package offers semi-automatic drilling according to drill plan. The platinum package, being the most comprehensive one, has the advantage of automatic boom movements and drilling cycle. The gold and platinum packages are integrated with the Sandvik iSURE tunnel management tool for accurate drilling, charging and blasting plans. ■

Website: www.construction.sandvik.com

Carmix TrailerPump 15 concrete pump

The new Carmix TrailerPump 15 concrete pump features a height and width of about 1.5 m, and is a little over 4 m long, making it easy to manoeuvre on the job site. Operators can also reach particularly high or difficult areas.

The unit is equipped with a twin-cylinder piston pump with a hydraulic control that ensures a capacity of up to 15 cu m/hr at a pressure of 70 bars. The large hopper (240 l) with the agitator, the grid with a 12 V electro-vibrator and the EasySpritz system, which optimises the pumping performance, are among the key factors that help increase productivity on the job site.

All operating parameters are available through electromechanical devices, while the pump can be controlled through a remote control with four functions. In addition, the Concrete-Mate weighing system provides high accuracy for the preparation of concrete. The Promix digital device ensures a perfect

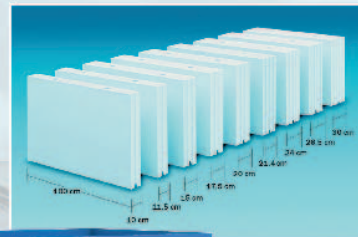


The Carmix TrailerPump 15 concrete pump is highly compact, allowing operators to reach difficult areas.

mix design; thanks to the sensor installed in the barrel, it transmits information on the slump, temperature, humidity, speed of rotation of the cement mixer to the cab, and also indicates when the mix is ready.

The TrailerPump 15 is compatible with the entire range of self-loading cement mixers, from Carmix One to the latest addition, the Carmix 3500 TC. ■

Website: www.carmix.com



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Efficient formwork system for new ‘urban oasis’

Sims Urban Oasis is a new residential development in Singapore, located at the junction of Sims Drive and Aljunied Road. Woh Hup (Private) Limited was appointed contractor on the project.

To carry out the work, Woh Hup opted for Peri's new lightweight formwork, DUO, which enables efficient forming of walls, columns and slabs by using a minimum number of system components. Core components of DUO are panels, including replaceable formlining and couplers to connect the panels.

Simple handling of the formwork allows high productivity on site; almost all operations can be carried out without any tools, said Peri. And with its low weight, cranes are not needed as the largest panel weighs less than 25 kg. Thus, the application of DUO can save valuable time and high costs.

Another advantage of DUO is the significant reduction of construction noise, as the formwork is made of composite material (polytech). This feature was definitely beneficial for the Sims Urban Oasis project, which is located in the centre of a living area. ■



Above: Sims Urban Oasis under construction.

Below left: Peri's new DUO lightweight formwork was chosen for the project. Simple handling of the formwork as well as its low weight and uniform system components allow high productivity on site.

Website: www.periasia.com



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Genie equipment scores in Vietnam tunnel project

The 33 m high and 8 km long Ca Mountain Pass crosses Dai Lanh Mountain that sits between Phu Yen and Khanh Hoa, two south-central provinces in Vietnam. With the rising industrial zone and big-scale economic hub and tourism development projects in these two provinces, the Vietnamese government saw a dire need to build a safer, more direct route between them.

In November 2012, Vietnam's Ministry of Transport launched a project to build a tunnel through the Ca Mountain. It is expected to reduce travel time by 75 percent and save at least US\$10 million in transportation cost annually. The Deo Ca Tunnel, as it is called, will be 3.9 km twin tunnels, each with two traffic lanes. The project is expected to be completed by end of 2017.

The main construction work was completed in June 2015, and the project moved into installation work of mechanical and electrical components of the interior structures, such as fire alarm, camera and electrical circuitry. One of the main jobs was the installation of huge air ducts, each weighing 980 kg and measuring approximately 5 ft in diameter and 3.3 m in length. These air ducts needed to be installed one by one in a tight space of not more than 8.5 m wide per tunnel.

A Genie GTH-844 telehandler and two Genie Z-45/25 boom lifts were used to carry out the installation work, with only four workers needed on the booms and one on the telehandler. The tricky aspect of it was that all of the machines had to be well coordinated in their operations despite the tight space of the tunnel. Hai Thach Group was the company contracted to do the installation. The project was serviced by Tuyet Nga Co Ltd (TNC), a Genie distributor that has offices in Ho Chi Minh City, Hanoi and Danang.

The Genie GTH-844 was used to lift the air ducts. The telehandler was specifically chosen because of its versatility; it not only periscopes vertically, but it can also reach out horizontally. This helped position an air duct quickly and smoothly, while workers standing in the Z-45/25 booms could work on the final installations efficiently.

The GTH-844 has a width of 2.48 m, maximum lift capacity of 3,629 kg and maximum lifting height of 13.41 m. The telehandler proved to be excellent for heavy-duty works, such as loading, unloading and moving the air ducts without having to move the machine much. This is a critical benefit when working in a tight space like the road tunnel.

The Genie Z-45/25 was used to lift the workers to the appropriate heights. Its 180° platform rotation and 355° turntable rotation allow the workers to move the platform exactly where they need it to be. The boom has a working height of 15.87 m and lift capacity of 227 kg. The



Above: A Genie GTH-844 telehandler and two Genie Z-45/25 booms were used to carry out the installation work in the tunnel. Below: Completed air ducts installation work.



model with jib boom moves with a range of 135° vertically for extra working range. The Z-45/25 also has a tight turning radius and zero tail swing for manoeuvring in confined work areas. The electric-operated Z-45/25 offers quiet, emission-free operation, which is important in a poorly ventilated road tunnel environment.

The project required only five workers to complete the installation job in five days. According to Genie, the key reason for the machines' productivity is their ability to be deployed in the correct position quickly and efficiently, and thus workers can proceed with other installation work and bring the project to completion much earlier than planned. ■

Website: www.genielift.com



The Deo Ca Tunnel will be 3.9 km twin tunnels, each with two traffic lanes. It connects Phu Yen and Khanh Hoa, two south-central provinces in Vietnam.

Nicolas MHD helps ‘connect’ HK-Zhuhai-Macao Bridge

A part of the massive Hong Kong-Zhuhai-Macao Bridge (HZMB) project involves the design and construction of a 9.4-km-long viaduct section from the Hong Kong boundary to Scenic Hill on the Airport Island, supporting dual three-lane carriageways over deep waters. This bridge features a pre-stress and precast pier structure. In order to transport the precast bridge elements, Dragages Hong Kong relies on its Nicolas MHD G2 SPE modules.

The Nicolas MHD G2 is available as two-, three-, four-, five- and six-axle module and can be equipped with a 215 or 410 hp Tier IV final PowerPack. Coupling sets make the combination with G1 vehicles easy. Mechanically steered vehicles can be coupled with electronically steered ones with special connection equipment. The MHD G2 is also in use as automatically guided vehicle, proving its high degree of flexibility and versatility. ■

Website: www.tii-group.com



Nicolas vehicle transports precast bridge elements on the HZMB project.

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Liebherr cranes 'climb' at Azerbaijan's new landmark

Four Liebherr luffing jib tower cranes - two 280 HC-L 12/24 Litronic and two 542 HC-L 18/36 Litronic - are currently working on The Crescent Hotel project in Baku, Azerbaijan. The hotel, part of The Crescent Bay development, is built on a small artificial island and will reach 166 m high. Based on the half-moon on the flag of Azerbaijan, the tower will be shaped like a vertical sickle open at the bottom. The Crescent Bay development comprises three elements: The Crescent Hotel, The Crescent City (office tower) and The Crescent Place (retail and entertainment centre).

At the construction of the hotel, the Liebherr cranes are able to climb up inside the building, thus leaving the space on the ground for other construction machinery. The cranes climb through the openings in the storey ceilings, which means that the entire climbing system is easily accessible. The resulting cavities are closed again as soon as the cranes have climbed past them.

The first storeys of the building had been completed when the cranes were assembled in April 2015. Therefore, the four Liebherr luffing jib cranes were attached by a crawler crane from above to the external frame. The two 280 HC-L cranes have a maximum hook height of 177 m, a radius of 35 m, a lifting capacity of 11 t at the jib head and a 110 kW heavy-duty hoist gear. The two 542 HC-L cranes have a radius of 50 m, a lifting capacity at the jib head of 9.7 t and a motor capacity of 160 kW to reach a maximum hook height of 194 m.

The entire reinforced concrete structure for the hotel will be erected by the four Liebherr cranes. These are believed to be the first internal-climbing cranes in Azerbaijan. ■

Website: www.liebherr.com



Right: Four Liebherr luffing jib tower cranes at the construction of The Crescent Hotel in Baku.

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Ammann fleet works on Bangladesh highway project

Tanvir Construction Companies Ltd recently repaired and overlaid a 75-km stretch of the Dhaka-Aricha Highway in Bangladesh. The company handled virtually all phases of the process - the manufacturing, paving and compacting of the mix - with the help of Ammann equipment.

The work started with the Ammann Apollo DM 50, an asphalt drum type continuous portable plant, which had a daily production volume of 285 to 300 t. The thermodrum unit utilises a triple-heat transfer system that uses conductive, convective and radiation techniques. The process ensures a total transfer of energy to the aggregates, which translates into higher productivity and lower fuel consumption. The innovative flight design enables total heat transfer, a thorough mixing and coating, lower emissions and prevention of bitumen oxidation.

The mix was transported to the jobsite, where the Ammann AP 600 wheeled paver finisher placed two lifts. First came a lift of 60 mm followed by a surface lift of 50 mm. The paver was productive, working at a pace of 5 to 6 m/min. The quality of mix left behind was excellent, and the material was evenly distributed along the screed to create a smooth mat.

The AP 600 extends to 7 m, making it suitable for projects involving two lanes of 3.5 m each. Without the AP 600's wide-width capabilities, a 9-m paver would have to be used, which costs more to operate and is harder to transport, said Ammann.

An Ammann AP 240 T2 pneumatic tyred roller compacted the asphalt, and was also used to seal joints. A ballasting range of 9.5 to 24 t helps make the roller a good fit on diverse jobsites. Also helping with flexibility is the air-on-the-run system, which the operator uses to adjust tyre pressures without ever leaving the cab. ■

Website: www.ammann-group.com

Top, middle and bottom: Ammann equipment - asphalt plant, paver and roller - helps Tanvir Construction Companies to upgrade a 75-km stretch of the Dhaka-Aricha Highway in Bangladesh.



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Sennebogen 655 in dredging operation for water supply

The Rangitata Canal diverts water for land irrigation and power generation from the Rangitata River. As one of New Zealand's longest rivers, this significantly shapes the landscape of the Canterbury Plains in the southern part of the country.

The construction of the 67 km long canal in 1937 fulfilled the long-standing dream of farmers to use the extensive arable land of the country's largest flat plain for agricultural purposes. Since its completion in 1944, the water of the mountain river has flowed through the plain with an average speed of 80 cu m/s and has sometimes carried up to over 10 times the usual water level during flooding. Especially during these times, the river conveys a large amount of sand and gravel into the canal, in addition to the required water, and threatens to block it unless it is regularly cleaned.

Rangitata Division Race Management Limited (RDRML) has recently started using the Sennebogen 655 duty cycle crane with a dragline bucket to keep the riverbed continuously clean. A new unit was supplied by New Zealand-based company Pace Cranes at the end of 2015. The crane is equipped with a 29 m long boom and a 2 cu m dragline bucket. It is driven by a 261 kW diesel engine and has two 160 kN freefall winches. For the dynamic loads in dragline bucket operation, the Sennebogen 655 has been fitted with a reinforced two-row slewing ring and second slewing drive. This considerably reduces the time for a cycle even more, and the riverbed can be emptied faster, especially in critical situations. The special fairlead and a deflection sheave integrated in the boom ensure optimum rope guidance and minimise wear at the same time. ■

Website: www.sennebogen.com



Sennebogen 655 duty cycle crane helps to clean sand and gravel from the riverbed of the Rangitata Canal in New Zealand.



The crane is equipped with a 29 m long boom and a 2 cu m dragline bucket. It is driven by a 261 kW diesel engine and has two 160 kN freefall winches.

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Terex tower cranes build new temple in India

Gammon India is using two Terex CTT 331-16 flat-top tower cranes to build the new Temple of the Vedic Planetarium (ToVP), currently taking shape on the banks of the Ganges in the town of Mayapur, West Bengal, India. When completed, the ToVP is set to be the largest Vedic temple in the world. The two cranes - one freestanding with a height under hook of 92.6 m, and the other using a special single tie-in collar to achieve an under hook height of 120 m - were supplied through Terex Cranes' local dealer, Harsadhan International.

Both cranes have another year or so on site before work at the temple is finally complete and in particular its main centrepiece dome, which will stand at a height of 113 m. This main dome houses the Vedic Planetarium providing visitors with a tour of the various regions of the cosmic creation. Beginning at the lower planets, pilgrims travel up through the earthly realm and then onto the higher planetary systems before passing beyond the boundary of the material universe. Within the spiritual realm, visitors view the various planets, before finally arriving at the topmost abode of the Supreme Lord Sri Krishna.

Construction of the ToVP had certain restrictions making it more difficult to complete the contract. The main challenge was that the cranes were not allowed to be fixed to the temple structure. This meant specifying one freestanding crane and one with a collar that is fixed into the ground using ground anchors. The pre-tensioning equipment for the collar has been specifically designed in-house by Gammon India. Tower cranes with collars tend to be used when constructing curved structures such as cooling towers, but rarely on regular shaped buildings, said Terex Cranes.

The Terex CTT 331-16 with HD23 tower has a 92.6 m freestanding height, which can be extended to 120 m when fitted with just one collar. The collar is located at a height of 70 m, allowing the crane a further 50 m to climb before reaching its maximum operating height. The freestanding crane uses four slightly larger 2.32 m square HD23 26.6 tower section at the base. Above these eleven, 2.28 m square cross-section towers were used. All are 6 m long, the smaller sections weighing 4,823 kg including ladders, platforms and assembly equipment.

Both cranes have 70 m jibs capable of lifting 3.5 t at the end of the jib. The CTT-331-16 has a maximum jib length of 75 m and can lift up to 16 t at a maximum radius of 22.4 m. On site the cranes have been lifting



Above and left: Terex CTT 331-16 flat-top tower cranes are being used by Gammon India to build the new Temple of the Vedic Planetarium in Mayapur, West Bengal. The main challenge was that the cranes were not allowed to be fixed to the temple structure; this meant specifying one freestanding crane and one with a collar that is fixed into the ground using ground anchors.

rebar, concrete, stainless steel formwork panels, which form the shape of the dome and finally a Kalasa which will be at the dome's pinnacle.

As well as being unable to tie the cranes into the structure and having to design the collar and pre-tensioning cables, the site was difficult to reach being surrounded by water on three sides. Many of the materials and equipment used has been transported by water boats, which are often used to move

items in this part of India.

The ToVP is an ambitious project representing the International Society for Krishna Consciousness (ISKCON) - or the Hare Krishna movement - now globally recognised as an authentic spiritual tradition. Combining modern technology, ancient science, timeless wisdom and lively culture, the Temple is set to be a popular spiritual destination. ■

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Going around Turkey with Haulotte access equipment

Turkey is currently building a high-speed railway between the capital, Ankara, and the financial capital, Istanbul. The line will include 21 new stations across the country and constitutes a key element of the government's plans to increase the share of rail transport by improving productivity and effectiveness of railway operations.

The Ankara station, scheduled for completion in 2016, is set to be one of the most important and largest public buildings in the city. It is planned to initially serve 20,000 passengers and its capacity is expected to be raised to 50,000 in the near future. Acarlar Makine, Haulotte's dealer in Turkey has supplied several units to help build this station. Among them are the H15SX and H18SX diesel scissor lifts, HA18SPX diesel articulated boom and H43TPX diesel telescopic boom.

The Haulotte H15SX and H18SX are suitable for the job with their ergonomic and spacious designed platform, thanks to the double extension that can be loaded up to 500 kg. The excellent handling 4WD with hydraulic differential lock greatly improves the traction on rough terrain handling. The HA18SPX has high flexibility throughout the working envelope and 360° continuous turntable rotation, whereas the H43TPX is designed to reach the most difficult working areas and increase time efficiency and productivity.

