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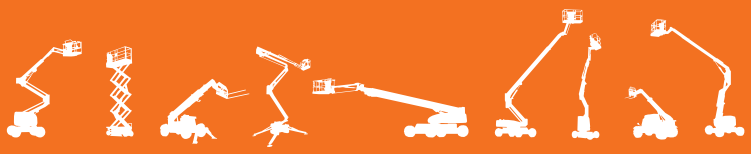

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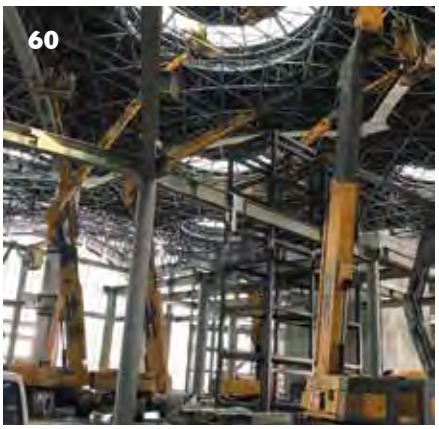

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Work starts on 'largest solar power plant in Vietnam'

Sunseap International has started the construction of its US$150 million solar power plant in Vietnam, which is believed to be the largest in the country. Located in the Ninh Thuan province, this new 168 MW facility is also said to be the largest solar collaboration between Singapore and Vietnam, and the first solar project in Vietnam led by a Singaporean company.

The solar power plant is expected to reach commercial operation by June 2019. Upon completion, it aims to generate enough electricity to power up to 200,000 households in Vietnam and create permanent jobs for over 200 local workers.

Sunseap, together with its joint-venture partners InfraCo Asia, an infrastructure development and investment company of the Private Infrastructure Development Group, and CMX Renewable Energy Canada Inc, a solar developer based in Canada, will be allowed to sell solar power generated by its solar farm to Vietnam's national grid at the mandated solar feed- in tariff of 9.35 US cents/kWh for the next 20 years, provided they complete the delivery of clean energy to the grid by June 2019.

"For Sunseap, this marks a significant step in our efforts to bring affordable, reliable and clean energy to beyond Singapore. As our name implies, we want the sun to be a major contributor to a sustainable future for Southeast Asia and the Pacific region," said Frank Phuan, co-founder and director of Sunseap.

Pham Van Hau, vice chairman of Ninh Thuan People's Committee commented, "Within eight months of receiving the decision on investment policy, the investor has showed great efforts to acquire all relevant permits and meet all the necessary conditions so that today, this 168 MW solar power plant can officially break ground.

"The groundbreaking ceremony of CMX RE Sunseap's solar farm today is not only a happy day for the company and the people in My Son Commune, but also a happy day of everybody in Ninh Thuan, who are expecting this project to be a breakthrough for the socio-economic development of Ninh Son district, making Ninh Thuan the renewable energy centre of Vietnam."

The groundbreaking ceremony for the construction of a new US$150 million solar power plant in Ninh Thuan, Vietnam, was held in June 2018. This 168-MW facility is expected to reach commercial operation by June 2019.

Sunseap International is a unit of Singapore's leading clean energy provider Sunseap Group. It is regarded as one of the largest and most established players in the solar energy industry in the region, with a pipeline of projects in Cambodia, India, Thailand, Vietnam, Malaysia and Australia. ■

Samsung C&T wins S$603 mil contract for Singapore NSC project

Samsung C&T Corporation has been awarded a S$603 million design and construction contract by Singapore's Land Transport Authority (LTA) for the North-South Corridor (NSC) project, comprising a 1.7-km-long underground road and facility building in the Toa Payoh area . The construction is expected to commence soon and be completed by November 2026.

According to Samsung C&T, the company was selected as the successful bidder due to its proposed original design that would minimise the impact on the surrounding traffic flow during construction. "I am very grateful to continue building upon our long-term relationship with LTA once again," said Bruce Lee, head of Samsung C&T's Civil Infrastructure Business Unit. "It is especially meaningful as it marks Samsung C&T's 50th project in Singapore. Based on Samsung C&T's core values of quality and safety, we will complete this project successfully, too."

Samsung C&T was awarded the first NSC contract in November 2017, involving the construction of a 1.25-km stretch of the corridor between Novena Rise and Toa Payoh Rise. The company has completed various civil projects around the world, including Downtown Line 3's Expo and Upper Changi MRT stations in Singapore. The company has also won the Marina Coastal Expressway (MCE) 483 and 486 projects, with the MCE 483 winning the 'Construction Excellence Award' at the annual Building and Construction Authority (BCA) ceremony in 2016. ■

Samsung C&T has won another contract for the North-South Corridor project in Singapore, comprising a 1.7-km-long underground road and facility building in the Toa Payoh area.

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Dressta names Intraco Penta dealer for Indonesia

Dressta has appointed Intraco Penta as its official dealer and service partner in Indonesia. With this new partnership, Intraco Penta can now provide sales, parts and service supports for Dressta's full range of crawler dozers and pipelayers, as well as support Dressta in expanding its market reach in Indonesia.

Based in Balikpapan, Intraco Penta will offer Dressta products and services throughout the construction, mining, quarry, road and highway, landfill and forestry segments.

"Intraco Penta bring along a tremendous amount of sales and service experience in the construction equipment sectors and we look forward to working with them closely," said Howard C. Dale, chairman of Dressta. "Intraco Penta has been in the construction machinery industry for over 40 years. And this year, we are celebrating our 70th year anniversary at Dressta. Both Dressta's and Intraco Penta's mission & vision are parallel in this great industry and I have no doubts that this partnership will be a fruitful one for our customers in the region."

Mr Dale continued, "Top-notch customer-oriented service approach offered from 14 locations in Indonesia along with the extensive product offering of Dressta will create high-level 360 degree solutions that can meet the expectations of even the most demanding customers in Indonesia."

George Setiadi, managing director of Intraco Penta added, "Dressta bulldozers are a perfect fit into our existing offering of products from Volvo. The addition of bulldozers will notably improve our ability to offer full-package solutions to our customers. This appointment is fully in line with our strategy to use our extensive network to distribute complementary products. Our deep knowledge and experience of the equipment sectors will allow us to provide Dressta customers with rugged, dependable products coupled with unbeatable service quality." ■

Dressta has appointed Intraco Penta as its official dealer and service partner for Indonesian market.

Goldhofer receives 'largest order'

Thailand-based company Silamas Group recently made a major order for over 150 THP/SL-L axle lines from Goldhofer. "This is the biggest ever single order in the history of Goldhofer," said Jean-Philippe Martin, Asia sales manager at Goldhofer. "Silamas will then have a total of over 550 Goldhofer axle lines in its fleet."

According to Silamas, the main reasons for the new order are the good market situation and the new requirements of Thailand's road traffic regulations, which is a reduction in the maximum permissible number of axle lines per vehicle configuration. In order to meet its customers' future logistics demand nationwide, Silamas will have to use more vehicles for the same total load and as a result of this, the company will need more vehicles.

Silamas CEO Chompoo Glinpu said, "The THP/SL-L modules in particular offer an ideal combination of the characteristics needed for heavy haulage today. Thanks to their optimum payload-axle load ratio, they will be the perfect solution for our response to the new regulations." ■

Silamas on the road with Goldhofer 2x16 THP/SL axle lines and Faktor 5 high girder bridge.

SMEC to undertake feasibility study for Malaysia power plant extension

SMEC has been engaged by Sarawak Energy to conduct the feasibility study and tender design for an extension of Bakun Hydroelectric Power Plant, located in central Sarawak on the Balui tributary of the Rejang River, Malaysia.

Following the completion of the pre-feasibility study in 2017, SMEC was engaged to provide an in-depth analysis on the possibility of increasing the existing hydropower scheme capacity, without interrupting the operation of the existing power plant and without drawing down the reservoir level.

In the pre-feasibility report, it was suggested that a 300 MW extension was possible by building a 1.2-km-long, 8.5-m-diameter headrace tunnel through the dam's right abutment to a new underground power station. The new power station will have a single 300 MW generator unit that will utilise the redundant 12-m-diameter diversion tunnels of the existing scheme as the new tailrace.

SMEC's project team will review the pre-feasibility study and confirm the development option for the extension. Other services to be provided include a Hazard and Operability (HAZOP) study, concept study report, basis of design for civil, electrical and mechanical aspects, tender design report, tender specification and drawings, training of client personnel and generic specification for SCADA, communications, controls and protection.

The project win is said due to the team's familiarity with the geological site conditions and ability to field a project team consisting mainly of engineers who have previously worked on the existing 2,400 MW Bakun Power Station or other hydropower projects in Sarawak. ■

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Manitowoc strengthens operations in the Philippines

Manitowoc is expanding its sales team in the Philippines with three new appointments. Albert Hernandez and Carlo Tarifa are new in-country sales managers for Potain tower cranes, and Michael Sanares is the new sales manager for Grove mobile cranes. Based in Manitowoc's office in Makati City, the three new managers will report directly to the company's sales director for the Philippines, Michael Macatangay.

Mr Hernandez is responsible for growing the Potain tower crane business in northern Philippines. He has over 24 years of experience in the automotive, food and steel industries. Potain tower crane sales in the south will be overseen by Mr Tarifa. He has 13 years of experience in marketing, sales, retail, wholesale and rental services. Mr Sanares will be growing the Grove mobile crane business. He has over 15 years of experience in the automotive, lighting supplies and lifting equipment industries.

These new appointments are part of a wider strategy by Manitowoc to strengthen its business in the Philippines. "The country continues to show positive signs of growth and we want to invest in our business to ensure we provide the very best levels of service to our expanding customer base. In addition to hiring new team members, we also want to expand our workshop and warehouse facilities over the course of 2018," said Mr Macatangay.

FROM LEFT: **Michael Sanares, sales manager for Grove mobile cranes; Carlo Tarifa, sales manager for Potain tower cranes (southern Philippines); and Albert Hernandez, sales manager for Potain tower cranes (northern Philippines).**

From the Potain range of tower cranes, the MCT205 top-slewing cranes continue to prove popular for contractors in the Philippines. The MCR160 and MCR225A luffing jib cranes are also well known, and in recent years there has been an increase in interest for Potain's self-erecting cranes, said Manitowoc.

From the Grove range of mobile cranes, the brand's rough-terrain cranes and all-terrain cranes can be found on jobsites across the Philippines, working on projects such as commercial and residential buildings and power plants. The four-axle GMK4100L-1 all-terrain crane is one of the newest units to launch in the Philippines.

The more popular Grove cranes include industrial cranes (up to 18 t capacity), rough-terrain cranes (from 30 to 130 t capacity) and all-terrain cranes (from 60 to 450 t capacity). A range of Manitowoc crawler cranes is also available in the Philippines, with those from 80 to 110 t attracting the most interest. ■

Conservatory residential project in Melbourne tops out

Malaysia-based property developer UEM Sunrise Berhad, along with Hickory Group, recently celebrated the topping out of Conservatory residential development in Melbourne, Australia.

The A$330 million project, located on the city's MacKenzie Street, offers 446 units of one, two and three-bedroom residences and four levels of residential facilities. It will be UEM Sunrise's first completed project in Australia since the company's entry into the Melbourne market in 2013. The first stage of Conservatory apartments is planned to be handed over to purchasers from late September 2018 onwards.

The new development is also an integral part of Melbourne's history. "Before construction began, we engaged an archaeological consultant for an archaeological excavation of the site. They uncovered over 250,000 artefacts, dating back to the early gold rush in the 1800s when the site was the Mistletoe Hotel," explained Anwar Syahrin Abdul Ajib, UEM Sunrise's managing director and CEO.

"Fittingly, these items reflect an opulent time when Melbourne's population was burgeoning, and settlement started to take shape. Conservatory similarly represents a new era of population growth and will service Melbournians with luxury accommodation options, boasting views over the Carlton Gardens and lavish amenities such as a rooftop jacuzzi, private cinema and golf simulator."

According to UEM Sunrise, starting from late September 2018, 477 pieces of significant artefacts found at the construction site of Conservatory will be on display in purpose-built glass cases in the foyer of the building, which the public can view from the Bell Place Laneway. The company has worked closely with Heritage Victoria and the appointed archaeological consultant as well as a conservator to identify these artefacts. ■

TOP LEFT AND ABOVE: **UEM Sunrise Berhad and Hickory Group celebrate the topping out of Conservatory residential development in Melbourne, Australia. The project is expected to be completed later this year.**

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Liuzhou ZF Machinery to launch new transmission

Liuzhou ZF Machinery Co Ltd (LZZF), a joint venture between Guangxi Liugong Machinery and ZF Friedrichshafen, plans to manufacture a new generation transmission, the BP230.

The BP230 transmission is developed from Ergopower, but it adopted multifunctional components and a front-back split structure, both tailored for Chinese users' habits, making operation more comfortable and assembling & maintenance easier.

Compared to the older generation product, the new transmission features a smaller size, yet it has a stronger output and can help the machine to reach a faster speed at the same capacity, according to LZZF. The compact size is also better adapted to the torque converter. Meanwhile, the improved speed ratio and its standard automatic mode is designed to reduce oil consumption.

The interior of the gearbox is driven by helical gears, ensuring stable driving and lower noise. The shifting comfort is also improved by a new proportional valve and optimised controlling programmes. Through an integrated design, the electro-hydraulic controlling system can monitor the working condition of the gearbox remotely through GPS, and perform fault diagnosis from afar, making maintenance easy and convenient.

The new transmission is suitable for wheel loaders and graders, such as LiuGong 856H, 862H and 870H wheel loaders, with options of four-speed and six-speed automatic gearboxes. It is an upgraded version of the WG200 and a replacement for the imported Ergopower transmission.

The introduction of the new transmission extends the product lines of LZZF. It also enhances the company's competitiveness and lays the foundation of a long-term development. The product's R&D began in 2016 at LZZF and a total of 15 prototypes were produced for reliability tests. The new transmission is scheduled for its official launch soon and is expected to begin large-volume production in November 2018. ■

Liuzhou ZF Machinery, a JV of Guangxi Liugong Machinery and ZF Friedrichshafen, is set to manufacture a new generation transmission.

New Singapore data centre to be built with DfMA method

Global Switch, an owner and operator of large scale carrier and cloud neutral data centres in Europe and Asia Pacific, has announced that its new Singapore Woodlands data centre will be the first project in the country to adopt the prefabricated mechanical and electrical and plumbing (MEP) modular techniques on a large scale. The facility is due to launch later this year.

The contractor on the project, Gammon Construction, will be assembling over 60% of the MEP works off-site. This method - supporting the Design for Manufacturing and Assembly (DfMA) concept - is known to offer many benefits including increased productivity, safety and quality.

The new data centre will provide 25,000 sq m of critical infrastructure, supported by 30 MVA of utility power supply capacity. The S$280 million facility will host multiple connectivity options with the ability to directly access the dense networks currently operating from within Global Switch Tai Seng, the company's other data centre in the country, which has significant sub-sea cable system infrastructure present.

According to Global Switch, the Woodlands data centre will also be targeting a Platinum BCA Green Mark as well as a Leadership in Energy and Environmental Design (LEED) Gold Rating. ■

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Global Switch's new data centre in Singapore will adopt the prefabricated mechanical and electrical and plumbing (MEP) modular technique.

Keppel to work on sustainable urbanisation solutions in the Philippines

Keppel Corporation has signed an agreement with Filinvest Development Corporation to develop solutions for sustainable urbanisation in the Philippines. Both companies will explore cooperation opportunities in developing and enhancing urban solutions for Filinvest's development portfolio. This includes Filinvest City in Alabang, a fully-integrated and self-contained 244-ha prime property south of Metro Manila that is home to a large number of Business Process Outsourcing (BPO) offices, residential enclaves, leisure destinations, an education zone as well as a medical and wellness hub; Filinvest New Clark City in Central Luzon, envisioned to pioneer the development of a global and smart business community in a 288-ha property north of Metro Manila; as well as office developments that are built around the needs of technology-based companies engaged in BPO and Knowledge Process Outsourcing (KPO) in Metro Manila. ■

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Master building and civil consultants for Changi T5

Singapore's Changi Airport Group (CAG) has appointed master building consultants to provide architectural design and engineering consultancy services for the development of Changi Airport's Terminal 5 (T5). At the same time, CAG has also appointed master civil consultants for the T5-related landside and airfield works.