Besides the high-speed train, Haulotte and Acarlar are also working on other major infrastructure projects in Turkey. The Osman Gazi Bridge is one of them, which has just been completed with the installation of the last bridge deck. It is said to be the fourth longest suspension bridge in the world by the length of its central span, and

is expected to cut the travel time between Istanbul and İzmit from nine hours to three-and-a-half. Many of Haulotte machines have been used to build the structure of the bridge and install and fix the steel beams. Among them were the Compact 12 with its 450 kg capacity, as well as several units of the HA41PX-NT, which is known for its rough terrain capabilities. ■

Website: www.haulotte.sg



Above: Haulotte H43TPX diesel telescopic boom works on the Ankara station project.

Left and far left: Haulotte Compact 12 scissor lift (left) and HA41PX-NT boom at the construction of Osman Gazi Bridge.

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Trimble speeds up earthworks project in Australia

Georgiou Group was recently awarded a land development project in Alkimos, approximately 50 km north of Perth, in Western Australia. This six-month project involved moving 600,000 cu m of sand, rock and limestone 1.5 km between the cut and fill zones. The site measured 2 km long by approximately 600 m wide. Georgiou turned to SITECH Western Australia and Trimble for help understanding payloads, movement of material, and productivity of operators and mass haul routes.

The company adopted a range of Trimble solutions including the 3D GCS900 Grade Control System, 2D Project Monitoring on Haul assets and Loadrite X2350 excavator scales. Data from this hardware was used by InsightHQ and VisionLink software to improve productivity, increase data transparency and accuracy, and therefore reduce costs. Georgiou used Business Centre - Heavy Construction Edition (HCE) software for Mass Haul Analysis and Design Creation. Utilisation of SCS900 Site Controller software and Unmanned Aerial Vehicles augmented the site solution.

Georgiou began by equipping two 125-t excavators and one 85-t excavator with the Loadrite X2350 excavator scales and 2D VisionLink monitoring devices. The Loadrite X2350 excavator scales reported live data to InsightHQ for analysis and goal-setting. Monitoring devices were also fitted to 16 dump trucks. The primary goals focused on productivity, tracking material moved, reducing their carbon footprint and keeping staff a safe distance from machines on the jobsite.

Trimble's VisionLink - a fleet, asset and site productivity management software - was then used to capture data from dump trucks to be analysed and displayed through dashboards available on iPad. The Loadrite system gave excavator operators precise weight information to optimally load dump trucks. Trimble GCS900 GPS systems were used to track project progress and monitor material movement and the locations where material was cut and filled. Business Centre - HCE created a digital terrain model of the Alkimos project site. The company also used Business Centre - HCE's Corridor Mass Haul module to define haul zones and perform a comprehensive mass haul analysis of the project.

Georgiou explained that one of the biggest advantages of using the Trimble solution was being able to determine and track the cost of moving a cubic meter of dirt on a daily basis. Project management could see how quickly trucks were being loaded and show operators their individual productivity data compared to other operators.

Operators running excavators and dump trucks were able to work as normal, loading material from the first cut zone and dropping it at the fill zone. The Trimble SNM940 Connected Site Gateway relayed production data to VisionLink and InsightHQ to gather payload information. Georgiou said that data from the Loadrite scales centralised performance and productivity information across the range of machine sizes, brands and models.

Georgiou and the equipment operators had real-time information about load counts, idle times, time stamps when trucks are loaded, and travel time for material movement. From the office and using iPads in the field, supervisors were able to access information immediately and work with operators to improve productivity. Georgiou explained that on a daily basis supervisors could graphically see project status, comparing a six-month project timeline to productivity to date. To track the progress of material moved at the end of each month, Georgiou also ran Trimble's UAV system to capture point cloud data and build a terrain model of the Alkimos site.



Top and above: Georgiou Group was recently awarded a land development project, which involved moving 600,000 cu m of sand, rock and limestone 1.5 km between the cut and fill zones.

Below, left and right: The company adopted a range of Trimble solutions to help with understanding payloads, movement of material, and productivity of operators and mass haul routes.



Within two weeks of using both Loadrite excavator scales and InsightHQ reports, Georgiou realised that although each truck was full by volume, they were under-loaded by weight due to lower density material and could take a further 8-t each. The company said that, as a result and with the same haul fleet, it could finish moving 600,000 cu m of material in four months instead of six, providing significant cost and time savings to its client. ■

Website: construction.trimble.com



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Bauer's foundation expertise for Gotthard Base Tunnel

The Gotthard Base Tunnel in Switzerland - the longest and deepest railway tunnel in the world - was finally opened in June 2016. This twin-tube tunnel ran from Erstfeld to Bodio. Construction work on the project started in 1999, and the tunnel was excavated from five different starting points simultaneously. The northernmost starting point was in Erstfeld, from which the tunnel was extended towards the south.

In 2005, Bauer carried out foundation work for the ARGE VGE Lot 1. The main work consisted of bored piles with diameters of 1,200 and 1,500 mm, which were drilled to 33.5 m under extremely difficult conditions, i.e. in boulder-like landslide material. A Bauer BG 40 rotary drilling rig was used on this project.

Bauer installed permanent anchors up to 70 m long in the pile wall. For this, bore holes were drilled through the boulder-like unconsolidated rock through to the solid rock. As a first step, the excavation pit served as a starting pit for the tunnel boring machine. After completion of the drilling works, the tunnel was constructed in this area using the open-cut tunnelling method, then the excavation pit was refilled.

From January 2011 to August 2013, Bauer also constructed

foundation piles for a 1,060 m long viaduct between Lugano and Bellinzona. For the static basis of the structural design, test piles were constructed beforehand and static pile load tests were carried out. A total of 313 cast-in-place concrete piles with a diameter of 1,200 mm and lengths of up to 29 m were drilled and concreted.

Furthermore, Bauer was involved in the construction of the tunnel. The company was commissioned – partly as a joint venture – with the construction and operation of two water treatment plants: in Amsteg, where the resulting mountain water had to be treated before its introduction into the river, and in Faido, where Bauer installed a nitrite treatment plant due to the high nitrite concentration resulting from the explosives used in the tunnel driving.

The breakthrough in the east tunnel took place on 15 October 2010, and the west tunnel on 23 March 2011. Test operation began in October 2015. At the start of June 2016, AlpTransit Gotthard AG handed over the operation of the tunnel to Swiss Federal Railway (SBB). After further testing, the tunnel is planned to be put into operation as the heart of the new Alp Transit on 11 December 2016. ■

Website: www.bauer.com



Bauer carries out foundation work for the ARGE VGE Lot 1 (left) on the Gotthard Base Tunnel project, with the help of its BG 40 rotary drilling rig (right).

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Extensive formwork technology for Lahntal Bridge

Doka is currently working on the Lahntal Bridge project in Limburg, Germany. This 450-m-long girder bridge, with an overall width of 43.50 m, is being built just a few metres west of the old viaduct. Work started in September 2013, and the new bridge is scheduled to be open for traffic in the second quarter of 2016.

Haunched, twin-cell pre-stressed concrete box girders form the superstructures. Pairs of super-slim, circular reinforced concrete columns will transfer the loads of the bridge. Cantilevering method is used to construct the superstructures. Secondary pier structures provide additional stability for the build phase. Lead contractor is Max Bögl Stiftung & Co KG. Doka was awarded the contract for the extensive formwork technology.

Doka's Xclimb 60 automatic climbing formwork is used to build the circular-section columns of the primary piers. The system climbs hydraulically and is anchored to the structure at all times by guiding shoes. So it can climb even when wind speeds are as high as 72 km/h. The formwork itself is made up of Top 50 large-area formwork planned specifically for this project. The panels consist of H20 top timber formwork beams and WU14 steel walings. Maximum pouring height is 5.75 m at a formwork height of up to 6 m. The XS ladder systems with cages ensure safe up/down access between the three platform levels.

Asymmetric pier heads are the springers for cantilever construction. These pier heads are constructed on top of each pair of primary piers and are anchored into the adjacent pair of secondary piers. There are 675 cu m of concrete in each pier head.

Two HEB 1000 primary beams, each featuring 20 m long, are the basis of each pier-head formwork structure. The secondary beams are ten coupled CFT anchoring cross beam. Together they carry a closed workspace flat measuring 340 sq m poised at heights of up to 50 m above the valley floor.

The bottom slab, weighing 437.5 t, is the first section of the pier head, which subsequently carries the weight of the second and third sections. Doka supplied the necessary planning and material for two formwork sets, each consisting of 950 sq m of project-specific Top 50 beam grills. Comprehensive fall-protection systems were also needed at the exposed platform ends for the second and third concreting sections.

The superstructures of the Lahntal



Above and below right: The Lahntal Bridge is expected to be open for traffic soon. Pairs of super-slim circular reinforced columns carry the superstructure; the diameter is no more than 2.80 m at the widest and the highest piers are 57 m tall. Doka was awarded a contract to supply its formwork technology for the project.

viaduct are constructed toward each other from pier head to pier head. The cantilever forming travellers work in pairs, so that the horizontal forces acting on the bridge piers are always in equilibrium. Each pair of primary piers has two adjacent secondary piers. They stabilise the pier head at all times while cantilevering is in progress. The monolithic pier heads of the secondary piers have an integral pier reinforcement consisting of steel beams. These pier heads were formed with two sets of Framax Xlife framed formwork.

The cantilever forming travellers on the Lahntal viaduct each have four longitudinal trusses. They can handle varying section lengths from 3.75 to 5 m and concrete weights of up to 250 t. Complete with platforms the bottom grid is 9.50 m wide and 25 m long. With formwork and platforms, each of the four cantilever forming travellers weighs some 130 t. Doka also designed and built a special strand-jack platform using the Bögl company's own materials for cantilevering. This platform was used to hoist the bottom grids straight off the ground without the assistance of heavy-duty truck-mounted cranes.

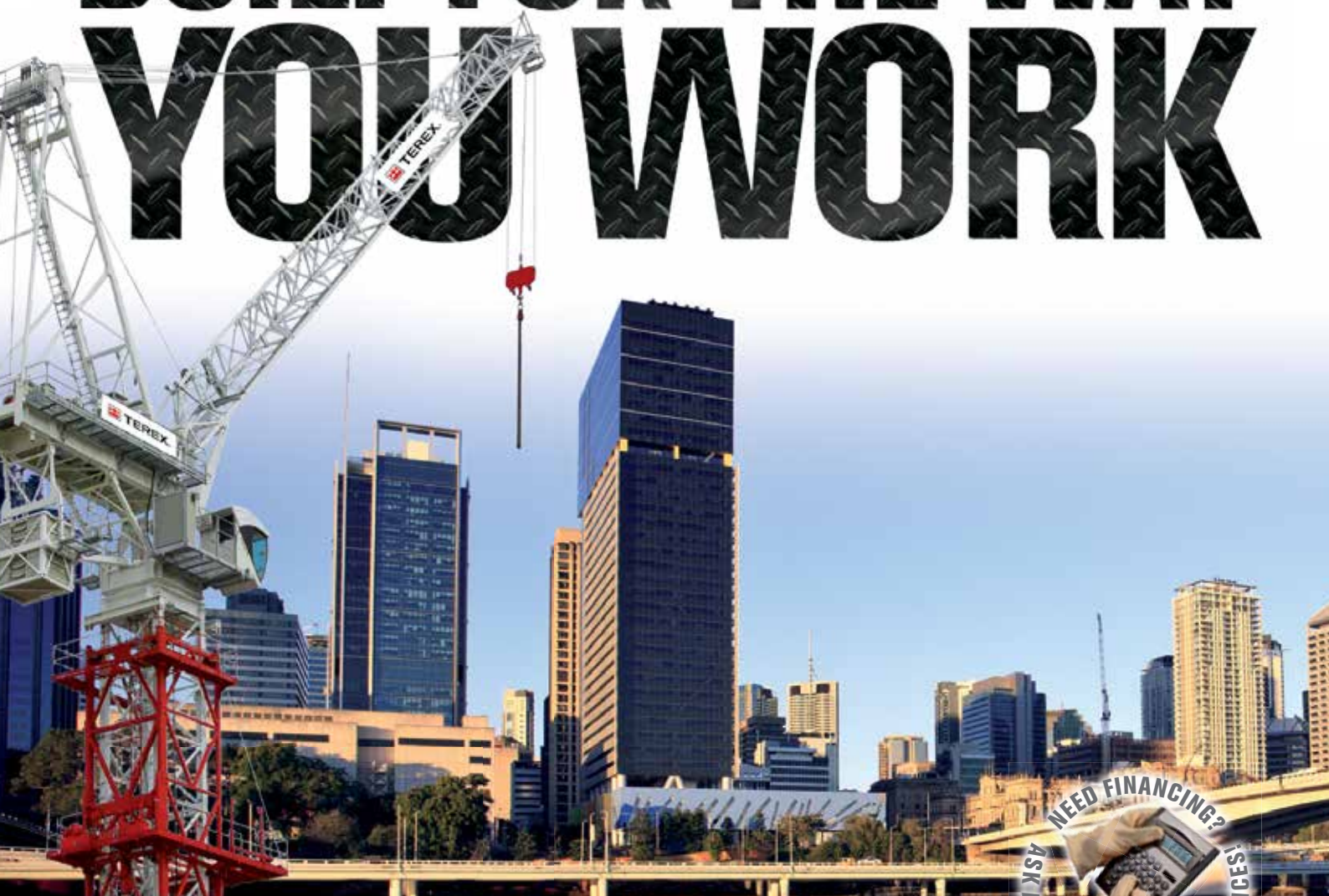
Unlike the typical cycles, the closing cycle has to be cast in two concreting sections. The bottom and the web are cast first. The top-slab rails of the cantilever



forming traveller are then extended without any prior dismantling. The concrete is then cast for the roadway slab. When the closing cycle is completed the cantilever carriage is brought back into position above the axis of the piers. ■

Website: www.doka.com

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Commander III adapts for high-production trimming

Marmot Concrete Services Ltd slipforms a variety of monolithic sidewalk and curb and gutter profiles. The company was recently working on a project in Calgary, Alberta, Canada, with the help of its Gomaco Commander III paver.

Alberta's soil is mostly clay-based and very rocky, which makes simultaneous sidewalk trimming and pouring not possible. Marmot then teamed up with Gomaco to create a high-production Commander III trimmer. It utilises the same framework as a Commander III curb and gutter machine, but with modifications.

The vibrator hydraulics used in paving applications were removed and replaced with a larger, closed-loop trimmer pump to increase power. The trimmerhead was equipped with three air shocks to keep it stable during trimming. If it would happen to hit a large rock, the air shocks reduce some



Marmot's Gomaco Commander III high-production trimmer cuts through the clay-based and rocky soil found in Calgary, Alberta, Canada.



Above: The three-track Commander III machine, with an extra concrete conveyor, slipforms 800 m of the profile at the Mahogany Central Beach site in Calgary.

Below: An aerial view of the Mahogany Central Beach development.



of the force of impact into the Commander III's mainframe.

Two conveyors moved the material through the machine and away from the trimmed grade. The transfer conveyor is located on the front of the machine and moves material from the trimmerhead towards the discharge conveyor at the back. Each belt is 508 mm wide and 3.4 m long. The discharge conveyor has 2.1 m of sliding capabilities to give contractors the choice of discharging into the centre of the roadway or placing the material over the stringline.

According to Marmot, the new Commander III trimmer allows the company to achieve about 800 to 1,000 m per day, per machine, compared to the old method of trimming that would only do 500 m.

Furthermore, Marmot also worked at the Mahogany Central Beach site, a new lake community in Calgary. Here, the company was tasked to build a wall that prevents the sand from blowing into the grass at the new development.

The profile that was created has a 2.5 m wide sidewalk with an 800 mm face on it. For this, Marmot set up stringline in its yard and started conducting tests with the Commander III. A total of 2 cu m of concrete were needed to slipform 1 m of the profile. At first, Marmot tried dumping concrete on the ground in front of the paver, but that did not work. A single conveyor also could not keep up with the concrete demand. So, the company decided the only way it could get enough concrete into the mould would be to mount a second conveyor to the Commander III and dump two ready-mix trucks at one time.