The companies that have been appointed as master building consultants include: KPF (Singapore) Pte Ltd, in partnership with Heatherwick Studio and Architects 61 Private Limited, for the provision of architectural design services; Arup Singapore Private Limited, Mott MacDonald Singapore Pte Limited and Surbana Jurong Consultants Pte Ltd, for the provision of engineering services; and DP Architects Pte Ltd, for the provision of design services for commercial spaces. These three teams will provide full consultancy services for the design of the main terminal building, satellite terminal building, ground transportation centre and primary landside roadway.

The master civil consultants appointed comprise: Arup Singapore Private Limited, Mott MacDonald Singapore Pte Limited, Surbana Jurong Consultants Pte Ltd and Changi Airport Planners and Engineers Pte Ltd. The companies will provide consultancy services for the design of infrastructure at the landside and airside areas outside of the T5 buildings. These include taxiways, aircraft parking stands, roadways and drainage systems, as well as the connections for utilities such as power, water, gas, fuel and telecommunications to the T5 buildings.

"With the aviation industry expected to experience strong growth in the coming decades and demand for capacity at Changi Airport projected to increase annually, the development of T5 as a single integrated terminal will ensure that Changi Airport remains competitive as a leading air hub capable of serving the growing needs of our airline partners and taking the travel experience of passengers to new levels," said Yam Kum Weng, CAG's executive vice president for Airport Development.

The new Terminal 5 is part of the larger Changi East development project that includes a three-runway system, as well as the development of cargo complexes and other supporting aviation and ground transport infrastructure. The project will provide Changi Airport with additional capacity of up to 50 million passenger movements per annum in its initial phase and 100 more aircraft stands. ■

Roxy wins contract for commercial project at HKIA

The Airport Authority Hong Kong (AA) has awarded a contract to Roxy Limited, a wholly owned subsidiary of New World Development Company Limited, to develop and manage a new commercial development in SkyCity at Hong Kong International Airport (HKIA).

Scheduled to be opened in phases from 2023 to 2027, the new development is located adjacent to HKIA's passenger terminals. It will provide a maximum gross floor area of 350,000 sq m, housing retail, dining and entertainment facilities. Under the agreement, Roxy will design, construct, finance and manage the development. ■

Deliveries start for Volvo EC200D excavator in Southeast Asia

Over the first quarter of 2018, Volvo Construction Equipment (Volvo CE) has held a number of launch events in Southeast Asia for its new EC200D excavator, including in Indonesia, Malaysia and Thailand. The company introduced the new 20-t machine at the beginning of this year and soon after that, it received a significant number of confirmed orders destined for construction and road building projects in Malaysia, Singapore, Indonesia, Vietnam, the Philippines, Thailand and Cambodia.

"The EC200D is ideal for general construction and its fast working speeds can help contractors stay ahead of schedule," said A.M. Muralidharan, VP for sales support and dealer development at Volvo CE Region APAC. "Construction work levels are healthy across the region and we're already confident the EC200D will become one of the most popular 20-t excavators around."

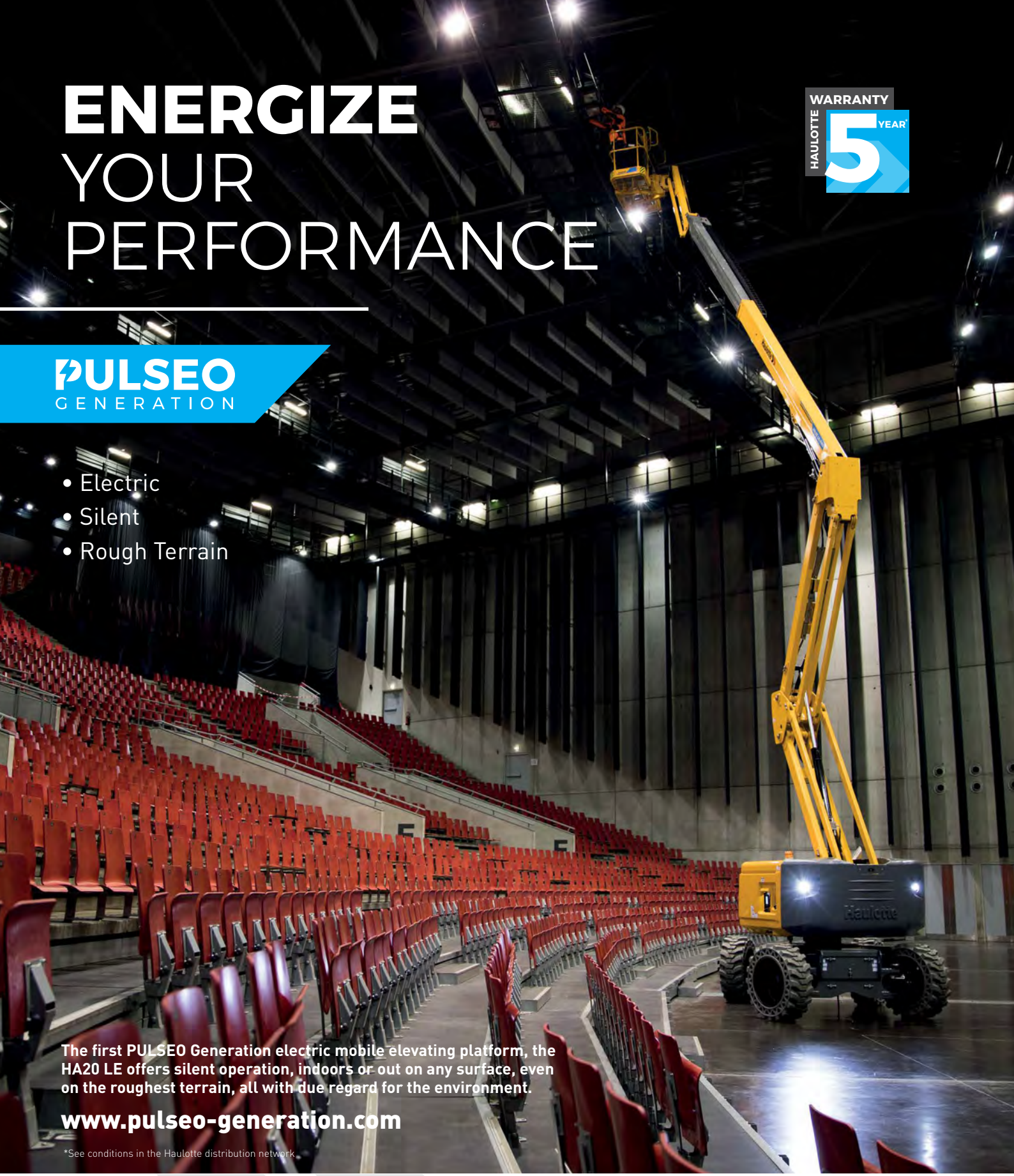
The EC200D was formally launched in Indonesia at an event in Yogyakarta earlier this year, although in total there will be another 20 events across the country to introduce the machine, according to Volvo CE, underlining the expected popularity of the unit in the country.

So far, six events have already taken place in Indonesia - in Palembang, Makassar, Medan, Lampung, Pontianak and Bandung. A key highlight of the launch events has been showcasing the fast working speeds of the EC200D. In some cases, specially-constructed test spaces were created to allow customers to experience the EC200D's high swing torque and lifting capabilities.

The EC200D offers an operating weight of 19,800 to 20,300 kg, and is configured with a 5.7 m boom, 2.9 m arm and 0.8 cu m bucket. The excavator features Volvo's Eco mode, which optimises the hydraulic system to reduce loss of flow and pressure while maintaining digging power and swing torque.