With testing successfully concluded in Marmot's yard, it was time to move the Commander III to the Mahogany Beach site and begin work on the project. Just 10 days later, the 800 m of retaining wall with sidewalk was completed. The concrete for the project was a 32 MPa city of Calgary mix design with an average slump of 10 to 15 mm. Since the profile was not slipformed over any steel reinforcing, fibre was added to the concrete. Twelve ready-mix trucks, two trucks every 20 minutes, carried 8 cu m loads to keep the Commander III supplied. ■

Website: www.gomaco.com



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MAKING THE GRADE



TO MEET THE GROWING DEMAND FROM THE ROAD-BUILDING SECTOR, SHANDONG LINGONG MACHINERY CO LTD (KNOWN AS LINGONG) IS EXPANDING ITS RANGE OF SDLG MOTOR GRADERS. AMONG THE HIGHLIGHTS IS THE G9190, WHICH IS GAINING POPULARITY IN ASIA.

The G9190 features a 3,658 mm mouldboard for wider grade coverage, and is powered by an DDE BF6M1013 EC engine. The low-noise engine is matched to the grader's electro-hydraulic transmission control system, allowing the operator to select the correct gear, depending on load, for optimum efficiency and power.

"The use of hydraulic cylinders also reduces stress on the machine and prolongs the life span of the mouldboard's turning circle," said Anthony Neo, SDLG's director of sales support, Asia Pacific.

The G9190 can be used for ground levelling and grooving, scraping slope, bulldozing, ploughing snow, loosening, compacting, material arrangement and mixing works. The grader has a down force of 8,386 kg to maximise the cut depth without front-end drift, and a tractive force of 82 kN.

The blade can rotate through a full 360° and incline up to a 90° gradient. It is operated via the Moveable Blade Control System (MBCS) for excellent



Top and above: The SDLG G9190 motor grader features a 3,658 mm mouldboard for wider grade coverage, and a down force of 8,386 kg to maximise the cut depth without front-end drift.

grading precision. The FOPS/ROPS cab features wrap-around glass for enhanced visibility. The cab design also incorporates an ergonomic control layout and a shock-absorbent seat that minimises vibration during operation.

“The G9190 has been designed to reduce cycle time and maximise value,” said Yu Mengsheng, president of SDLG. This model has been widely used in Asia - particularly Southeast Asia - and is currently available in Indonesia, Vietnam, Thailand, Laos, Timor-Leste, the Philippines, Myanmar, Cambodia and India. According to Mr Yu, sales for the G9190 have contributed to the consistency of SDLG’s performance among the top three providers of motor graders in the region.

Asia expansion


As Asia is ramping up its infrastructure development, SDLG has seen increasing demand from the road-building sector.

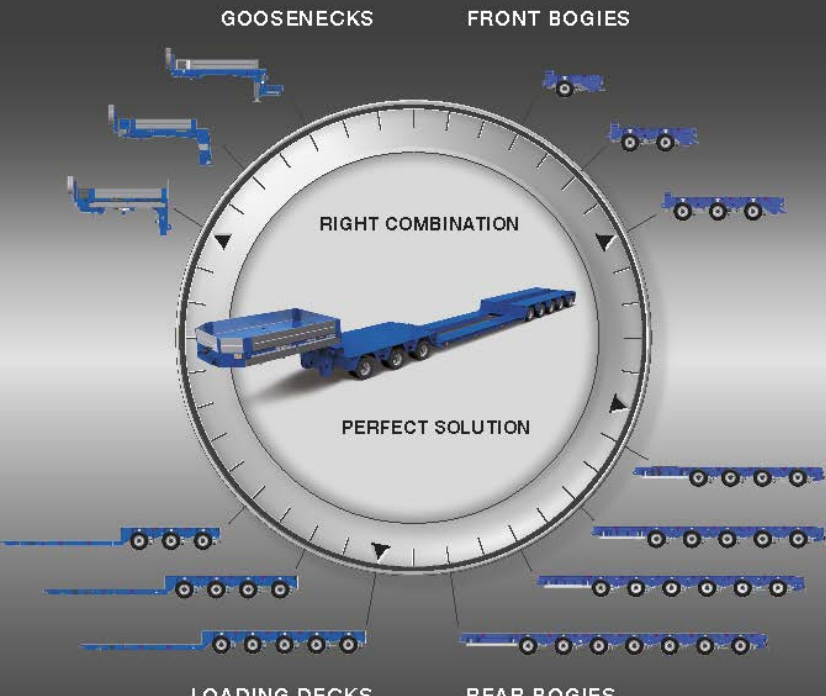
“Many countries in the region, such as India, Malaysia and Indonesia, are planning for improvements to their road



The blade on the G9190 can rotate through a full 360° and incline up to a 90° gradient. It is operated via the Moveable Blade Control System (MBCS) for excellent grading precision.

Continued overleaf...







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infrastructure. These projects, many of which are large in scale, will drive demand for road construction machines in general, and this includes motor graders as well as other SDLG machines,” explained Mr Neo.

“Our customers are also looking for reliable support for their machines to help them meet ever bigger challenges,” added Mr Yu. “By working with an established dealer network that includes experienced service technicians, we can offer dedicated maintenance to complement our fast parts availability.”

SDLG is now represented by 77 dealers worldwide. In 2014, it opened a parts warehouse in Singapore to improve parts availability and service response time in the Southeast Asian market. And to serve

the Indian market, SDLG opened a parts warehouse in Bangalore, southern India.

“With these two parts warehouses, our Asian customers who already have SDLG wheel loaders in their fleet will have an added benefit of receiving parts in a more timely manner, since many SDLG machines feature common engine and transmission parts,” said Mr Neo.

Last year, SDLG launched its range of wheel loaders, backhoe loaders, motor graders and road rollers into Myanmar through its local dealer. In addition, SDLG rolled out its Top Driver campaign in Thailand to enhance machine operators’ skills and improve safe practice on site.

“2015 was a strong year for SDLG, and I’m confident that 2016 will be too. We will



Left: Yu Mengsheng, president of SDLG.



Right: Anthony Neo, director of sales support, Asia Pacific, SDLG.

keep investing in aftermarket support and dealership,” stated Mr Yu.

“SDLG has been steadily growing since coming onto the market in 2009. This year, we have increased our market share significantly for wheel loaders,” said Mr Neo. “There is a demand for reliable products in the value segment. SDLG’s strong manufacturing base in Linyi, China, and an established dealer network in support of the sales team has helped the company seize a significant portion of this demand.”

So how has the slowdown in China’s economy affected SDLG? Mr Yu said, “Although there has been a decrease in sales in China, sales have increased in other markets in Southeast Asia.”

Mr Neo is also optimistic about the future. “We are in a business that is cyclical in nature, so highs and lows are par for the course. But with a number of infrastructure projects in the pipeline across Asia, we see greater room for the business and the construction industry in general to grow.” ■

Website: www.sdlg.com



Top and above: The G9190 motor grader has been widely used in Asia, especially Southeast Asia.


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GET IN THE GROVE



THE GROVE GMK5250L, DESIGNED FOR THE GLOBAL MARKET, IS BELIEVED TO BE THE FIRST ALL-TERRAIN CRANE TO FEATURE THE VIAB TURBO CLUTCH AND INTEGRATED RETARDER SYSTEM. THE FIRST UNIT FOR ASIA HAS RECENTLY ARRIVED, AND WILL BE PUT TO WORK VERY SOON.

The 250 t capacity, five-axle Grove GMK5250L features a 70 m main boom, which also includes Grove's Megaform shaping for better strength and stability. "This model with a long boom is suitable for our customers in Asia, especially given the increasing number of high-rise projects across the region," said Andreas Cremer, global product director for all-terrain cranes at Manitowoc Cranes.

The crane's 21 m hydraulic swing-away jib can be extended with either an 8 m boom extension, two 8 m jib inserts, or a combination of both for a total possible jib length of 37 m. For optimum usage, the full jib can also be operated while the crane is working with its full 70 m boom length extended. Another benefit of the jib is its ability to offer increased offset of up to 50°, compared to a typical 40° on other Grove cranes in its class.

Launched last year, the GMK5250L is believed to be the first all-terrain crane to utilise a VIAB turbo clutch module. "The system protects the transmission so that it doesn't produce heat, therefore it can eliminate fluid overheating and clutch burning, while enabling wear-free starting and breaking," explained Mr Cremer. "It also allows us to achieve fuel savings of around 30 percent compared with its predecessor, the GMK5220."

VIAB is a turbo coupling and integrated retarder all-in-one, which results in less weight and less space, and it comes as standard on the new Grove crane. "The system has already been used by heavy-duty trucks, but we haven't seen it on other all-terrain cranes," said Mr Cremer.

With its 12 t per axle configuration, and dimensions suited to global roading requirements, the Grove GMK5250L offers excellent

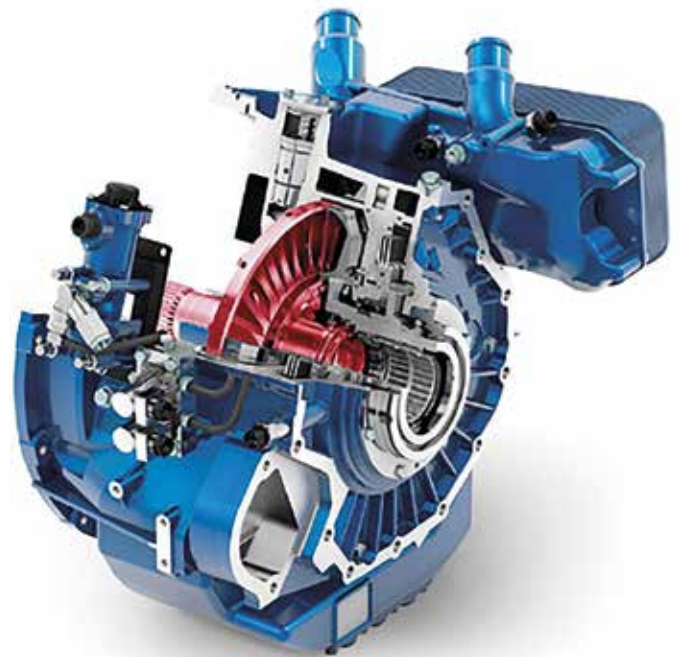
roadability. Compared to the GMK5220, the Gross Vehicle Weight has been reduced to give customers more transportation options, including the ability to carry more equipment on the crane.

Special attention has also been given to the appropriate axle group spacing and specifically the fact that this exceeds 2.4 m – a strict requirement for roading mobile cranes in North America. There are additional design features that make the crane easier to move in countries with stricter axle loading requirements, such as the US, Canada, Norway, Australia and Japan.

Meanwhile at the other end of the scale, in countries where the local requirement is for axle loadings of under 16.5 t, such as the UK, the crane is able move on the highway with up to 21 t of counterweight.

Offering compact dimensions and a maximum outrigger width of only 7.8 m, the GMK5250L can access very tight job sites. An optional self-rigging auxiliary hoist that eliminates the need for an assist crane during on-site rigging is also available and can be interchanged with the GMK6300L and the two smaller models, the GMK5180-1 and GMK5200-1.

Once on the job site, the GMK5250L can be moved while carrying its full counterweight of 80 t. The ability to travel in this configuration saves valuable time on the job, which would otherwise be taken up with installing and removing counterweight sections. “Some of



Top right: The VIAB turbo clutch and integrated retarder system eliminates both fluid overheating and clutch burning, while enabling wear-free starting and breaking.

Above: The GMK5250L has a 70 m main boom, which also includes Grove’s Megaform shaping for better strength and stability

the counterweight slabs are also interchangeable with those of the GMK6300L, GMK5180-1 and GMK5200-1,” added Mr Cremer.

On site movements are made easier with the inclusion of Grove’s Megatrak independent suspension as well as the all-wheel steer system, which means no axles need to be lifted while moving - again enabling the optimum amount of counterweight to be carried. Another solution on the GMK5250L, which has already featured on the GMK6300L and GMK6400, is the HMI (Human Machine Interface). The HMI allows the suspension to be controlled even while in a locked position.

The GMK5250L is equipped with a single engine, which both drives the carrier and powers the superstructure. “We were the first crane manufacturer to develop this concept,” claimed Mr Cremer. “We started it about six years ago on the Grove GMK6400. Using one engine means greater fuel efficiency and less maintenance. Plus, the machine is lighter in weight.”

The engine on the GMK5250L is a Tier IV Final/Euromot 4 Mercedes-Benz OM471LA six-cylinder diesel engine with a 390 kW rating and a maximum torque of 2,460 Nm. However, for less regulated markets, the crane will be powered by a Tier IIIA compliant engine, according to Mr Cremer.

The superstructure cab features the Crane Control System (CCS) and Boom Configurator Mode. The CCS is a user-friendly interface that is now fitted on all of Manitowoc’s new cranes, including all-terrain, crawler, rough-terrain, truck and tower cranes.

Each CCS unit has the same control layout, including a jog dial and central display with standardised symbols. There are only seven major components that make up CCS, simplifying service and maintenance. These components include: crane controller, safety controller, small IO (input/output), large IO, joysticks, jog-dial and display. Each can be easily replaced if necessary, or even switched from another machine for the purposes of completing a job.

The highly intuitive Boom Configurator Mode makes it quick and easy to select the optimum boom position for a specific lift. The operator inputs the lift parameters – radius, load and distance to be moved – and the system calculates the best boom configuration. Once the operator selects the preferred option, the boom automatically extends to the required length.

The CCS is the first control system from Manitowoc to be developed since the introduction of the company's Product Verification Centres (PVC). At its PVC locations, Manitowoc is able to simulate a variety of applications and environments to which individual components are subjected. This allows the company to predict future behaviour and performance and to optimise the design of its cranes and components accordingly, to build-in better reliability, durability and longevity.

First unit in Asia

The first GMK5250L for the Asian market has recently arrived in Singapore, as part of Asiagroup Leasing Pte Ltd's latest deliveries. The company plans to deploy the crane on oil and gas projects, as well as for erecting and dismantling tower cranes.

"Having such a long boom is a real advantage for the GMK5250L. The longer boom means it can work on bigger developments, while its smaller footprint makes it versatile enough to fit a wide variety of projects," said Jeffrey Poh, business development manager at Asiagroup Leasing.

"Having a smaller footprint than other cranes in its class, means better manoeuvrability and that makes it optimal for Singapore's roads."

He added, "We expect the VIAB turbo clutch to mean less maintenance for the crane, which in turn means better utilisation for us and longer working hours for our customers."



Left: Andreas Cremer, global product director for all-terrain cranes at Manitowoc Cranes.

Below and inset: The superstructure cab features the Crane Control System (CCS). It is a user-friendly interface, which is now fitted on all of Manitowoc's new crane models.