The Eco mode helps the EC200D reduce fuel consumption by up to 12% when compared to similar excavators, said Volvo CE. Equipped with the Volvo D5E Tier 3 engine (with an output of 123 kW at 2,000 rpm) and compatible hydraulics, the EC200D is designed to operate fast and with short cycle times. ■

LEFT AND BELOW: **Volvo EC200D excavator is targeted at the Asian market, ideal for general construction applications.**



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Atkins and Dragages achieve breakthrough at HK tunnel

Atkins, Dragages and Civil Engineering and Development Department (CEDD) of Hong Kong recently celebrated the TBM breakthrough at the Lung Shan Tunnel northbound section of the Liantang - Heung Yuen Wai boundary crossing facility. It is the second and final TBM (tunnel boring machine) breakthrough of the project.

Appointed by Dragages Hong Kong Limited, SNC-Lavalin's Atkins business has been undertaking the major design and build project as its detailed design consultant since December 2013. The key scope of the project consists of the 4.8 km dual two-lane road tunnels, constructed by TBM and drill-and-blasting method, connecting passengers and cargo between Hong Kong and mainland China.

The 4.8 km Lung Shan Tunnel is expected to be the longest twin tube road tunnel in Hong Kong. The project reportedly engages the largest EPB (earth pressure balance) TBM in Hong Kong, with a diameter of 14.1 m.

Following the breakthrough of the southbound tunnel section in March 2017, the TBM went on to complete a 180-degree U-turn in order to start the construction of the northbound section just three months later. It is believed to be the first time in Hong Kong that a TBM has completed a U-turn in a specially-designed rock caverns, whereby the normal practice is to substantially dismantle the TBM prior to being transported back and set up again at its original launching position. This TBM U-turn operation enabled the construction progress to remain in line with the tight schedule. The project is due to complete by the end of 2018.

The project team celebrates the TBM breakthrough at the Lung Shan Tunnel northbound section of the Liantang - Heung Yuen Wai boundary crossing facility.

HK water infrastructure

Atkins has also been appointed by the Water Supplies Department (WSD) of Hong Kong to carry out a feasibility study on the relocation of the Yau Tong fresh water and salt water service reservoirs to caverns. This relocation aims to release the existing sites for housing and other uses to meet the long term social and economic needs of Hong Kong whilst ensuring a reliable, adequate and quality supply of water for the territory. The study is expected to take approximately 24 months to complete

The scope of the study includes the selection of a suitable site for its relocation, preliminary technical and impact assessments, site investigations, preparation of an outline design for the engineering works, formulation of the implementation strategy and programme, and public engagement. It will also involve a planning review of the future land use of the existing sites to establish a business case to confirm the financial viability of the project. ■

Ammann India unveils new, expanded facility

Ammann India, a joint venture between Ammann Group and Apollo, has expanded its manufacturing facility in Mesana, near Ahmedabad. Covering an area of 120,000 sq m, the facility will employ 800 workers and house production areas, administrative offices, a training centre, a compactor testing centre and a painting and sandblasting shop.

The revamp work began in 2014 and was completed in April this year. The first phase included construction of two halls for the production of asphalt-mixing plants for the Indian market; this portion was completed two years ago. The second phase, which was just completed, has been more extensive. Old production halls were removed and replaced with new buildings. Additional structures were built to house administrative staff and accommodate key product trainings for customers. The expansion also provides an opportunity to include several outside operations into a single location.

The products manufactured at the facility are designed for both local and overseas markets. These include those of Apollo brand (asphalt-mixing plants, pavers and related products), as well as Ammann machines and plants (ARX 91 and ARS 121 compactors; AFT 500 pavers; ValueTec, UniBatch and EcoBatch asphalt-mixing plants; and core plant components). The Apollo/Ammann Elba concrete-mixing plants will also be manufactured at the facility.

The new manufacturing areas feature better layouts for higher efficiency. The processes are more technologically advanced as well, with modern robotics used for welding as an example, which is expected to improve quality. Customers will also see products delivered more quickly due to increased efficiency. ■

ALL IMAGES: **Ammann India celebrates the opening of its new expanded manufacturing facility in Mesana, near Ahmedabad.**

JLL acquires JCL International in the Philippines

Global real estate consulting company JLL has acquired JCL International, a Philippine company that provides project management and construction services. Established in 2002, JCL is located in Manila and has more than 40 employees, including architects, engineers and construction personnel. Its team is led by senior partners John Morgan and Calum Swinnerton, who have both been involved in the construction industry for more than 30 years.

"For JLL, the acquisition will significantly expand our existing project and construction platform, giving us the ability to offer our clients even more services," said Anthony Couse, CEO of JLL Asia Pacific. "With JCL's specialist expertise and strong reputation, we will gain greater access to new corporate and investor clients in the country's core growth industries, specifically hospitality, industrial, data centre, retail, residential, healthcare and outsourcing. The acquisition will also strengthen our ability to support global and regional clients in the Philippines."

The Philippine economy continues to expand and, according to a recent World Bank report, will record growth in excess of 6% per year until 2019 on the back of infrastructure programmes and a burgeoning Business Process Outsourcing (BPO) sector. With stable demand for office space, particularly from technology and professional services firms, the real estate and construction sectors continue to experience steady growth.

JCL handles both domestic and international projects. The company's services that will be incorporated into the JLL business include project management, construction management, cost and claims management, procurement management, design management, building audits and consultancy, energy management and audit, move management, management of testing and commissioning, and client management.

During an initial transition phase, JCL will operate as JCL International – A part of the JLL network. Both Mr Morgan and Mr Swinnerton will report to Henning Badenhop, JLL's managing director for project and development services in Southeast Asia. ■

New digital construction education centre in Singapore

A new facility for teaching digital construction skills has been established at the Institute of Technical Education (ITE) in Singapore. The Integrated Digital Delivery (IDD) Centre is part of the country's strategy to transform its construction industry by creating a highly skilled workforce trained in the latest architecture, engineering, construction and operations technologies.

Support from Trimble will expand ITE's construction curriculum in 3D Building Information Modelling (BIM) design, digital fabrication and sustainable built environment. Trimble's solutions will provide ITE the capability to more fully integrate the technological tools across its courses that are rapidly transforming how building and living environments are designed and constructed.

The broad range of Trimble software includes Tekla Structures, Tekla Structural Designer, Tekla Tedds, Trimble Connect collaboration software, Trimble RealWorks scanning software, Vico Office Suite, Sefaira Architecture and its popular 3D modelling software SketchUp Pro and SketchUp Viewer for Hololens. In addition, ongoing support services and annual training for ITE staff will be provided. The hands-on training will enable students to access the latest technology and workflows to develop design, engineering and construction skills. The new IDD Centre is located in the new Engineering Design Hub, School of Engineering, ITE College Central.

ITE will incorporate Trimble's solutions into a variety of courses including Civil and Structural Engineering Design, Facility Systems Design, Interior & Exhibition Design, and Mechanical and Electrical Services Supervision. Besides courses, access to the solutions is expected to enable secondary school students to better understand the technology with the intent to increase interest in construction industry careers.

Increasing the use of IDD is a key component of the Singapore Government's Construction Industry Transformation Map (ITM). One of the goals of the ITM is to train 80,000 people in new construction technologies by 2025, up from 32,600 currently. ■

A new IDD centre for teaching digital construction skills has been opened at the Institute of Technical Education (ITE) in Singapore. Support from Trimble will expand ITE's construction curriculum in 3D BIM design, digital fabrication and sustainable built environment.

Dr Ang Kiam Wee, principal of ITE College Central (left) and Dr Roz Buick, vice president of Trimble, at the official opening of the new IDD Centre.

Genie SX-150 boom lift makes debut in Vietnam

The Genie SX-150 boom lift was recently delivered to Nishio Rent All Vietnam Co Ltd, adding to the company's 2,000-unit fleet of equipment. The machine is also expected to help expand Nishio Rent All's current market share of 20 to 30 percent.

"We are well positioned to meet the expectations of strong economic growth and rapid urbanisation in Vietnam," said Takumi Hosoi, general director of Nishio Rent All Vietnam Co Ltd. "Our biggest boom lift to date is Genie Z-135/70 model. With increasing demand for more sophisticated construction, we saw the need for Genie SX-150 boom to be introduced into the Vietnam market."

The Genie SX-150 boom lift has the ability to telescope vertically to 48.33 m and reach horizontally 24.4 m. It is designed to perform in the most extreme construction applications, boasting a full working envelope for excellent productivity and capacity. The machine features the Genie XChassis system, which extends and retracts the boom's axles to provide stability on the job. With a narrow profile, the Genie SX-150 can also be easily transported. ■

Sharon Foong, general manager of Terex Asia AWP Southeast Asia (in the centre, on the left) officially presents the Genie SX-150 to Takumi Hosoi, general director of Nishio Rent All Vietnam Co Ltd at the handover ceremony.

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Surbana Jurong secures masterplan project in India

Surbana Jurong has been commissioned to provide the masterplan for the Pune Metropolitan Region in the state of Maharashtra, western India. The project was awarded by the Pune Metropolitan Regional Development Authority (PMRDA) at the recently held 1st Maharashtra-Singapore Joint Committee Meeting.

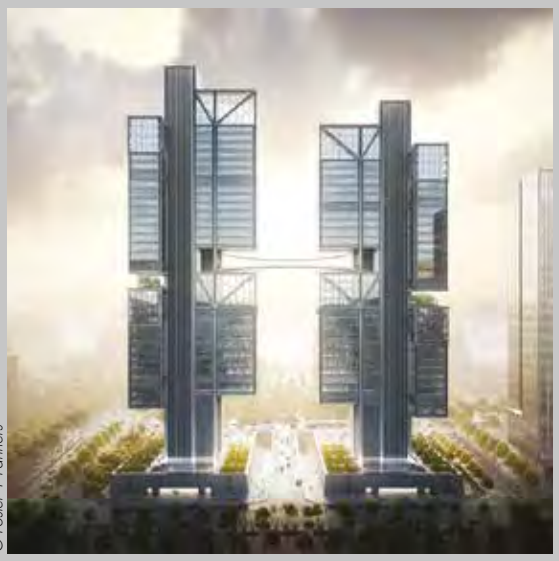
Surbana Jurong's scope of work will include a review of the existing regional plans and provide recommendations in the form of an integrated masterplan for future developments for the region. The planning process will be a joint effort with PMRDA and other related authorities. The masterplan will guide the physical development through planning for land use, infrastructure and transportation, as well as provide a sustainability framework and identify strategic projects. The plans are expected to be delivered in 10 months' time.

Close to India's financial hub of Mumbai, Pune is a growing metropolis and industrial hub with rich natural resources and heritage. The PMRDA, the planning and development authority for the region, aims for the city to become a world-class economic hub through sustainable growth.

Surbana Jurong's masterplan will take into account the long-term needs of the region and provide a blueprint for its development decades into the future. The plans will help transform PMRDA's vision of a sustainable city of economic opportunities and high living standards into reality. ■

Surbana Jurong has been tasked by the Pune Metropolitan Regional Development Authority (PMRDA) to provide the masterplan for the Pune Metropolitan Region. Wong Heang Fine, group CEO of Surbana Jurong, is seen here (on the front right) with Kiran Gitte, PMRDA commissioner.

New landmark for Shenzhen



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An artist's impression of DJI's new headquarters in Shenzhen.

Foster + Partners has unveiled its design for the new headquarters of DJI, a global robotics company. The project is currently under construction in Shenzhen, China. The twin towers combine sensitive research and development areas with office and other public functions. The floors are arranged in floating volumes cantilevered from central cores by large steel megatrusses – creating large, column-free spaces throughout, with quadruple-height drone flight testing labs. These two towers are linked by a sky bridge. ■

Major order for Terex tower cranes

Singapore-based tower crane rental company and Terex tower cranes distributor Crane World Asia (CWA) has ordered 31 Terex CTL 260-18 luffing jib tower cranes all at once, as well as three Terex CDK 100-16 luffing jib derrick cranes. Another batch of nine Terex CTL 630B-32 and one CTL 650F-45 luffing jib tower cranes are scheduled to reach South Korea later this year.

"The thing that really sold us on the CTL 260-18 was its powerful performance characteristics, which are demonstrated by its ability to lift over 3 t at its maximum boom length of 55 m," said Roger Poon, director of Crane World Asia.

A total of 30 Terex CTL 260-18 cranes will be delivered to Busan, South Korea, while the remaining one will go to Hong Kong. "We'll be delivering the first three cranes in the next weeks, and the other 28 will be delivered throughout the year until the end of October," said Zac Tan, sales manager for Terex tower crane.

Mr Woo, director of SeoHae Tech, who already bought several CTL 260-18 cranes in 2018 commented, "The tip load, load moment and load capacity are excellent. Plus it is a very versatile crane." Mr Woo also said that the CTL 260-18 is the company's most popular crane.

Mr Eom, director of MK Tower Co Ltd added, "We were looking for a luffing jib tower crane which would cause no downtimes for us, and the CTL 260-18 proves to be very reliable, hence, we have already placed an order for 20 units." ■

LEFT: **Representatives from Crane World Asia and SeoHae Tech.**

RIGHT: **Terex CTL 260-18 luffing jib tower crane.**

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Doosan Bobcat opens backhoe loader plant in India

Doosan Bobcat has set up a new backhoe loader plant in India, marking its entrance into one of the world's three largest markets for the compact construction equipment industry. The company took over the facility in May 2018, which has a site area of 80,000 sq m, a factory floor area of 15,000 sq m and is capable of producing 8,000 machines a year.

Doosan Bobcat has entered the backhoe loader market in a bid to expand its emerging market portfolio with the aim of exploring mid- and long-term growth engines. India's compact equipment market is reportedly the third largest in the world after the US and China, with an estimated worth of KRW 1.3 trillion, where the backhoe loader sales account for more than 80%. Since 2014, the Indian backhoe loader market has grown at an average annual rate of 9.7%.

Doosan Bobcat has acquired idle facilities to produce backhoe loaders in India to minimise its risk of investment. By dramatically shortening the period from preparation time to shipping time compared to the time taken to establish an entirely new plant, the company expects to be able to start releasing its first batch of backhoe loaders in the second half of next year. It will then focus on marketing activities targeting the Indian market in order to expand its market share.

"With government-led infrastructure investment increasing in recent years, the compact market is growing rapidly in India, making it a highly attractive market," said Scott Park, president and CEO of Doosan Bobcat. "Our mid- and long-term goal, beginning with backhoe loaders, is to lead the Indian small construction machinery market." ■

ABOVE: **Scott Park, president and CEO of Doosan Bobcat (on the right), visiting the company's new backhoe loader plant in India.**

LEFT: **A Bobcat B700 backhoe loader.**

First Liebherr LTM 1450-8.1 mobile crane delivered to Asia

Set Win Group in Hong-Kong has taken delivery of a Liebherr LTM 1450-8.1 mobile crane, which is believed to be the first unit in Asia. The model was unveiled at the bauma exhibition in Munich, Germany, back in 2016.

Hong Kong is among the most densely populated cities in the world and is famous for building many skyscrapers. The 85-m telescopic boom and the time-saving set-up concept of the LTM 1450-8.1 are therefore important factors for Set Win. This eight-axle crane will be used to tackle various applications including tower crane assembly, hoisting work for steel structures and prefabricated concrete parts, as well as the installation of air conditioning systems and generators on skyscraper roofs.

"VarioBase and VarioBallast have proven even more useful in practice than we initially thought. These systems open up a whole new range of possible uses," said Alan Kan, one of the managing directors at Set Win. "Another advantage of the crane is that not only can it be ballasted at the front, but also at the rear end of the undercarriage. That makes things significantly easier on constricted sites."

Set Win currently has 25 cranes in its fleet, 20 of which are Liebherr cranes. The company's fleet is expected to expand again in the middle of this year with a new Liebherr LTM 1500-8.1. "The two Liebherr eight-axle cranes will supplement each other and form an unbeatable pairing," said Mr Kan. ■

Set Win Group recently took delivery of a Liebherr LTM 1450-8.1 mobile crane (left) during the Liebherr Customer Day in Hong Kong (above).