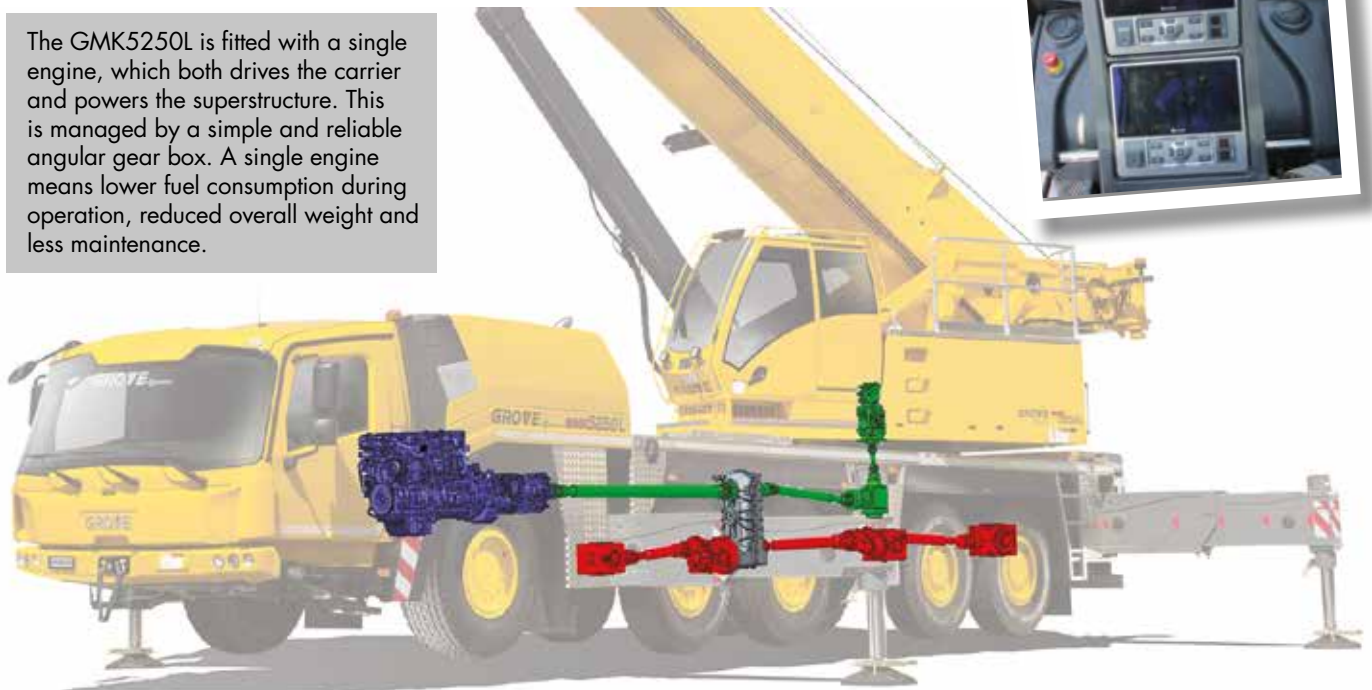
Asiagroup Leasing is one of the largest crane rental companies in the Southeast Asia region. Headquartered in Singapore, it also operates crane supply businesses in Malaysia and Myanmar. The company has ordered nine new cranes from Manitowoc over the past two years.

"Asiagroup Leasing is one of the most forward-thinking crane rental companies in this region and it's no surprise to see them taking Asia's first GMK5250L," said Teo Yew Boon, Manitowoc's sales director for mobile and crawler cranes in Asia Pacific.

"The company has been constantly investing in the industry's most advanced lifting equipment so it can provide better service and better solutions to its customers, and based on this philosophy the GMK5250L is a natural addition for them."



The GMK5250L is fitted with a single engine, which both drives the carrier and powers the superstructure. This is managed by a simple and reliable angular gear box. A single engine means lower fuel consumption during operation, reduced overall weight and less maintenance.



Along with the new GMK5250L, Asiagroup Leasing has also added a GMK4100L – the third of these in the company’s fleet. With a maximum capacity of 100 t and a 60 m main boom, the GMK4100L can reach considerable heights without the need to rig a fly jib. Rigging a jib can be something of a challenge on space-constrained job sites, and it also adds time and cost to overall operations.

“The GMK4100L’s compact four-axle design allows greater manoeuvrability. More importantly, the counterweight can be carried onboard within local Singaporean road regulations. This means that no additional trailer is needed for the mobilisation of the crane and it can start work as soon as it reaches the job site. Ultimately, our customers get cost savings on transportation and complete their jobs faster,” explained Mr Poh.

These latest deliveries to Asiagroup Leasing boosts the number of Manitowoc cranes in the company’s fleet. In addition to Grove all-terrain cranes, the company also operates several 8500-1 and 11000-1 Manitowoc crawler cranes in Malaysia and



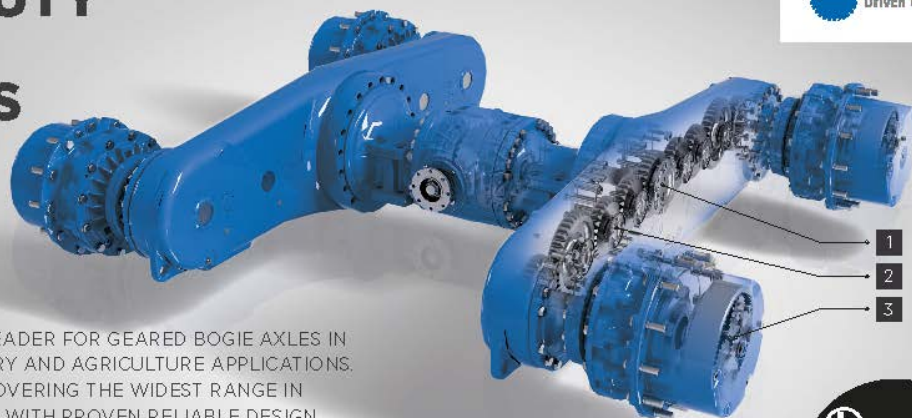
Singapore-based Asiagroup Leasing has taken delivery of the first Grove GMK5250L in Asia. Representatives from both companies are seen here, including (from left) Christophe Simoncelli, Manitowoc; Steven Poh, Asiagroup Leasing; Jeffrey Poh, Asiagroup Leasing; and Yew Boon Teo, Manitowoc.

Myanmar. Mr Poh said, “We find the cranes from Manitowoc are well-suited to the Singapore market, offer reliable performance

and are backed up with excellent after-sales support.” ■

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MSHEIREB STATION



Above: The Msheireb Station in Doha has been designed as a major interchange, featuring almost 200 m long and 180 m wide imposing structural dimensions.

Right: The complex structural geometry as well as massive reinforced concrete components with up to 3 m thick slabs and wall thicknesses up to 2 m required a customised system.



The Msheireb Station in the heart of Qatar's capital, Doha, is being built as a major interchange that connects three lines: the Gold Line, Red Line and Green Line. By 2020, 82 km of tunnel routes and 25 stations will have connected the residential and commercial centres with the suburbs and stadiums for the 2022 World Cup. In the final phase, the Doha metro system will feature a total of four lines and nearly 100 stations.

The Msheireb metro station will have four main levels at a depth of up to 40 m. The inner-city location of the jobsite, along with the imposing almost 200 m long and 180 m wide structural dimensions, placed extremely high demands on the execution of the construction work.

Six stadiums for the 2022 World Cup in Qatar are based in Doha, with a further six others located in cities in the surrounding area. All sports venues will be connected to the rapid transit system (Light Railway System) currently under construction and whose core is formed by the Doha Metro.

The Msheireb Station is one of two major stations awarded to the SOQ Joint Venture (Samsung C&T, OHL and QBC) by Qatar Railways Company (Qatar Rail). It is believed to be the biggest station within the Qatar Rail's Doha Metro development programme.

Formwork and scaffolding system

The project has to be carried out within a tight schedule. For this, Peri was commissioned to supply its formwork and scaffolding systems.

The complex structural geometry and the massive reinforced concrete components, with up to 3 m thick reinforced concrete slabs and wall thicknesses reaching 2 m, required a customised system and rapid material availability of the corresponding system equipment. So, within a short time period, Peri managed to deliver 10,000 sq m of wall and column formwork as well as 150,000 cu m of shoring to the construction site.

For forming the mostly large-sized massive walls, the individually customised Vario girder wall formwork system is being used. In turn, for the single-sided forming of the up to 9.50 m high wall sections against the retaining walls, SB brace frames not only supplement the Peri formwork solution

but also transfer the fresh concrete pressure to the sub-structure. For the higher wall sections, Vario elements together with CB climbing platforms form crane-movable climbing units. The DK anchor system is used for the subsequent sealing of the tie points. These are reliably closed by means of concrete cones using a special sealing compound.

The project-specific shoring concept developed by Peri for transferring the high loads is based on the PD 8 shoring towers, Multiprop aluminium slab props and Peri Up Flex modular scaffolding system. In particular, the Peri Up Flex allows optimum adaptation to suit the wide range of geometries and load requirements due to the 25 cm system grid.

Under the so-called Doha Metro Major Stations Project package, Peri is also providing formwork and scaffolding solutions for the Education City major station. In addition, for numerous other stations along the Gold Line, Peri was selected by the ALYSJ Joint Venture to provide efficient formwork and scaffolding solutions. ■

Website: www.peri.com



The project-specific formwork and shoring concept developed by Peri, just-in-time provision of corresponding system equipment as well as continuous on-site support has facilitated cost-effective execution of construction within the tight schedule.

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THE LIBESKIND TOWER



Above: An artist's impression of the Libeskind Tower, which is also nicknamed 'The Curved One'.

Top right: The base slab of the building was cast in November 2015. A total of 5,890 cu m of concrete was poured in approximately 30 hours.



The CityLife district in Milan, Italy, represents one of the largest redevelopment projects in Europe. It extends over an area of 366,000 sq m, combining public and private developments for housing, business hubs, shopping centres, services and parkland. The project was launched in 2004 and was planned to be completed for the start of Expo 2015, but due to various delays it is now scheduled to be finished in 2023.

Among the highlights of the project are the three CityLife towers, with dedicated areas for offices, shops, restaurants and services. They stand out not only for their sheer height but also for their architectural form. The Allianz Tower was designed by the Japanese architect Arata Isozaki (in collaboration with another architect, Andrea Maffei), the Generali Tower by Zaha Hadid and the Libeskind Tower by Daniel Libeskind. They are nicknamed, respectively, The Straight One, The Twisted One and The Curved One.

The Allianz Tower is 202 m high with 50 floors and 50,000 sq m of office space for more than 3,500 people. Characterised by its straight, slender form, the building is currently the only one of the three towers that has been completed to host the head office of the German insurance group Allianz.

The Generali Tower features a dynamic, twisting movement pointing upwards. At 170 m high and with 44 floors, it will become the Milan head office of the Generali insurance group. The building is expected to be completed in 2017.

The Curved One

The Libeskind Tower has an arched conformation, hence the nickname 'The Curved One'. The foundation of the building was completed in November 2015, while the construction work started this year and is scheduled to continue until 2018. Once completed, the skyscraper will have 31 floors for a total height of 175 m and a total commercial surface area of 33,000 sq m. Apart from this building, Daniel Libeskind has also designed a residential complex in nearby Via Spinola.

The Libeskind Tower will be linked directly to the CityLife shopping district and the three towers' square. It will also be served by a new station along the M5 line of the underground rail system, which was inaugurated in 2015. Vehicle access is via a network of underground roads reserved for the towers and the business units in the area. With the roads and carparks located below ground level, the CityLife could be the largest pedestrian area in Milan.

Inside the tower, the lobby will be arranged on two levels. The shape of each floor of the office space and the surface area of each office will vary, depending on which floor the offices are located with respect to the geometric development of the tower. The variation in shape for each floor - due to the volumetric layout of the tower - will be compensated for by the modulated support areas on each floor around the central nucleus.

The structure of the tower is made from reinforced concrete up to the 29th floor,



Left: The iconic CityLife towers include, clockwise: the Generali Tower (The Twisted One), the Libeskind Tower (The Curved One) and the Allianz Tower (The Straight One).

Below: The project's architect, Daniel Libeskind (on the left), visits the site before the start of the concrete pouring work.

Bottom: Mapei's Dynamon Xtend W300 R admixture is used on the project to create high quality ready-mixed concrete.

while from the 30th floor it is made from steel and glass, forming the crown at the summit of the tower. The building is supported by 20 pillars located around its perimeter and each pillar has a circular section ranging from 60 to 140 cm. The pillars are made from reinforced concrete, except for those used for the twin-level lobby, which are made from steel profiles.

The summit of the building will feature a glass section with metal blades. The facade is designed based on the geometry of the building, and for this reason its shell is made from glass panels supported at their ends by metal beams that blend in seamlessly with the network of pillars in the lower floors. Because the geometry of the building varies, the glass panels used for the facade will have different sizes on each floor. A twin-level conference hall will be built on the 27th and 28th floors. Just like the other two towers, this one has also been awarded LEED pre-certification with a Gold rating.

Intensive concrete work

The base slab of the Libeskind Tower features an irregular hexagonal shape up to 66 m by 40 m and a thickness of 2.50 m. A total of 5,890 cu m of concrete was poured in approximately 30 hours. The contractor, Colombo Costruzioni, and the concrete company Holcim divided the 30 hours of work into three 10-hour shifts. For each shift, there was a general logistics-production foreman, 45 drivers (each with a 10 cu m concrete truck), three operators with pumping equipment with a capacity of 200 cu m/hr, at least three operators controlling and supervising the production and quality of the mix, five operators working in the mixing units, a maintenance technician to look after the equipment, 18 trucks to transport the aggregates, nine trucks to transport the cement and around 100 workers on site to lay the concrete and support all the operations while the concrete was being poured.

After carrying out a series of site surveys, Holcim designed a mix of C32/40 concrete with exposure class XC4 and consistency class SCC/SF1 made from 32.5 R LH SR IV/A Pozzolan cement. This type of cement is specially designed and manufactured to reduce cracking, which often occurs when casting particularly large and thick foundation slabs.



The mix design, therefore, included the use of 32.5 R IV/A LH SR Pozzolan cement by Holcim to reduce hydration heat and high thermal gradient, which can lead to cracking from thermal shock. Special care was also taken to design the most appropriate

granulometric curve for the structure and the method chosen to pour the concrete. Further attention was paid to guarantee its workability and limit cracking caused by hygrometric shrinkage.

A full scale trial of the mix was performed and monitored with thermocouples - before the slab casting work took place - in order to verify its characteristics according to weather conditions and temperature for that period. The data taken during the trial allowed the development of hydration heat in the conglomerate to be measured and to verify that it was suitable for use.

The base slab was cast in a series of layers, each around 15-20 cm thick. The more critical areas of each layer were lightly compacted to help the concrete flow correctly, make sure even layers were formed and guarantee the homogeneity between consecutive layers. Samples were taken in a specially selected area during pouring to characterise the concrete, while other tests were carried out to check its consistency, water/cement ratio, density and air content while, at the same time, monitoring the temperature of the cast concrete. Because of the time of year the intervention was carried out, Holcim also ensured the temperature of the fresh concrete was at least 5°C when it was delivered to site.

Quality admixtures

Mapei was tasked to supply its admixtures for the concrete. The company's acrylic-based super-plasticiser Dynamon Xtend W300 R was then tested and approved. This product is a watery solution of modified acrylic polymers, designed for the production of high quality ready-mixed concrete in compliant with the UNI 11104 - UNI EN 206 standard for high quality concrete in consistency class S4-S5 and self compacting concrete.

About 12 hours after pouring the concrete, and once the level of the upper layer had been reached, polythene sheets were placed over the concrete to protect it and maintain the correct level of moisture and thermal gradients.

The sheets were removed after around seven days. Thermocouples were placed in the concrete to measure the thermal gradient between the core and surface of the slab and the surrounding temperature near the slab. This data allowed the curing period of the slab to be established accurately. ■

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A TRUCK AFFAIR

TWO YEARS AFTER JOINING VOLVO CE, TEREX TRUCKS CONTINUES TO MAINTAIN ITS COMPETITIVE POSITION ON THE GLOBAL ARENA. THE COMPANY SEES THE PARTNERSHIP AS A PERFECT FIT THAT GIVES THE BEST OF BOTH WORLDS, SUPPORTING ITS FURTHER GROWTH AND HELPING TO FLOURISH IN EMERGING MARKETS.

'King of Earth'

Terex Trucks' history dates back to 1933 when Euclid Road Machinery Company was established in Ohio, USA - it was a spin-off from Euclid Crane and Hoist Company that was founded in 1909.

Euclid Road Machinery built the Model 1Z truck in 1934, which was said to be the world's first true off-highway rear dump truck. In 1950, Euclid Great Britain was set up as a subsidiary, and began manufacturing off-highway trucks in Motherwell, Scotland.

In 1953, Euclid Road Machinery was bought by General Motors and a year later, Euclid produced its 1,000th truck in Scotland. In 1968, General Motors divested the Euclid brand and the remaining earthmoving division was renamed Terex - from the Latin 'Terra' (Earth) and 'Rex' (King). Shortly after, the Terex 33 Series was rolled out.

In 1982, Terex introduced its first articulated dump truck (ADT) - the 3204. The machine was designed, tested and manufactured in Scotland. In 1987 North West Engineering purchased the Terex hauler business (trading as Terex Equipment Limited), having already acquired Terex USA the previous year. During 1987 the manufacturing footprint in Scotland was expanded and the name of the company was changed to Terex Corporation.