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AA REIT plans for new industrial facility in Singapore

AIMS AMP Capital Industrial REIT (AA REIT) plans to redevelop its property at 3 Tuas Avenue 2 in Singapore. Due for completion in the second half of 2019, the design-and-build project will transform the site into a modern and versatile ramp-up industrial facility suitable for both production and storage. The gross floor area is expected to increase by 52 percent to approximately 24,890 sq m.

Costing about S$48.2 million, the redevelopment is in line with the Singapore government's masterplan to develop and upgrade the Tuas region into a high-performing industrial space anchored by the development of Tuas mega port. When completed, the new Tuas mega port will be able to handle up to 65 million standard containers annually, almost double the current capacity. ■

An artist's impression of the redevelopment.

JP Nelson gets more big drill rigs for Singapore

JP Nelson has taken delivery of two rotary drill rigs, a Bauer BG55 and a Sunward SWDM36H, for use in a major project in Singapore. The Bauer BG55 PremiumLine is the first unit to arrive in Asia, said the company. The machine has a maximum drilling diameter of 3,700 mm, maximum drilling depth of 126 m and maximum torque of 553 kNm. It also features a line pull of 570 kNm and is equipped with a number of safety features.

The all new Sunward SWDM360H is equipped with a 418 kNm rotary torque, making it suitable for rock coring jobs. According to JP Nelson, the machine is currently working on a rock coring project performing 1,800-2,000 mm with great consistency and production. The SWDM36H has a 370 kNm line pull and with its innovative winch system, the wire rope's wear rate can last for about 15% longer compared to other similar machines. The SWDM36H has also been used in other countries, including Malaysia, Thailand, Cambodia, China and Turkey.

"We expect more challenging jobs ahead with bigger piles and rocks, so we want to provide our customers with the right machines in order to help them carry out their projects smoothly. We are committed to bring in higher performance and newer rigs for the market here," said Harry Yong, general manager of JP Nelson. ■

JP Nelson has acquired two more large drill rigs for Singapore market, a Bauer BG55 (above left) and a Sunward SWDM360H.

Delivery for Sunward SWDM280

JP Nelson has recently delivered a new Sunward SWDM280 drill rig to JF Foundation. Although the machine is ideal for rock coring projects, it is also versatile when it comes to marine clay and soil, said JP Nelson. The high-speed spin-off function is an optional add-on. The winch design with a maximum line pull of 300 kNm enables the machine to work with heavier loads and deeper depths.

Furthermore, JP Nelson has secured an order for more than 10 Sunward drill rigs in the first half of 2018 and the company plans to deliver the machines by July and August. ■

Sunward SWDM280 drill rig on a jobsite.

The winch design with a maximum line pull of 300 kNm enables the drill rig to work with heavier loads and deeper depths.

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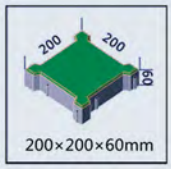

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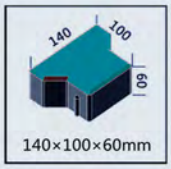

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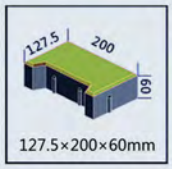

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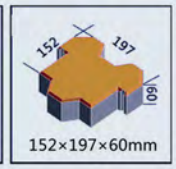

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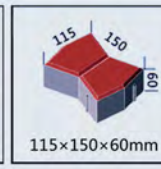

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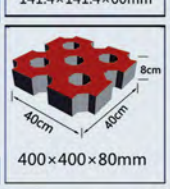

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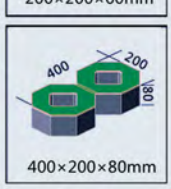

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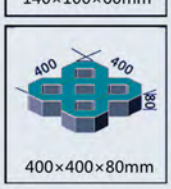

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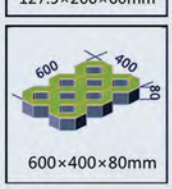

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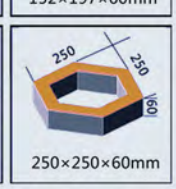

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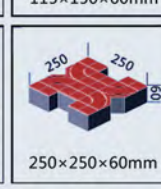

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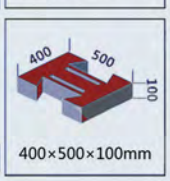

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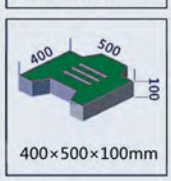

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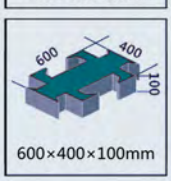

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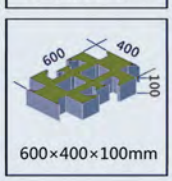

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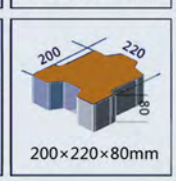

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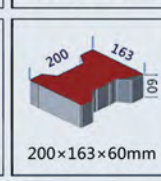

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Company: Fujian HuaYuan Machinery Co., Ltd
Address: Taoyuan Industrial Zone, Fengzhou Town, Quanzhou , Fujian, China
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Mail: okblockmachine@gmail.com Tel: +86 595 86858556 Cell: +86 15396638683

Kinshofer acquires Atlas transverse cutter business

Kinshofer, a global manufacturer of excavator and loader crane attachments based in Germany, has acquired the Schaeff transverse cutter business from Atlas GmbH, a crane and excavator manufacturer also based in Germany.

Kinshofer said the transverse cutters are the first in its line of crane and excavator attachments, allowing the company to serve contractors in a wider range of industries, including tunnelling and mining. The addition also gives contractors in construction, demolition and landscaping access to a broader range of attachments, all from one manufacturer.

Kinshofer is rolling out the new product line globally as the WS-series drum cutters. The cutters will be Kinshofer branded and sold and supported by the company's dealer network. Kinshofer will also service units sold by Atlas and provide technical support as well as parts, which are available through Kinshofer dealers.

"Customers come to us for our breadth of high-quality, innovative attachments that are known for increasing productivity," said Thomas Friedrich, group president and CEO of Kinshofer. "It's the hallmark of our business, and the new drum cutters represent that by giving contractors higher profitability, greater efficiency and more flexibility than competitive models."

"This change is not only good for both companies, but customers as well," added Brahim Sitiou, president and CEO of Atlas GmbH. "They want one manufacturer they can go to for their attachment needs, and this transition gives them that." Atlas decided to divest its cutter business to continue focusing on its core products, cranes and excavators.

Kinshofer has introduced its new WS-series drum cutters, which were developed through its acquisition of Atlas transverse cutter business.

According to Kinshofer, the new transverse cutters close a gap in its range of demolition tools, which include the Demarec MQP and DRG range or the HPXdrive grapple range. The company said these three segments also account for the largest portion of its product portfolio. ■

XCMG and Weichai Power sign agreement to strengthen cooperation

XCMG and Weichai Power, a global manufacturer of off-highway components, have signed an agreement to strengthen their strategic cooperation in heavy trucks, cranes, excavators, loaders, roller compactors and other sectors.

XCMG and Weichai Power have been working together for more than 20 years in various areas, including product research and development, manufacturing, supply and after-sales services. With the new agreement, both companies will be able to improve and innovate their core technologies in order to create world-class products and also develop their international markets through deeper cooperation. ■

ABOVE: **XCMG and Weichai Power have signed a cooperation agreement.**
LEFT: **Wang Min, chairman of XCMG (second from left) with Tan Xuguang, chairman of Weichai Power.**

MAT Mischanlagentechnik is now Bauer MAT Slurry Handling Systems

MAT Mischanlagentechnik, a subsidiary of Bauer Maschinen GmbH, has been delivering mixing and separation technology for over 25 years. The company is now operating under a new name, Bauer MAT Slurry Handling Systems, highlighting its affiliation with the Bauer Group.

With the new name, the company will take the next step in its future strategy. This will include strong growth in the international markets as well as significant expansion of the company's tunnelling business. In addition, the company plans to further expand its core business of developing and manufacturing advanced mixing and separation equipment for challenging specialist foundation engineering and tunnelling projects. By doing this and expanding its sales and service network, Bauer MAT Slurry Handling Systems will be in a better position to tap the full potential of local markets in the future, said Alexander Konz, branch manager at MAT. ■

Bauer MAT Slurry Handling System manufactures mixing and separation equipment for challenging specialist foundation engineering and tunnelling projects.