In 1998, Terex TA and TR ranges were unveiled with the introduction of new white Terex. The Generation 7 ADT was launched in 2002, and the 1,000th Generation 7 (Platinum) ADT rolled off the production line in 2005.

Terex changed the nomenclature of TA25 to TA250, TA30 to TA300 and TA40 to TA400 in 2009. Within two years, the Generation 9 ADT was built and launched around the world.



Paul Douglas, director and general manager of Terex Trucks, recently talked to Southeast Asia Construction about the changes in the company after Volvo's acquisition and how Asia Pacific will remain an attractive market for Terex Trucks haulers.



1934: Euclid Model 1Z truck was built.



1950: Euclid Great Britain was formed.



1954: Euclid produced its 1,000th truck.



1968: Euclid was renamed Terex, and Terex 33 Series was launched.



1982: Terex unveiled its first articulated dump truck (ADT).



2005: The 1,000th Generation 7 Terex ADT (Platinum) rolled off the line.

In 2014, Terex Corporation's off-highway truck product line was acquired by Volvo Construction Equipment (Volvo CE) which unearthed the creation of Terex Trucks.

Best of both worlds

Volvo CE's acquisition of Terex Trucks included the company's rigid and articulated haulers, which offer payloads of 41 to 91 t and 25 to 38 t respectively, as well as the main production facility in Motherwell. It also included the distribution of haulers in the US and the 25.2 percent holding in Inner Mongolia North Hauler Joint Stock Co (NHL), which manufactures and sells rigid haulers under the Terex brand in China.

"Two years on, and despite a further downturn in demand for haulers in general, a series of product, service and distribution improvements at Terex Trucks have firmly taken root," said Paul Douglas, director and general manager of Terex Trucks.

"Volvo has invested in making Terex Trucks' products more reliable, as well as easier to use and support since the acquisition. This has occurred due to Terex Trucks need to push forward and stabilise its position in the market. A lot of time has been spent improving the way the Scottish manufacturer goes to market, how the brand is supported and in strengthening the sales team and dealer network. Volvo has also helped to champion Terex Trucks at exhibitions such as Bauma and Intermat."

Despite such close collaboration, Mr Douglas pointed out that Terex Trucks will maintain its independent status. "We remain fully committed to the Terex Trucks name and to our entire customer base and product range. That means both rigid and articulated haulers will play important roles in the company's future, and we will continue to support the entire field population with parts and service," he said. "We are also committed to retaining our dealer partners, our existing production footprint and our skilled and committed workforce."

With this approach, Terex Trucks could have the best of both worlds, added Mr Douglas. "We retain our lean and agile organisational structure, our entrepreneurial spirit, customer focus



Above and below: Terex Trucks' manufacturing plant in Motherwell, Scotland, produces both rigid and articulated dump trucks for the global market.



and speed of execution – but with the added benefits that being part of a global leader in the construction equipment industry brings with it.”

Asia Pacific: Slow but sure

Terex Trucks has been active in Asia Pacific for a number of years, in countries such as Indonesia, Thailand, Laos, Myanmar, China and Australia, among others. However, the recent slowdown in the Chinese economy, whose impact is being felt across the region - and the rest of the world - has led to difficult times for global construction and mining equipment manufacturers, including Terex Trucks.

According to the company, from 2006 to 2012 demand for heavy equipment in the region (excluding China) was close to double, from about 63,000 to a peak of 120,000 units; however, this fell to about 89,000 units in 2015. In particular, demand for off-highway trucks in the region (excluding China) fell by almost 63 percent from its 2011 peak of about 4,100 units to 1,500 in 2015 (all off-highway classes).

“The Asia Pacific markets have been seriously affected by the Chinese economy downturn, and we are no exception,” said Mr Douglas. “The demand from China for mined commodities and processed products has been greatly reduced, and thus has had a major impact on countries such as Indonesia, which has for many years been a big export of products like coal, to China. The resulting effect is that truck demand is significantly down in these territories.

“Also, as you know, we have 25 percent ownership of our partner company, NHL, based in Baotou, China. We sell various truck kits to NHL, which they convert into end product for sale to domestic Chinese mining companies and contractors. The levels of production and sales have dropped by some 75 percent since previous peaks in 2011/12 - again a strong indication of the economic decline in the region.”

“ASIA PACIFIC COUNTRIES WILL CONTINUE TO SEE POPULATION GROWTH, AND WITH THAT WILL COME ACTIVITY TO PROVIDE THE RAW MATERIALS FOR CONSTRUCTION OF HOUSING, SCHOOLS AND INFRASTRUCTURE DEVELOPMENT.”



Mr Douglas and Terex Trucks team members visit Leadway Heavy Machinery, the official Terex Trucks dealer for Thailand and Myanmar.



TR100 rigid trucks on their way to Myanmar.



TR60 rigid trucks work on a project in Indonesia.

Nevertheless, opportunities for growth do exist, said Mr Douglas. “Myanmar has been a strong market for us during this period of downturn. Historically we would have said Indonesia and Australia were strong markets for us, but they are just down right now. And of course through our trading partner NHL, China had been a strong market for us.”

In response to this new cycle of growth, Terex Trucks is implementing new strategies that will see even closer co-operation with its dealers, allowing the company to be more responsive to changing market conditions and in finding better solutions to emergent challenges. As part of these new strategies, the company will improve on its existing dealer footprint, and support its dealers’ capability to supply, maintain and service customers better than ever.

Terex Trucks said there is some indication that things will stabilise at the end of 2017, and from 2018 it can expect to see some bright spots, especially in those countries or industries that were not too dependent on Chinese growth. On the whole, Asia Pacific is still an attractive market and will remain an important area of focus for the company.

“Asia Pacific countries will continue to see population growth, and with that will come activity to provide the raw materials for construction of housing, schools and infrastructure development. As well as mining the raw materials, there will be an uptake in construction activity to deliver these needs, therefore we should see

Continued on page 90...

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Continued from page 88...

these markets come back,” explained Mr Douglas. “Energy needs will also drive growth in production of coal for example, where countries like India will use coal to meet a large part of their energy demands going forward.”

To that end, Mr Douglas underlined Terex Trucks’ priority, “We have been investing in the future, as we believe that the markets will eventually recover to a more reasonable level, although we have no idea when that turnaround will come. Therefore during this slow market period, we have been investing in our product development, our factory safety, quality and efficiency, and in developing our distribution network. These investments will set us up well for the market recovery.” ■

Website: www.terextrucks.com

Right: The Generation 9 TA400 articulated hauler.



THE NEXT GENERATION

Terex Trucks will be introducing its new Generation 10 range of articulated haulers to the Asia Pacific region early next year. This includes the 25 t TA250, 28 t TA300 and 38 t TA400. The Generation 10 models will be offered to the global market – the Stage IV range designed for European countries, Tier 4 Final for countries in North America, and Tier 2 for non-regulated countries.

To guarantee maximum uptime of the truck, investments have been made to ensure increased durability and protection of truck components, including upgraded hydraulic hoses, electrical interfaces, transmission mountings and brake pipes. To prolong hydraulic component lifecycles, the magnetic suction filters reduce the risk of contaminants entering the system, thus improving the cleanliness of the hydraulic oil.

Further lowering operational costs, as well as increasing safety, is the force-cooled multi-disc brakes. Supported by an electronic activated exhaust brake and a six-stage modulating transmission retarder, the hauler benefits from longer brake component lifecycles. The transmission now features high performance oil that extends time between service intervals to 6,000 hours, and the drivetrain can maintain traction in difficult terrains thanks to longitudinal and limited slip transverse differential locks.

The engine and drivetrain is well matched, utilising automatic adaptive shifting and a pre-selected two-speed transfer box (drop box), providing good performance and productivity for all haul conditions. For enhanced operator comfort and a smooth haul, anti-vibration mounts for the engine and cabin (TA300 only), as well as cushioned stops on the steering cylinders have been integrated, and the cab features an improved air conditioning and ventilation system. Machine performance information has also been updated, including transmission diagnostics that informs the operator on the status of the machine, such as the oil quality, oil level, filter life and fault codes/service indication.

Speaking about new product trends in the market, Mr Douglas said, “There is a drive for lower total cost of ownership, as this is a very important area for companies using trucks. The machines also need to be highly efficient and easy to repair, and have low costs of maintenance and repair.

“We will also see the introduction of alternative drive methods. This technology is not new in the industry, but I believe we will see



Above and below: Terex Truck’s new Generation 10 TA400 articulated hauler has rolled off the production line.



an increase in new electric and hybrid technologies in vehicles.

“And finally, the trucks will become more connected – for the mine managers, with other machines, for the truck manufacturers and engineers – and big data will be available for the trucks in use. Again, this is not a new technology, but I think it will increase in scope and usage going forward.”

When asked whether Terex Trucks plans to develop autonomous vehicles in the near future, Mr Douglas said, “Not at the moment - but that doesn’t mean we never will. The technology exists and is advancing quickly in on-highway automotive application. Driverless trucks are not new in our industry, but technology advances make the next generation of autonomous vehicles smarter and much better connected and controlled.” ■

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NEW ULAANBAATAR INTERNATIONAL AIRPORT



The construction of New Ulaanbaatar International Airport (NUBIA) in Mongolia is in full swing. Located in the Khushigiin Khundii valley of the Tuv province, approximately 52 km from Ulaanbaatar, NUBIA is built on an easily accessible elevated plain with no mountains in the immediate take-off and landing air corridor.

The existing Chinggis Khaan International Airport is in need of an upgrade and expansion of the airport capacity is deemed necessary. The airport was built in 1956 and upgraded in 1987 and 1997 for international traffic.

With a new location as well as advanced design and

installations like a 24-hour all-weather air traffic control system, NUBIA will have improved facilities with better safety standards. The airport is expected to increase passenger capacity by three times - three million passengers a year - and cargo handling ten-fold.

To finance the project, the Government of Mongolia has signed a 40-year soft loan agreement for JPY 65.6 billion with the Japan Bank for International Cooperation (JBIC). The Mitsubishi-Chiyoda Joint Venture (MCJV) won the contract in the technical bidding. In May 2013, the main construction contract was signed between MCJV and the Civil Aviation Authority of Mongolia.



A panoramic view of the NUBIA project in August 2015: the New Ulaanbaatar International Airport is located about 52 km from the capital and designed with a 3,600-m-long, 4E-category runway. Concrete was selected as the material for the runway due to the extreme climate.

The new airport is designed with a robust 3,600-m-long, 4E-category runway, which is to be constructed from concrete. This will allow the runway to withstand the harsh weather conditions of the extreme continental climate. Furthermore, it will be able to handle large aircraft, such as B747 or A340, in the future.

The concrete paving work is being carried out by Sungdo Construction, and it started in May 2014. The entire construction work was awarded to Samsung C&T.

Runway paving

A Wirtgen SP 1600 is being used to pave the runway. The machine paves concrete slabs at widths of up to 16 m. A second complete concrete paving kit is available for integration into the SP 1600 to enable paving of dual-course concrete slabs in a single operation. At the new airport, the SP 1600 is paving the 45-m-wide and 3,600-m-long runway in several segments, with a paving width of 11.25 m and a paving thickness of 38 cm on average.

The first layer paved by the SP 1600 is a 27-cm-thick cement concrete slab, followed by a second layer consisting of an 11-cm-thick cement concrete slab, paved wet-in-wet immediately after the first layer to achieve a perfect bond between the top layer and bottom course. Wire bar fabric is then placed between the two layers for additional reinforcement according to the specifications set by the Japanese company, Azusa Sekkei and Oriental Consultants Joint Venture, which developed the airport design. Optimal material compaction is



Top: The Mongolian capital of Ulaanbaatar is the hub for the rising economy and centre of expansion for trade and industry.

Above: The existing Chinggis Khaan International Airport is in need of an upgrade and expansion of the airport capacity is deemed necessary. The airport was built in 1956 and upgraded in 1987 and 1997 for international traffic.

Left: The new airport is built on an easily accessible elevated plain with no mountains in the immediate take-off and landing air corridor.

ensured by up to 48 electric vibrators emitting high-frequency vibrations. The right functional properties of the concrete surface are achieved by the oscillating beam and the super smoother of the SP 1600.

“We have to face the extreme continental climate with short, hot summers and long, icy winters. This gives us a construction time window of only three to four months during summer time. The wind from the Gobi desert and the intensive sunlight quickly dry out the concrete. That’s why the main paving operation with the SP 1600 had to happen during night shifts,” explained Dongin Park, Samsung C&T’s project manager of the NUBIA project.



Above and left: A Wirtgen SP 1600 is being used to pave the airport runway. The machine could not pave concrete during the daytime, because the direct exposure of the intensive sunlight and the strong wind from the Gobi desert dry out the concrete pavement too quickly.

Continued overleaf...

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The SP 500 paver takes care of the slightly curved aprons and some taxiway sections. Here up to five adjoining, parallel slabs are paved by the machine. The paving width of the SP 500 is 5,625 m. In total, there are around 50,000 sq m of taxiways and 7,500 sq m of aprons to be paved by the SP 500.

Sungdo Construction brought several containers of spare and wear parts to the remote jobsite. The regional service network of the Wirtgen Group supports the operation from several angles. The local Wirtgen dealer Sambo Heavy Industries in South Korea supplies spare parts, or the parts can be ordered directly from the Wirtgen headquarters in Germany. ■

Website: www.wirtgen-group.com/Singapore



Samsung C&T carries out the project together with the slipform paving contractor Sungdo Construction.



Top: The SP 1600 is usually in operation from 7 pm to 6 am, paving dual-course concrete slabs with an average thickness of 38 cm.

Above: The high-quality concrete slabs is built to withstand the harsh weather conditions of Ulaanbaatar.

Left: Once completed, NUBIA is expected to accommodate three million passengers a year.

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First CSO installation to tackle urban river pollution in China

China's National Water Pollution Control and Treatment Science and Technology Project, known as 'water special', is one of 16 major science and technology initiatives identified to make breakthrough progress in the country over the next 15 years. Water projects cover six major themes incorporating lakes, rivers, urban water environment and drinking water. Anhui Province is one of the demonstration areas selected for the water projects, which cover improvements to river basin water pollution control, lake eutrophication control and water environment ecological restoration.

By protecting the watercourse, the project supports the ongoing success of water quality improvements at Chao Lake, one of China's five largest fresh-water lakes and a popular tourist destination. Although in the past decades high levels of surface runoff and agricultural organic pollution caused eutrophication and silting in Chao Lake, recent treatment work has significantly improved its water quality.

CSO installation

Hydro International has played a role in the project with its Combined Sewer Overflow (CSO) installation in Chaohu City, in the eastern province of Anhui. The company provided a Storm King advanced hydrodynamic vortex separation system for this trial.

"After hearing of the Storm King's sustainable, no-power solution for high-performance pollutant removal, XiaoWangZhuangZhonggou retrofit engineering project research engineers from Shanghai contacted Hydro International. A trial site was identified in Chaohu City to assess the Storm King's suitability with a view to recommending it as a Combined Sewer Overflow solution that could help solve wider water quality challenges in Anhui and potentially throughout China," explained Charlie Zhong, Hydro International's China business manager.

"At XiaoWangZhuangZhonggou retrofit engineering in Chaohu City, Storm King improves the river water quality by minimising pollutants in combined sewer overflow going into the river," said Dr Jia



Hydro International has carried out its Combined Sewer Overflow (CSO) installation in Chaohu City, in the eastern province of Anhui. The company provided a Storm King advanced hydrodynamic vortex separation system for this trial, which aims to prevent the highly polluting sediments that are re-suspended in sewer water during peak storm events from being discharged into the XiErChi River.



The Storm King system is activated automatically by the rising flow of water during heavy rainfall periods. However, the one installed in Chaohu City has been constructed in a raised position, so that it can be viewed in a public area to encourage community engagement in water quality improvements.

of Shanghai Urban Construction Design & Research Institute.

The Storm King prevents the highly polluting sediments that are re-suspended in sewer water during peak storm events from being discharged into the XiErChi River,

one of the inland rivers in Chaohu City. With a design average flow rate of 200 l/s and a peak flow rate of 300 l/s, it will prevent floatables, grit and sediment carried in the sewer network from entering the watercourse.

The installation is designed to take



The Storm King installation was designed by Shanghai Urban Construction Design & Research Institute and supplied via Inter Flow Control Technology of Tianjin. It was manufactured by Hydro International in the UK.

out 95 percent of 200 micron grit and sediment, with average 50 percent Total Suspended Solids (TSS) removal, achieving average 30 percent Biological Oxygen Demand (BOD). The retained effluent is diverted back through the sewer network to a nearby wastewater treatment works for processing.

Mr Zhong added, “A major advantage of the Storm King is that it is activated automatically by the rising flow of water during heavy rainfall periods. It does not need power and has no moving parts, so requires minimal maintenance.

“The system can deliver primary treatment pollutant removal levels, a high performance which only the Storm King is capable of achieving. Conventional CSO screening solutions would not be capable of these standards.”

Unusually, the Chaohu Storm King has been constructed in a raised position, so that it can be viewed in a public area to encourage community engagement in water quality improvements.

The Storm King installation was designed by Shanghai Urban Construction Design & Research Institute and supplied via Inter Flow Control Technology of Tianjin, an appointed distributor of Hydro International equipment in China. The Storm King was manufactured by Hydro International at its UK-based fabrication centre in Cambridgeshire.

Hydro International provides vortex separation technologies for stormwater and wastewater treatment. The Storm King overflow system is a technology for improving watercourse quality and has also been used in CSOs in the UK, continental Europe and North America. ■

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DHIC carries out heavy lifting work on South Korea railway project

South Korean contractor Doosan Heavy Industries & Construction (DHIC) recently carried out work at a congested railway station jobsite in Daegu City, 300 km from Seoul. This station is part of an expansion project being managed by the South Korean government's rail department.

Manitowoc's MLC650 crawler crane was used by the contractor to perform heavy lifting operations on the project. Bearing in mind the site's limited land area, it offered little space for large cranes to operate, let alone the additional buffer required for assembly and dismantling. Despite these challenges, the MLC650 was still able to lift heavy objects such as 55 t precast concrete sections and move them to designated areas with precision.

The MLC650's ability to navigate with ease in highly congested job sites, coupled with its increased capacity for heavy lifts without traditional counterweight configurations, can be credited to its Variable Position Counterweight (VPC) technology. The system allows for reduced ground preparation, lower space requirements and counterweight; and eliminates the need to stack or unstack counterweights after or during a lift.

For the railway station job, the MLC650 was configured using a 68 m main boom with the VPC-MAX attachment, a special configuration that uses VPC technology to offer improved capacity and reach. In this set-up, the crane was used to service a 62 t load, positioning it at a radius of 50 m. This was still possible despite local site stipulations requiring that the crane lift at only 70 percent of its rated capacity.

The closest alternative choice of crane for this project required a small hill – 10 m x 10 m x 40 m – to be levelled in order for it to be positioned, and this location was also a further 10 m away from the site. Such a distance also immediately translated to a 25 percent decrease in load capacity. In contrast, the compact design of the MLC650 allowed it to be stationed comfortably adjacent to the railway.

"This feat accomplished by our advanced MLC650 crawler crane is a testament not just to the company's longstanding reputation for engineering ingenuity but its real world relevance in modern congested work sites, particularly in urbanised environments like South Korea," said Choi Byung Eun, president and CEO of Shinui Petra, the rental company that owns the crane. "We always aim to provide unmatched value to our customers and that has been clearly evidently in this project."

Following the completion of lifting operations at the Daegu railway site in April, the MLC650 was immediately moved to another work site: a cement factory. Over a period of three months, its role will be to support the removal and replacement of equipment parts to refurbish the factory's processing machines.

Similarly, one key operating challenge was the factory's narrow space. The MLC650 was chosen again for its ability to take maximum advantage of ground bearing pressure at close proximity. A more extensive configuration comprising a 50 m main boom with VPC-MAX and an added 47 m luffing jib was deployed, showcasing the MLC650's versatility. ■

Website: www.manitowoccranes.com



Doosan Heavy Industries & Construction performs heavy lifting operations at a congested railway station jobsite in Daegu City, South Korea, using a Manitowoc MLC650 crawler crane. The machine features a 68 m main boom with the VPC-MAX attachment.

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Chinese quarry upgrades aggregate plant to meet increasing demand

Zhongshan Xinlong Aggregate Co Ltd is based in Zhongshan City, Guangdong Province, China. From there and other locations, the company produces and supplies high quality aggregates to its customer base located primarily in the Pearl River Delta Area. Its main quarry in the locale is believed to be the largest in the area, with total annual sales of over CNY 10 billion, and employs more than 150 people.

The material produced at the quarry is used in a wide range of applications, including concrete and pipe manufacturing, batching plants, as well as in general civil engineering and construction applications. The aggregate is also used by the company in other fields such as demolition and quarrying.

Crushing solution

Due to a large variety of customers, who also involve in many differing applications, Zhongshan Xinlong Aggregate decided to upgrade its aggregate plant to meet the rising demand. For this, the company chose four Sandvik CH870 cone crushers, which would allow it to produce the aggregates at 2,000 mtp/h.

The cone crushers are helping to produce the required end product fractions of 28-24 mm, 24-11 mm, 11-5 mm and 5-0 mm. The CH870's large eccentric throw and high eccentric speed result in more rock-on-rock crushing in the crushing chamber. This means that the end product possesses excellent shape.

The CH870 is also ideal for Zhongshan Xinlong Aggregate's tertiary cone crushing requirements. It has a hydraulically supported main shaft that is supported at both ends, with its robust crusher design, adjustable eccentric throw and a constant intake opening ensuring sturdiness, yet delivering operational flexibility. These features make the CH870 particularly suited for the company's high-reduction tertiary application.

Supplied as a complete package, with all functions working together with a motor designed for exacting requirements, its Hydroset system provides safety and setting-adjustment functions, whilst



Top and above: Zhongshan Xinlong Aggregate has upgraded its aggregate plant to meet the increasing demand. The company opted for Sandvik CH870 cone crushers, which would allow it to produce the aggregates at 2,000 mtp/h, with the end product fractions of 28-24 mm, 24-11 mm, 11-5 mm and 5-0 mm.

ASRi automatically adapts crusher to feed conditions. Its Unibody mainframe ensures optimal strength resulting in less maintenance being required, whereas the facility for it to be lifted from above minimises risks and allows for safer on-site maintenance.

In addition, Sandvik is able to offer a wide selection of crushing chamber options

for the CH870. This facilitates rapid optimisation of the crushing process with a variety of alloys to choose from, each with properties meeting specific needs. As such, the crushers can be configured to meet their exact requirements, and if in future customer specifications or feed material changes, this may also be easily accounted for. ■

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Civil Engineering Projects Category

MARINA COASTAL EXPRESSWAY CONTRACT 482

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Project Team

Builder: Ssangyong Engineering & Construction Co Ltd

Developer: Land Transport Authority

Principal Consultant: Land Transport Authority

Structural Consultant: Mott MacDonald Singapore Pte Ltd

Construction Cost: S\$835.3 million

Construction Period: 69 months

Scope of works: Design and construction of 330 m (westbound) to 390 m (eastbound) of depress road structure, 670 m (westbound) to 610 m (eastbound) of vehicular tunnel structure and two slip roads connecting to and from Central Boulevard and Marina Boulevard respectively. It also included the design and construction of a tunnel stub for future connectivity and 285 m of North-South Line extension (NSLe) underneath the MCE tunnel.

Main constraints:

- Existing seawall from previous reclamation work affected the ground improvement and foundation works.
- Wide (120 m) and irregular shape of excavation complicated strutting.
- Provision for future transit tunnel under MCE in the design.

Notable features:

- Adopted DSM (deep soil mixing) and JGP (jet grouting pile) as methods of soil improvement for underground seawall zone.
- Adopted semi top-down construction with Superbeam ERSS to construct the MCE tunnel and FTT tunnel concurrently.
- Pipe piles were used instead of sheet/soldier piles to improve the robustness of the ERSS.
- Changed the interlocking for pipe piles to JGP for better water tightness and easier extracting of pipe piles later.
- The strong DSM/ERSS design reduced five layers of struts required to two layers and created more working rooms.
- The reduction of struts allowed the entire tunnel box to be constructed without the need for strut removal, which significantly increased buildability, productivity, safety and cost effectiveness.
- Replaced the normal steel waler beam design with concrete beam to improve robustness and safety for strutting the 120 m wide irregular shape excavation segment due to the provision of a stub.
- Removed seawall by oscillator and grab out.
- Installed two tower cranes to reduce decking for conventional crawler cranes, thus improving productivity.
- Adopted BIM in design.

Notable achievements:

- MOM SHARP Award 2010, 2011, 2012, 2013 and 2014.
- LTA Annual Safety Award (ASAC) - numerous from 2010 to 2013.
- UK RoSPA Gold Award 2011, 2012, 2013 and 2014.
- BCA Green & Gracious Builder Scheme (GGBS) Excellence.



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Civil Engineering Projects Category

MARINA COASTAL EXPRESSWAY CONTRACT 483

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Project Team

Builder: Samsung C&T Corporation
 Developer: Land Transport Authority
 Principal Consultant: Land Transport Authority
 Structural Consultant: Mott MacDonald Singapore Pte Ltd
 Construction Cost: S\$685 million
 Construction Period: 60 months

Scope of works: Design and construction of 950 m stretch of MCE tunnel at Marina South, including two slip ramps connecting with the at-grade roads, Marina Boulevard and Marina Coastal Drive, and a three-storey facility building with a basement plenum above the tunnel.

Main constraints:

- Difficult ground condition with soft marina clay of depth from 25 to 60 m, with an average thickness of 45 m and capped with 15 m thick of fill.

Notable features:

- Used a combination of DSM (deep soil mixing) and JGP (jet grouting pile) to enhance stability and safety of the excavation.
- To prevent damages to existing utility services, LODIC (low displacement control) method of installing DSM columns was employed to minimise ground movement.
- Screw-type DSM rod was introduced to minimise ground heaving near ground utilities such as gas pipes, drain and water pipe as it discharged the pressurised slime upwards to the ground level.
- Installed steel tubular piles using vibro-hammer to construct deep temporary earth retaining walls, in order to facilitate a safe excavation. Small gaps between tubular piles were closed by either C/T pipe pile joints to improve water tightness.
- The strong DSM design reduced five layers of struts required to two layers, which created more working rooms and improved productivity by cutting as much as 60 percent of the lifting and manual handling operations and safety.
- Productivity of DSM was about three times higher than JGP for this project.
- Optimised ventilation building design by using 3D BIM.
- The ground supporting the trunk link sewer was improved using prefabricated vertical drain (PVD) method to achieve an allowable differential settlement (1/120) in 120 year design life.

Notable achievements:

- BCA Green Mark Gold Award 2011 (for facility building).
- MOM SHARP Award 2011.
- LTA Annual Safety Award (ASAC) – Certificate of Recognition Participation in 2011 and 2012, Certificate of Merit in 2011, Certificate of Excellence in 2012, and Best Theme Presentation Award 2012.
- BCA Green & Gracious Builder Scheme (GGBS) Star.



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Commercial / Mixed Development Buildings Category

PARKROYAL ON PICKERING

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Scope of works: Construction of three hotel towers and an office tower with a podium and sky gardens at Upper Pickering Street.

Main constraints:

- Limited site space due to close proximity of boundary and buildings.
- Heavy traffic volume in CBD.
- One third of the site area was within MRT Reserve Line.
- Poor soil condition – presence of marine clay.
- High volume construction work.

Notable features:

- Cobiax system changed the conventional framing design to flat slab design by eliminating internal beams:
 - a). Office (9th/12th storey): beams eliminated at each floor were 18 out of 48 (38 percent).
 - b). Hotel (9th/11th/13th storey): beams eliminated at each floor were 100 out of 265 (38 percent).
- Standardised column shape and sizes to allow for one cast for high columns and to suit existing formwork available.
- Converted perimeter elements to precast/GRC elements to improve productivity and safety by eliminating the needs for external scaffold.
- Used precast U shell as permanent formwork for transfer beams.
- Advanced formwork for the construction of the tall round columns, which incorporated work access ladder and platform and the ability to dismantle formwork in two sections.
- Converted the spiral staircase to precast element to improve the quality of finishes.
- Adopted screedless flooring system to minimise wet trade.
- Converted Acotec/block wall to dry wall system, thus minimising wet trade and improving housekeeping.
- Redesigned the plumbing for the water feature to minimise penetration/provision on walls and excavation works.
- Installed self-climbing perimeter screening (rail climbing system) to prevent falling from height and falling objects.

Project Team

- Builder: Tiong Seng Contractors (Pte) Ltd
- Developer: Parkroyal Pickering Hotel Pte Ltd (UOL Group Limited)
- Principal Consultant: WOHA Architects Pte Ltd
- Architectural Consultant: WOHA Architects Pte Ltd
- Structural Consultant: TEP Consultants Pte Ltd
- M&E Consultant: Beca Carter Hollings & Ferner (SE Asia) Pte Ltd
- Quantity Surveyor: Rider Levett Buckall LLP
- Signage Consultant: Design Objectives Pte Ltd
- Facade Consultant: Meinhardt Facade Technology (Singapore) Pte Ltd
- Lighting Consultant: Lighting Planners Associated (S) Pte Ltd
- Landscape Consultant: Tierra Design (S) Pte Ltd
- Acoustic Consultant: CCW Associates Pte Ltd
- Precast Specialist: Robin Village Development Pte Ltd
- Construction Cost: S\$128.9 million
- Construction Period: 35.5 months
- Gross Floor Area: 30,131.00 sq m

Notable achievements:

- High CONQUAS score of 92.1 points.
- High Buildability Score of 87.
- BCA Green Mark Platinum Award.
- BCA Green & Gracious Builder Scheme (GGBS) Star.
- RoSPA Award 2011 (Silver), 2012 (Gold) and 2013 (Gold).
- Happy Toilet (Star).
- Nparks LEAF Award 2015.



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Commercial / Mixed Development Buildings Category

CAPITAGREEN



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Scope of works: Construction of a block of 40-storey commercial building located in Singapore’s central business district and in close proximity to the extended downtown Marina Bay.

Main constraints:

- The site is triangular in shape and surrounded by three major traffic junctions and three existing vehicular roads, i.e., Market Street, Cross Street and Cecil Street.
- Existing underground MRT EW/DTL lies about 10 m from the site boundary and posed a very difficult challenge in carrying out the foundation works.
- To construct three basements in poor soil condition.

Notable features:

- Bored piles with a diameter of 3.5 m - the first, largest bored piles and equipment used in Singapore for a high-rise building - were installed due to the difficult soil condition and stiff boulders.
- Soil improvement by jet grouting before commencement of substructure works because of the existing shield walls of the MRT lines.
- Top-down construction methods were implemented to meet the challenges of the short and tight construction schedule.
- Set record on the use of 100 MpA high-strength concrete to meet the design requirement of 1 m x 1 m concrete column size.
- Redesigned and reconfigured the column-beam-balcony into one single integrated column-to-beam-to-balcony integrated precast concrete (PC) element, which shortened the schedule for erection and installation of the PC components. This in turn reduced the structural works to six days per floor, compared to 12 days per floor using a conventional method.
- Specialised erection tool called ‘Tatekata Ace’ was used for the erection of the funnel structure where no guy wire was required, and also enabled the adjustment of verticality of columns to be much simpler and easier.
- Fire proofing using dry fire proofing system eliminated the negative impact of the conventional spray fire proofing system, which would have required protection to the surrounding areas, increased health hazards and held back other trade of works temporarily - this could cause delays to the overall construction schedule.
- Changed the fabrication of the compact nodes of the wind funnel structure construction to cast iron, in order to minimise hot-works and fire hazards on site, which resulted in shortening the overall construction schedule.
- Used a high performance and high capacity temporary lift imported from Japan, which could travel at a speed of 110 m/min and has a loading capacity of 3.3 t, thus resulting in higher productivity.
- Pipe roof method was used in the tunnelling work for underground pedestrian network (UPN), in order to minimise inconveniences to the high volume public traffic above and diversion works for the high voltage cables.
- Used BIM from planning to construction and completion of the project.