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Telescopic Crawler Cranes

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- 65 years leading in crane & duty cycle crane technology
- Proven reliability & simplicity

Product Range	10 t	50 t	100 t	200 t	300 t
Duty Cycle Cranes	13,5 t · 30 t · 40 t · 55 t · 70 t · 90 t · 100 t · 130 t · 140 t · 180 t · 300 t				
Crawler Cranes	50 t · 80 t · 125 t · 140 t · 180 t · 300 t				
Telescopic Cranes	16 t · 40 t · 50 t · 70 t · 80 t · 120 t				

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Bernhard Kraus

SENNEBOGEN Maschinenfabrik GmbH
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94315 Straubing
bernhard.kraus@sennebogen.de

SENNEBOGEN

New MTU customer care centre opens

A new MTU customer care centre was recently opened in Friedrichshafen, Germany. This facility is part of a drive by Rolls-Royce Power Systems to transform its global customer support with a new service and digital strategy, dubbed Customer Service 4.0. The other two MTU customer care centres are located in Singapore and Novi, the US.

"With our service and digital strategy, we intend to deliver an exceptionally high customer-focused improvement in both our services and products. The aim of our transformation is to support our customers as a complete solutions provider," said Andreas Schell, CEO of Rolls-Royce Power Systems.

"We are developing digital products and services that will generate substantial customer benefits and we are doing it in the style of a start-up company – fast, agile and with close proximity to the customer," added Jürgen Winterholler, who is in charge of the digital solutions department at Rolls-Royce Power Systems. "With the methods we are using, such as design thinking, we ensure that we do not simply assume we understand what the customer needs, but ensure that we know precisely what the customer needs."

The first digital products include MTU-Go!Act and MTU Go!Manage, which are designed specifically for individual applications and to meet customer needs, regardless of whether they are used for dump trucks, power generation, trains or ships. Connecting up the customer's system to a 'data logger' enables MTU experts and the customer to remotely monitor the performance of engines; schedule maintenance work and ensure the availability of required spare parts needed; analyse operational data; and determine what actions to recommend. ■

The opening of MTU customer care centre in Friedrichshafen marks another step for Rolls-Royce Power Systems to transform its global customer service, with digitalisation playing a key role.

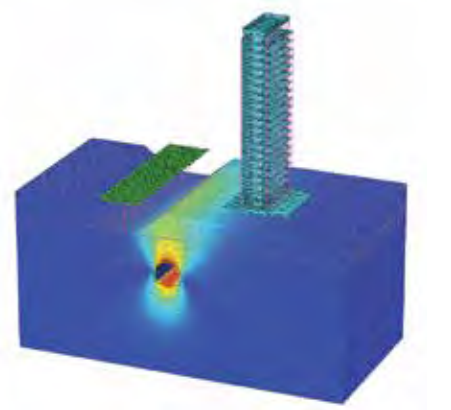
Bentley integrates geotechnical engineering within digital workflows

Bentley Systems has acquired Plaxis - a provider of geotechnical software based in Delft, Netherlands - and also signed an agreement to acquire soil engineering software provider SoilVision based in Saskatchewan, Canada. These acquisitions, with Bentley's borehole reporting and data management software gINT, aim to make Bentley a complete source for geotechnical professionals 'going digital.' As such, BIM advancements can now be extended to the essential subsurface engineering of every infrastructure project.

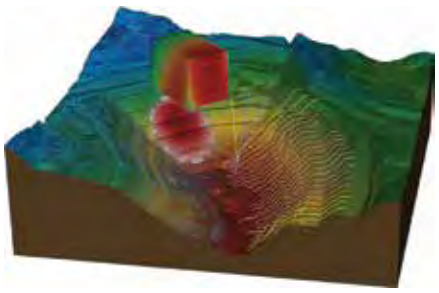
Projects necessarily begin with geotechnical surveys and sampling, captured with gINT for versatile documentation and reporting. Next, professionals perform engineering related to soil properties, soil behaviour and groundwater flow using SoilVision's SVOffice applications, supplemented by Plaxis' offerings. Then soil-structure interaction is analysed through Plaxis' design, simulation and engineering software (e.g. Plaxis 2D, Plaxis 3D).

This new solution, by way of digital workflows enabled through Bentley's comprehensive modelling environment, is aimed for geotechnical applications to be integrated with Bentley's structural applications (such as STAAD, RAM, and SACS) for excellent geo-structural engineering performance. As changes may occur in owner requirements, structural strategies, or site conditions (continuously surveyed through UAVs and Bentley's ContextCapture for reality modelling), geotechnical analysis could be continuously applied for improved outcomes, as managed through ProjectWise collaboration services.

"Plaxis is one of our core analysis tools being used across our global geotechnics practice," said Tony O'Brien, global practice leader for geotechnics at Mott MacDonald. "When used by experienced specialists, Plaxis can analyse many of our most complex ground-structure interaction problems. In Bentley's hands, we have high expectations that we can accomplish more through digital workflows made possible through integration of Plaxis technology with Bentley's comprehensive modelling environment - workflows that are compatible with Mott MacDonald's commitment to connected thinking and solving complex infrastructure challenges." ■



Plaxis 3D performs three-dimensional analysis of deformation, soil-structure interaction, and stability in geotechnical engineering and rock mechanics.



SoilVision applications provide capabilities for engineering related to soil properties, soil behaviour, and groundwater flow.

Kobelco and Manitowoc to end OEM supply agreement

Kobelco Construction Machinery and The Manitowoc Company have decided not to renew their OEM supply agreement, under which Kobelco supplies Manitowoc-branded lattice-boom crawler crane models with lift capacities under 150 US t (13.6 mt) to the worldwide Manitowoc distribution network, and Manitowoc supplies Kobelco-branded all-terrain crane models for marketing in Japan.

The global alliance began in November 2003 and will end on 9 November 2018. Kobelco will continue to support Manitowoc and its customers, and Manitowoc will continue to support Kobelco and its customers, with service parts for a period of 10 years.

"Manitowoc has an outstanding reputation around the world and offered a strong distribution network in regions it serves globally. I can say our partnership was very successful between two highly respected industry players joining forces," said Kazuhide Naraki, president and CEO of Kobelco.

"I strongly feel that both companies share the same approach – focusing on customers with care and bringing to market reliable products, which have a high standard of quality and safety. We look forward to a new chapter in growing our businesses globally," added Mr Naraki.

Barry Pennypacker, president and CEO of Manitowoc said, "Kobelco has been an excellent partner, providing our customers with a high standard of product quality and reliability. After nearly 15 years, we have agreed to pursue separate ways developing our own products in the smaller capacity cranes to serve our respective customers. With the implementation of The Manitowoc Way, we will continue to deliver new and innovative quality products, on time, ensuring that our customers continue to have the right product offerings." ■