Project Team

Builder: Takenaka Corporation
 Developer: CapitaLand, CapitaLand Commercial Trust and Mitsubishi Estate Asia
 Principal Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 Architectural Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 Structural Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 M&E Consultant: Squire Mech Pte Ltd
 Quantity Surveyor: Langdon & Seah Singapore Pte Ltd
 Construction Cost: S\$420.3 million
 Construction Period: 36 months
 Gross Floor Area: 82,003.07 sq m

Notable achievements:

- High CONQUAS score of 91.5 points.
- High Buildability Score of 87.
- BCA Green Mark Platinum Award 2012.
- WSH Innovation Awards 2015 (Bronze).
- BCA Green & Gracious Builder Scheme (GGBS) Excellent.
- BCA Universal Design (UD) Gold Plus Award 2013.
- BCA BIM Platinum Award 2015.

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Institutional Buildings Category

SINGAPORE UNIVERSITY OF TECHNOLOGY DESIGN (SUTD)

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Scope of works: Construction of four blocks of seven-storey campus with basement car parks, including part MRT underground link at Somapah Road / Changi South Avenue 1.

Main constraints:

- In proximity to existing residential properties and international school.
- Shared accesses to worksite with LTA contractor and Plot B contractor.
- Poor soil condition.
- Height control limits by CAAS.

Notable features:

- Used system formwork systems, including round steel column system formwork with integrated ladder and platform, thus increasing productivity and improving safety.
- Changed precast RC staircase to prefabricated steel staircase, so that it could be installed by lorry crane instead of tower crane.
- Changed aluminium facade panels to precast RC panels due to too many variances in the curvature and better QC.
- Redesigned precast facade panels to integrate with unitised curtain wall system, balustrade and planter boxes, in order to ease construction.
- Used custom made hoist gear balancer to extend tower crane to install precast RC panels for those out-of-reach areas, where the floor slab set-back was relative to the upper floor.
- Extensive use of drywall partition system in both interior and semi-exterior wall panelling system.
- Installed pipes with pipe jacking method to minimise excavation and improve safety and housekeeping.
- Changed waterproofing system to 40 mm thick heavy-duty drain cell mat system to manage basement water simplified construction.
- Changed RC lintel and stiffener to Stiflex pre-cut steel lintel and stiffener.
- Used preinsulated chilled water pipes, prefabricated ductworks, and factory painted ducts and sprinkler pipes to increase productivity in M&E works.
- Application of BIM improved coordination of interfacing details.

Project Team

Builder: Kajima Overseas Asia Pte Ltd
 Developer: Singapore University of Technology and Design
 Principal Consultant: DP Architects Pte Ltd
 Architectural Consultant: DP Architects Pte Ltd
 Project Management Consultant: PM Link Pte Ltd
 Structural Consultant: Parsons Brinckerhoff Pte Ltd
 M&E Consultant: CPG Consultants Pte Ltd
 Quantity Surveyor: CPG Consultants Pte Ltd
 ESD & GM Consultant: DP Architects Pte Ltd
 Acoustic Consultant: Acvicon Acoustics Consultant Pte Ltd
 Facade Consultant: Arup Singapore Pte Ltd
 Landscape Consultant: Surbana International Consultants Pte Ltd
 Security Consultant: ST Education and Training Pte Ltd
 Construction Cost: S\$312.8 million
 Construction Period: 30.5 months
 Gross Floor Area: 103,646.92 sq m

Notable achievements:

- High CONQUAS score of 92.0 points.
- BCA Green Mark Platinum Award 2012.
- BCA Green & Gracious Builder Scheme (GGBS) Star.

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Institutional Buildings Category

SINGAPORE INSTITUTE OF MANAGEMENT CAMPUS EXTENSION

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Project Team

Builder: Tiong Seng Contractors (Pte) Ltd
 Developer: Singapore Institute of Management
 Principal Consultant: Architects 61 Pte Ltd
 Architectural Consultant: Francis-Jones Morehen Thorp
 Structural Consultant: Meinhardt (Singapore) Pte Ltd
 M&E Consultant: Meinhardt (Singapore) Pte Ltd
 Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
 Signage Consultant: Acacia Design Pte Ltd
 Facade Consultant: Meinhardt Facade Technology (S) Pte Ltd
 Lighting Consultant: Meinhardt (Singapore) Pte Ltd
 Construction Cost: S\$137.2 million
 Construction Period: 24 months
 Gross Floor Area: 33,500.00 sq m

Scope of works: Construction of an eight/nine-storey block with two link bridges, a four-storey multi-purpose sports hall and a two-level basement at the junction of Clementi Road and Maju Drive.

Main constraints:

- A 19-month fast track project.
- Deep excavation in excess of 10 m for construction of the two-level basement car park.
- Large column-free floor plates.
- Various high volume construction activities at the multi-purpose sports hall.
- In proximity to and integration with existing buildings including basement car park and link bridges.

Notable features:

- Adopted a combination of cantilevered wall system (freestanding CBP wall) and semi top-down construction utilising cast slab as strutting, to minimise strutting to 15 percent in the excavation works and enable quick completion of basement works within six months in a much safer manner.
- Redesigned basement slab as flat plate system and integrated pipe caps as drop panels to ease construction.
- Used precast columns, beams, walls and staircase for superstructure.
- Changed slab to Cobiax flat slab system to eliminate internal beams, reduce weight, reduce concrete usage and ease construction.
- Achieved a column free design for the multi-purpose sports hall using 35 m span post tensioned beams.
- Designed facade walls as non-critical path precast walls installed by bracket system without wet joints for better quality and to improve productivity.
- Adopted a variety of advanced formwork systems to improve productivity, e.g. Rundflex system for casting curve walls, rail climbing system for core walls, Skydeck aluminium for flat slab, etc.
- Used ST100 heavy shoring to support all high volume and heavy transfer beams.
- Used unitised curtain wall, drywall partition system and screedless floor system to minimise wet trades.
- Application of BIM improved coordination of interfacing details.

Notable achievements:

- High CONQUAS score of 92.2 points.
- BCA Green Mark Gold Plus Award 2014.
- RoSPA Safety Awards 2012, 2013 and 2014.
- BCA Green & Gracious Builder Scheme (GGBS) Star.
- BCA DESEA Merit 2014.

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Institutional Buildings Category

TAHIR FOUNDATION BUILDING AT YONG LOO LIN SCHOOL OF MEDICINE, NATIONAL UNIVERSITY OF SINGAPORE

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Scope of works: Construction of block MD1 comprising a 17-storey mixed-use building and a basement for Yong Loo Lin School of Medicine NUS at 10 Kent Ridge Crescent, aka Tahir Foundation Building.

Main constraints:

- Restrictions on traffic flow, working hours and delivery of materials to sync with activities in NUS.

Notable features:

- Adopted a combination of system formwork and prefabricated elements to increase productivity, i.e., table form with prefabricated column formwork, auto jump wall form with pre-cage wall rebar, etc.
- Used volumetric aluminium cladding integrated with fully unitised curtain wall system.
- Extensive use of interior wall cladding panel and drywall partition to minimise plastering.
- Changed to bigger size stone cladding to increase productivity.
- Changed waterproofing system and simplified construction by using heavy duty cellular drain mat to manage basement water.
- Replaced heavier stainless steel water tank with FRP/GRP water tanks, thus improving safety in hoisting and eliminating welding works.
- Successfully achieved Zero air e-filtration for facade at the laboratory areas.
- Design and installation of EMF (electro-magnetic shielding) insulation for laboratory that required EMF shielding to the RC floor, wall, ceiling and the drywall.
- Used pre-insulated chilled water pipes, prefabricated ductworks, and factory painted ducts and sprinkler pipes with Quick fix slot pipe and joint design to increase productivity in M&E works.
- Changed RC lintel and stiffener to Stifflex pre-cut steel lintel and stiffener.
- Used Bondek as permanent formwork for casting over roof voids/ double volume space.
- Used self-smoothing pre-packed screed to achieve better quality than conventional cement and sand screed.
- Improved on the post tensioned beam dead end termination detail to eliminate extra hacking by adding reinforcement bars to tie the tendon outside the core wall.
- Application of BIM in design and construction.

Project Team

Builder: Kajima Overseas Asia Pte Ltd
Developer: National University of Singapore
Principal Consultant: CPG Consultants Pte Ltd
Architectural Consultant: CPG Consultants Pte Ltd
Structural Consultant: CPG Consultants Pte Ltd
M&E Consultant: CPG Consultants Pte Ltd
Quantity Surveyor: Rider Levett Buckall LLP
Green Mark Consultant: CPG Consultants Pte Ltd
Facade Consultant: Building Facade Group (HCCH Consulting Pte Ltd)
Construction Cost: S\$155.4 million
Construction Period: 30 months
Gross Floor Area: 38,887.54 sq m

Notable achievements:

- High CONQUAS score of 89.8 points.
- BCA Green Mark Platinum Award 2014.
- BCA Green & Gracious Builder Scheme (GGBS) Star.



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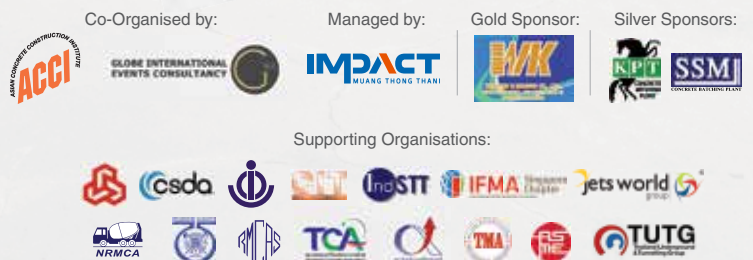
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Residential Buildings – Below S\$1,800/sq m Category

LAKE VISTA @ YUAN CHING

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Project Team

Builder: Straits Construction Singapore Pte Ltd

Developer: Hoi Hup Sunway Yuan Ching Pte Ltd

Principal Consultant: Consortium 168 Architects Pte Ltd

Architectural Consultant: Consortium 168 Architects Pte Ltd

Structural Consultant: BC Koh & Partners LLP

M&E Consultant: Rankine & Hill (Singapore) Pte Ltd

Construction Cost: S\$82.9 million

Construction Period: 34 months

Gross Floor Area: 69,957.36 sq m

Scope of works: Construction of four blocks of 22-storey residential towers with 682 units and an MSCP block at Yuan Ching Road.

Main constraints:

- Extensive diversion of HT electrical cables, gas mains, fibre-optic cables and water mains prior to piling works.
- In close proximity to two schools.

Notable features:

- Changed the roof feature to precast elements due to extensive use of groove lines.
- External ‘skin’ of the precast components was included on the external facade to eliminate the needs for formwork and access for grouting.
- Used crane to lift perimeter scaffold.
- Used hydraulic stationary pump for concreting.
- Adopted spray painting.
- Engineered timber flooring adopted to minimise the need for sanding and coating.
- Used precast partition wall for internal to minimise wet trades.
- Minimised scaffolding by using external hanging cages, mast climbing platforms and gondolas for external works on the facade.

Notable achievements:

- High CONQUAS score of 94.3 points.
- UK RoSPA Gold Awards 2013 and 2014.
- SCAL WSH Innovation Award (Merit) for PM Hoist Safe.
- BCA Green & Gracious Builder Scheme (GGBS) Star.
- PUB ABC Water Certified Project.

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Residential Buildings – Below S\$1,800/sq m Category

WOODLANDS N7C26 & C28 (WOODLANDS DEW AND WOODLANDS MEADOW)

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Scope of works: Construction of 11 blocks of 16-storey residential apartments with 1,329 units, two MSCP blocks with a roof garden, a food court, supermarkets and shops at the junction of Woodlands Avenue 9 and Gambas Avenue.

Main constraints:

- In proximity to existing HDB blocks and two schools.
- Short construction period of 27 months.

Notable features:

- Planned for two phases of construction accesses to minimise inconveniences to new residents during the hand over.
- Mobilised two construction teams to handle the two precincts concurrently.
- Converted cast in-situ RC footings to precast footings.
- Changed the RC fins roof features to steel to improve handling and safety for construction.
- Added access panel for safe access to maintenance of the roof aluminium screen wall.
- Stacked the water supply mains at the roof to make room for roof access corridor.
- Saved cost and minimised disturbances by converting original retaining wall design along Riverside Primary School to slope realignment and soil stabilisation.
- Installed minor sewer pipeline using pipe jacking method instead of open cut to improve productivity.
- Used modular scaffold for falsework to improve accessibility, eliminate cross bracing and for faster transferring of scaffold.
- Added an additional Building Service Centre to improve service quality in view that the two precincts were handed over concurrently.

Notable achievements:

- HDB Construction Award 2015.
- High CONQUAS score of 94.3 points.
- BCA Green & Gracious Builder Scheme (GGBS) Excellent.

Project Team

Builder: China Construction (South Pacific) Development Co Pte Ltd
 Developer: Housing & Development Board
 Principal Consultant: P&T Consultants Pte Ltd
 Architectural Consultant: P&T Consultants Pte Ltd
 Structural Consultant: P&T Consultants Pte Ltd
 M&E Consultant: UPC Engineering Consultants
 Quantity Surveyor: Langdon & Seah Singapore Pte Ltd
 Landscape Consultant: Sitetectonix Pte Ltd
 Construction Cost: S\$168.7 million
 Construction Period: 35 months
 Gross Floor Area: 144,818.52 sq m



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YISHUN RIVERWALK (YISHUN N3 C21)

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Project Team

Builder: Teambuild Engineering & Construction Pte Ltd
 Developer: Housing & Development Board
 Principal Consultant: ADDP Architects LLP
 Architectural Consultant: ADDP Architects LLP
 Structural Consultant: DE Consultants (S) Pte Ltd
 M&E Consultant: United Project Consultants Pte Ltd
 Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
 Construction Cost: S\$189 million
 Construction Period: 40.3 months
 Gross Floor Area: 153,747.00 sq m

Scope of works: Construction of 14 residential blocks with 1,408 units and two MSCP blocks at Yishun Avenue 11.

Main constraints:

- The trunk sewer line across the site handicapped the mobility of heavy machinery as it was not allowed to cross over.
- The trunk sewer line was located within 3 m of the piling work for some blocks.

Notable features:

- Used in-house apps to enhance productivity on managing workers’ attendance records, safety records and architectural defects.
- Converted in-situ roof gutter to precast elements to improve productivity and safety, as it eliminated the needs to erect external cantilever scaffold.
- Changed the single-ring water tank to double-ring water tank, in order to reduce the weight of precast components for hoisting.
- Conducted a seismic survey to chart details of the soil profile so as to optimise the use of boring rigs and achieve a record.

Notable achievements:

- HDB Construction (Merit) Award 2015.
- High CONQUAS score of 92.4 points.
- MOM SHARP Award 2015.
- HDB Construction Safety Award 2015.
- BCA Green & Gracious Builder Scheme (GGBS) Star.



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Residential Buildings - S\$1,800/sq m and above Category

368 THOMSON



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Scope of works: Construction of a 36-storey residential tower with five units per floor, a basement car park, a covered car park at the first and second storey and an environmental deck with sky terraces, swimming pools, a club house, a gymnasium and ancillary buildings at Thomson Road.

Main constraints:

- Restricted working hours on weekdays and no working on Sundays and public holidays due to proximity to residential areas.
- Diversion of a 130 m long, 1.4 m wide and 2.8 m deep drain.

Notable features:

- Elected a vertical rebar prefabrication yard for fabricating double height reinforcing bars, which reduced rebar wastage and improved safety and productivity.
- Achieved an average five-day cycle using a combination of modular metal formwork system and precast elements with in-situ top up.
- Customised modular metal formwork to adapt to complicated facades.
- Column formworks were articulated with suspended hinge over a rotational axis to allow easy column casting at varying angles.
- Eliminated full height scaffolding by installing external cantilevered facade platform, stair platform, working platform and internal shaft platform.
- Retractable cage formworks were used for the construction of the lift shafts and ventilation shafts, thus enabling concrete pouring in one operation and in turn saving time.
- Set up a precast yard on site to produce all the precast beams and slabs and to eliminate delivery issues.
- High early strength concrete was used in precasting to allow early demoulding, thus increasing production capacity.
- Adopted shear wall system where possible in the design to eliminate plastering works and achieve better water tightness.
- Adopted a staircase story shelter (SSS) design with 30 percent saving and having a better habitable space in the unit, compared to the conventional household shelter (HS).
- Redesigned the conventional transfer beam into 1.8 m thick transfer plate, which was faster to construct.
- Redesigned and changed the steel roof crown fin wall structure to RC precast type to minimise working at height and prevent falling objects.
- Used precast bathrooms (PBU).
- Extensive use of drywall partition system.
- Used prefabricated air-con ducting to improve productivity in M&E works.
- Application of BIM improved coordination of interfacing details.

Project Team

Builder: Dragages Singapore Pte Ltd
 Developer: City Developments Limited
 Principal Consultant: DP Architects Pte Ltd
 Architectural Consultant: DP Architects Pte Ltd
 Structural Consultant: Meinhardt (Singapore) Pte Ltd
 M&E Consultant: CONTEEM Engineers Pte Ltd
 Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
 Landscape Consultant: COEN Design International Pte Ltd
 Construction Cost: S\$72.7 million
 Construction Period: 39 months
 Gross Floor Area: 17,330.20 sq m

Notable achievements:

- High CONQUAS score of 98.9 points.
- QM Star with QM Average of 92.6.
- BCA Green Mark Platinum Award 2010.
- MOM SHARP Awards 2012 and 2014.
- UK RoSPA Gold Awards 2012, 2013 and 2014.
- BCA DESEA Award 2014.
- BCA Construction Productivity Award 2015.
- BCA Green & Gracious Builder Scheme (GGBS) Star.

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steven.chwee@reedpanorama.com

Mr. Marzuki Herry

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marzuki.herry@reedpanorama.com

Ms Silviana

+62 21 2556 5026 / +62 878 8522 2880
silviana.muliawan@reedpanorama.com

Sales Team :

Mr Eric Anthony

+62 21 2556 5003 / +62 878 7700 2211
eric.antonius@reedpanorama.com

Mr Ricky Chandra

+62 21 2556 5028 / +62 818 418 483
ricky.chandra@reedpanorama.com

Mr Nicky Marsab

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Residential Buildings - S\$1,800/sq m and above Category

ALTEZ



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Scope of works: Construction of a 250 m high, 63-storey residential tower with 280 units, a multi-storey car park, sky terraces, a tennis court, a swimming pool, BBQ areas, gymnasium and other communal facilities at Tanjong Pagar.

Main constraints:

- Limited to one tower crane due to a small footprint and proximity of surrounding high rise buildings.
- Longer vertical lifting time for crane and passenger hoists required due to the building's height, especially as the construction went higher.
- Construction of six transfer floors with changing floor plates.
- Construction of multiple high voids at sky terraces and loft units (30th to 62th storey).
- BMU had to be installed first before the installation of the roof crown feature.
- Down hang column construction to support loft levels.
- Double slab construction for all transfer floors (six floors) to conceal services and balancing tanks.

Notable features:

- Redesigned the CBP to incorporate RC ring beams to facilitate the excavation of the raft construction 9 m below the first storey level.
- Upgraded concrete and provided additional reinforcements to allow early striking of formwork (second day after casting) and to achieve a seven-day cast cycle per floor.
- To ensure verticality, numerous survey points were set up on the internal and external of the core wall as well as on the perimeter of the building.
- Pour strips were provided between the main tower and the ninth storey podium to allow for differential settlement due to the building's weight. Casting of the pour strips was done after the tower settlement.
- Overcame the limited tower crane hook time by using Peri auto climbing core wall formwork system; Peri auto climbing external safety screen; high pressure concrete pump; lightweight shear wall aluminium and lightweight cuplock slab formwork systems to facilitate easy transferring manually between floor; and floor cranes and electric winch for window wall installation; as well as by replacing curtain wall and staggering the handover of lift shaft with semi-unitised system.
- Adopted screedless floor system with smart levelling machine.
- Used Peri ST100 high strength shoring system for the construction of the transfer slabs.
- Used precast storey shelter MV shaft and RC refuse chute.
- Adopted monolithic casting for slab, shear walls and bay windows.
- Application of BIM improved coordination of interfacing details.

Project Team

Builder: Woh Hup (Private) Limited
 Developer: Far East Organization
 Principal Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 Architectural Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 Structural Consultant: KTP Consultants Pte Ltd
 M&E Consultant: United Project Consultants Pte Ltd
 Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
 Project Management Consultant: Davis Langdon KPK (Singapore) Pte Ltd
 Construction Cost: S\$120.2 million
 Construction Period: 49 months
 Gross Floor Area: 25,504.00 sq m

Notable achievements:

- High CONQUAS score of 95.5 points.
- QM Excellent with QM Average of 91.3.
- MOM SHARP Awards 2012, 2013, 2014 and 2015.
- UK RoSPA Gold Awards 2011, 2012, 2013, 2014 and 2015.
- BCA Green & Gracious Builder Scheme (GGBS) Star.

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BUCKLEY CLASSIQUE

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Project Team

Builder: Unison Construction Pte Ltd
 Developer: City Developments Limited
 Principal Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 Architectural Consultant: RSP Architects Planners & Engineers (Pte) Ltd
 Structural Consultant: KTP Consultants Pte Ltd
 M&E Consultant: Squire Mech Pte Ltd
 Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
 Landscape Consultant: Site Concept International Pte Ltd
 Construction Cost: S\$45.9 million
 Construction Period: 34 months
 Gross Floor Area: 10,285.75 sq m

Scope of works: Construction of two residential blocks featuring five- and six-storeys housing 64 units, a conserved colonial bungalow, a basement car park and a swimming/SPA pool at 9/11 Buckley Road.

Main constraints:

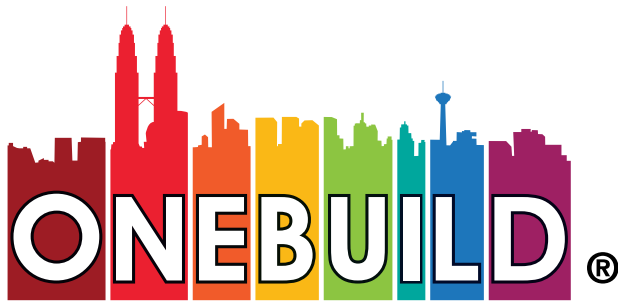
- Restricted working hours due to proximity to school and residential areas.

Notable features:

- Adopted the semi top-down construction method for basement using CBP wall as retaining structure due to tight worksite, and to prevent settlement of nearby structures.
- Installed CBP wall to isolate the weak conserved bungalow, to minimise vibration and settlement.
- Replaced bored piles with jack-in RC piles to reduce vibration and noise.
- Re-engineered the in-situ columns, walls and roof slabs into precast elements for greater productivity and minimised noise.
- Used jump formworks for lift/staircase walls.
- Used table formwork shoring system for slabs.
- Eliminated external scaffold by using various MEWPs such as boom lifts, scissor lifts and gondolas to access external facade works.
- Extensive use of lightweight Acotec panels and dry wall partition to improve productivity.
- Used prefabricated and pre-insulated ducting for ACMV.
- Used PEX water pipe system for water supply system.
- Used REHAU waste water pipe system.
- Application of BIM improved coordination of interfacing details.

Notable achievements:

- High CONQUAS score of 95.1 points.
- QM Star with QM Average of 92.0.
- BCA Green Mark Gold Plus Award 2011.
- MOM SHARP Awards 2013 and 2014.
- UK RoSPA Gold Awards 2013 and 2014.
- BCA Green & Gracious Builder Scheme (GGBS) Star.



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Project Team

Builder: Woh Hup (Private) Limited
 Developer: Allgreen Properties Limited
 Principal Consultant: APCO Architects and Town Planners Collaborative Pte Ltd
 Architectural Consultant: APCO Architects and Town Planners Collaborative Pte Ltd
 Structural Consultant: Meinhardt (Singapore) Pte Ltd
 M&E Consultant: Parsons Brinckerhoff Pte Ltd
 Quantity Surveyor: Langdon & Seah Singapore Pte Ltd
 Construction Cost: S\$65 million
 Construction Period: 40 months
 Gross Floor Area: 10,930.85 sq m

Scope of works: Construction of a 10-storey residential building with 118 units, three basement car parks, a swimming pool, a fitness station, a children’s playground, a Jacuzzi, a BBQ area and other communal facilities at 38 Handy Road.

Main constraints:

- In close proximity to Plaza Singapura, Dhoby Ghaut MRT Interchange Station and the Istana.
- Very tight and narrow site.
- Very close to existing condominium sitting on raft foundation.
- Above MRT first reserve/tunnel/station.

Notable features:

- Redesigned the basement 1 & 2 from slab and beam system to flat slab with drop panel to replace the double layers I-beam strutting system required for the construction, which simplified the complicated first storey permanent beam profile to one layer strut and resulted in savings, greater safety and productivity gain.
- Top-down construction method was adopted using D-wall (diaphragm wall) as ERSS (earth retaining/stabilising structures) in conjunction with the redesigned flat slab as strutting for the basement.
- Auto climbing core wall formwork system, lightweight shear wall aluminium formwork system and auto climbing external safety screen were adopted to improve productivity and safety.
- Adopted screedless floor system with smart levelling machine.
- Reframed the third storey structural layout due to clashes with M&E services.
- Omitted 300 mm thick hardcore for the base of the entire basement after restudying of the soil condition.
- Used self-compacting concrete for basement vertical elements to minimise honeycombing due to top-down construction.
- Application of BIM improved coordination of interfacing details.

Notable achievements:

- High CONQUAS score of 95.5 points.
- QM Star with QM Average of 90.6.
- MOM SHARP Awards 2012, 2013, 2014 and 2015.
- UK RoSPA Gold Awards 2011, 2012, 2013, 2014 and 2015.
- BCA Green & Gracious Builder Scheme (GGBS) Star.



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Residential Buildings - S\$1,800/sq m and above Category

TOMLINSON HEIGHTS



Scope of works: Construction of a 36-storey residential flat with 70 units, a basement car park, a swimming pool and communal facilities at 31 Tomlinson Road.

Main constraints:

- Avoiding damages to neighbouring and public properties during excavation works.

Notable features:

- Improved the car parking lot ratio from 1.5/unit (108 lots) to 2.07/units (145 lots).
- Mixed ERSS designs including CBP, soldier piles and king posts were adopted considering the variances in the terrain.
- Used table formwork shoring system and jump form to improve productivity and safety.
- Changed the conventional in-situ RC columns for the roof feature with fins to prefabricated steel columns clad with aluminium shingles.
- Used precast elements for pile raft/cap formwork, refuse chute, bay windows, planter and staircase shelter blast door frames.
- Changed RC spiral staircase to metal spiral staircase.
- Eliminated the use of external scaffold by using various MEWPs such as boom lifts, scissor lifts and mast climbing platforms for access equipment.
- Retained the existing C7 drain and relocated the pedestrian walkway for conservation of trees.
- Used PEX water piping system.
- Application of BIM.

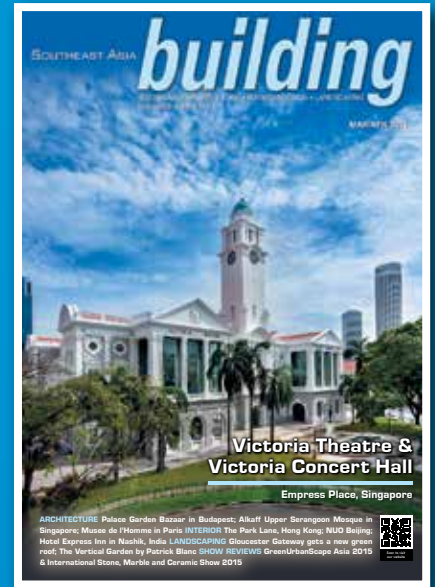
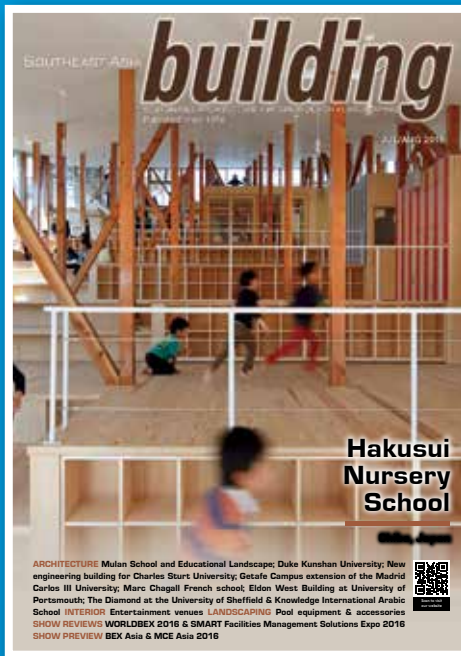
Notable achievements:

- High CONQUAS score of 94.2 points.
- QM certified with QM Average of 89.3.
- BCA Green Mark Platinum Award 2011.
- UK RoSPA Gold Award 2013.
- BCA Green & Gracious Builder Scheme (GGBS) Excellent.

Project Team

Builder: Chang Hua Construction Pte Ltd
 Developer: Yarra Investments Pte Ltd
 Principal Consultant: Architects 61 Pte Ltd
 Architectural Consultant: Architects 61 Pte Ltd
 Structural Consultant: KTP Consultants Pte Ltd
 M&E Consultant: Alpha Consulting Engineers Pte Ltd
 Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
 Landscape Consultant: Cicada Pte Ltd
 Construction Cost: S\$100.7 million
 Construction Period: 36 months
 Gross Floor Area: 22,000.68 sq m

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Residential Buildings - S\$1,800/sq m and above Category

THE TENNERY

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Project Team

Builder: China Construction (South Pacific) Development Co Pte Ltd
Developer: Far East Organization
Principal Consultant: RSP Architects Planners & Engineers (Pte) Ltd
Architectural Consultant: RSP Architects Planners & Engineers (Pte) Ltd
Structural Consultant: RSP Architects Planners & Engineers (Pte) Ltd
M&E Consultant: United Project Consultants Pte Ltd
Quantity Surveyor: Davis Langdon KPK (Singapore) Pte Ltd
Landscape Consultant: Ong&Ong Pte Ltd
Interior Design Consultant: Creative Mind Design Pte Ltd
Construction Cost: S\$87.5 million
Construction Period: 42.4 months
Gross Floor Area: 38,488.00 sq m

Scope of works: Construction of two blocks of part eight-storeys and two blocks of part 16-storey residential apartments with 338 units, a swimming pool and ancillary facilities on top of existing Junction 10 shopping mall and LRT depot (at level 3) at the junction of Choa Chu Kang Road and Woodlands Road.

Main constraints:

- In proximity to LRT’s protection zone and was only allowed to work during ‘no train’ hours.
- Limited access and storage at the first storey due to operation of existing shopping mall.

Notable features:

- Used steel structure to protect portion of LRT track entering the depot at level 3 from falling objects.
- Partially enhanced the structural strength of e-deck to store material due to limited storage at the first storey and over existing shopping mall.
- Adopted a hybrid of precast beams, precast slabs, system formworks, station pumps and placing booms to improve productivity.
- Used drywall partition and precision block for internal walls.
- Improved the design of rainwater discharge system for the e-deck for better distribution of rainwater to existing roof rainwater outlets.
- Replaced the specified cementitious waterproofing system with protection plaster to crystallisation waterproofing system, in order to overcome the constraints of lack of working space in the e-deck deep perimeter drain.
- Upgraded the chipping concrete protection screed for waterproofing membrane above the LRT depot roof to minimise surface cracks.
- Changed the wall mounted steel bracket to concealed steel cast-in pipe within the roof RC parapet wall for mounting the outrigger for gondola, to improve life cycle serviceability.
- Improved the ‘frameless’ design of riser door using cement based material instead of metal as door frame.
- Improved the threshold design of the marble piece at the base of timber door frame between the room and the toilet.
- Replaced colour grout with marble gum for grouting the marble floor to improve uniformity and quality.
- Changed the natural timber hand rail to composite wood type for the balcony glass railing for consistency and needs for coating.
- Application of BIM improved coordination of interfacing details.

Notable achievements:

- High CONQUAS score of 95.9 points.
- BCA Green Mark Platinum Award 2011.
- BCA Green & Gracious Builder Scheme (GGBS) Excellent.



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