Date	Events in Asia	Organiser & Contact
18 to 19 Jul 2018	IPAF Asia Conference & Showcase 2018 Kuala Lumpur Convention Centre Kuala Lumpur Malaysia	IPAF Tel: +65 9686 4191 Email: raymond.wat@ipaf.org Website: www.ipaf.org/asiaconference
24 to 26 Aug 2018	LankaBuild 2018 Sri Lanka Exhibition & Convention Centre Colombo Sri Lanka	AMB Tarsus Events Group Tel: +603 2692 6888 Email: darren@ambtarsus.com Website: www.lankabuild.org
29 to 31 Aug 2018	OSH + A 2018 Suntec Singapore Singapore	Messe Düsseldorf Asia Tel: +65 6332 9620 Email: ailing@mda.com.sg Website: www.osha-singapore.com
29 to 31 Aug 2018	Our World in Concrete and Structures (OWICS) Goodwood Park Hotel Singapore	CI-Premier Pte Ltd Tel: +65 67332922 Email: ci-p@cipremier.com Website: www.cipremier.com/conferences/owics
6 to 8 Sept 2018	Intermat ASEAN 2018 Impact Exhibition & Convention Centre Bangkok Thailand	Impact Exhibition Management Tel: +662 833 5315 Email: info@asean.intermatconstruction.com Website: www.asean.intermatconstruction.com
6 to 8 Sept 2018	Concrete Asia 2018 Impact Exhibition & Convention Centre Bangkok Thailand	Impact Exhibition Management Tel: +662 833 5315 Email: info@asean.intermatconstruction.com Website: www.concrete-asia.com
12 to 14 Sept 2018	Cambuild 2018 Diamond Island Exhibition & Convention Centre Phnom Penh Cambodia	AMB Tarsus Events Group Tel: +603 2692 6888 Email: richard@ambtarsus.com Website: www.cambuildexpo.com
19 to 21 Sept 2018	Concrete Show Southeast Asia 2018 Jakarta International Expo Kemayoran, Jakarta Indonesia	PT. UBM Pameran Niaga Indonesia Tel: +62 21 2930 5959, Fax: +62 21 2930 5960 Email: niekke.budiman@ubm.com Website: www.concreteshowseasia.com
22 to 24 Oct 2018	BuildTech Asia 2018 Singapore Expo Singapore	Sphere Exhibits Tel: +65 6319 4021, Fax: +65 6319 6140 Email: buildtechasia@sph.com.sg Website: www.buildtechasia.com
8 to 11 Nov 2018	Philconstruct 2018 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@globallinkmp.com Website: www.philconstructevents.com
16 to 18 Nov 2018	Myanbuild 2018 MEP Mindama Yangon Myanmar	AMB Tarsus Events Group Tel: +603 2692 6888 Email: darren@ambtarsus.com Website: www.myanbuild.net
19 to 21 Nov 2018	World of Concrete Asia 2018 Shanghai New International Expo Centre Shanghai China	Informa Exhibitions Tel: +86 21 2326 3669 Email: info@wocasia.com Website: www.wocasia.com
27 to 30 Nov 2018	Bauma China 2018 Shanghai New International Expo Centre Shanghai China	Messe München Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bauma-china.com Website: www.bauma-china.com
11 to 14 Dec 2018	Bauma Conexpo India 2018 HUDA Ground Gurgaon, Delhi India	Messe München Tel: +49 89 949 20251 , Fax: +49 89 949 20259 Email: info@bcindia.com Website: www.bcindia.com

Date	Events outside Asia	Organiser & Contact
15 to 18 Oct 2018	The Year in Infrastructure Conference 2018 Hilton London Metropole London UK	Bentley Systems Website: https://yii.bentley.com (registration should be made online)
26 to 29 Nov 2018	The Big 5 Dubai World Trade Centre Dubai UAE	dmg events Tel: +971 4 438 0355 Email: info@thebig5.ae Website: www.thebig5.ae
22 to 25 Jan 2019	World of Concrete 2019 Las Vegas Convention Centre Las Vegas, Nevada USA	Informa Exhibitions Tel: +1 972 536 6379 Email: info@worldofconcrete.com Website: www.worldofconcrete.com
8 to 14 Apr 2019	Bauma 2019 Munich Trade Fair Centre Munich Germany	Messe München Tel: +49 89 949 11348, Fax: +49 89 949 11349 Email: info@bauma.de Website: www.bauma.de
10 to 14 Mar 2020	Conexpo-Con/Agg 2020 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

OS+H Asia returns in August 2018

The next edition of the Occupational Safety + Health Exhibition for Asia (OS+H Asia) will return from 29 to 31 August 2018 in Singapore, to be held at the Suntec Singapore Convention & Exhibition Centre. Organised by Messe Düsseldorf Asia, the exhibition will focus on safety, security and healthcare at the modern workplace.

This year, there will be seven renewed focus areas on Work at Height, Fire Protection, Environmental Control, Crisis and Emergency Management, Workplace Ergonomics, Smart Technologies and Health at Work.

The exhibition will take place in conjunction with the Singapore WSH Conference and Forum on Workplace Safety and Health. These parallel events will bring together a focused multidisciplinary international group of OSH professionals, thought-leaders and government officials who are committed to improving the workplace environment.

Onsite demo (above left) and indoor exhibition area at the Occupational Safety + Health Exhibition for Asia in 2016.

Advancement in technology and emerging labour market trends are constantly re-shaping the landscape of the workplace. In recent years, the Association of Southeast Asian Nations (ASEAN) is also said to have made rapid progress in raising OSH standards, performance and capabilities.

With that in mind, the 2018 OS+H Asia is expected to attract strong regional and international representations. It is estimated to have more than 200 exhibitors from 25 countries, plus five national pavilions and country groups will come from China, Malaysia, Russia, Singapore and Taiwan, according to the organiser.

In its previous edition in 2016, OS+H Asia welcomed 199 exhibitors from 25 countries and 4,500 trade professionals from close to 40 countries. ■

Website: www.osha-singapore.com

Intermat ASEAN and Concrete Asia to highlight changes in the industry

Intermat ASEAN and Concrete Asia are preparing for their next edition, which will take place from 6 to 8 September 2018 in Bangkok, Thailand. The two events will be co-located for the first time this year, expected to draw more than 500 companies and brands, with 9,000 trade professionals from the region.

Intermat ASEAN focuses on five key sectors: earthmoving & demolition, roads, minerals & foundations, building industry and lifting, and handling & transportation. Concrete Asia offers the latest in concrete, concrete surfaces, decorative concrete, material handling, concrete production, cement, building materials, and construction equipment & machinery.

The industry outlook in Southeast Asia looks promising, with the construction and cement output expected to increase until 2025. The construction industry is forecast to grow at an average rate of 8-12% up to 2019, resulting in an increase in backlogs or the volume of work available. Intermat ASEAN and Concrete Asia serve as a trade platform for the industry to explore the myriad of opportunities available, as well as discover the innovations in Asia.

Concrete Asia (above left) and Intermat ASEAN have previously been organised separately. This year, the shows will be held together for the first time from 6 to 8 September in Bangkok, Thailand.

Speaking about changes in the concrete industry, Dr Pichai Nimityongskul, founding president and advisor of Thailand Concrete Association said, "Concrete companies are compelled to raise production to meet the demand for concrete products in the construction projects. However, increasingly, focus is placed on innovation to reduce the environmental impact."

Moving in tandem with the industry shifts, speakers from Council of Engineers, Safety and Health at Work Promotion Association (Thailand), Alternative Asset Co Ltd, and Concrete Décor (Thailand) Co Ltd, will share their expertise and views on several issues, including: New BIM technology for construction industry 4.0; creating a safety culture of prevention for workers with 'vision zero' strategy; expectations of developers on construction companies for condominiums; and concrete decoration trends in 2018. ■

Website: www.asean.intermatconstruction.com
www.concrete-asia.com

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Global MEWP rental market 'continues to boom'

The global MEWP rental market is booming, with the sector once again outstripping wider construction and sustained recovery in places such as Spain and Brazil that suffered during economic downturns, according to the latest market analysis from the International Powered Access Federation (IPAF). At the end of 2017, the worldwide rental MEWP fleet size reached an estimated 1.35 million units, compared to 1.25 million estimated at end 2016 – a year-on-year increase of around 8%, based on IPAF's Powered Access Rental Market Report, exclusively compiled by global research intelligence company Ducker Worldwide.

Growth in Asia is being driven by China, Malaysia, Singapore and Thailand in particular, while the boom in the Middle East is nowhere better exemplified than in the UAE, which experienced continued growth in fleet size and rental activity, driven in no small part by the global 2020 Expo world trade show.

The US rental market continued to power ahead, growing by around 4% in terms of fleet size with the total number of units surpassing 580,000. Rental rates continued to increase slightly and in terms of outlook similar growth is expected for 2018.

The European MEWP rental market also had another positive year in 2017; for the second year in a row all indicators were positive in all 10 European countries under study, with most markets experiencing strong overall revenue growth.

There is a sense of growing optimism in southern Europe (Spain and Italy), where MEWP rental fleet sizes grew respectively by 7% and 4%. Countries that experienced relative stagnation in recent years, such as France, the Netherlands and Finland experienced close to double-digit revenue growth.

The UK, Germany and Sweden saw strong market growth for the seventh or eighth year in a row, though in Denmark and Norway revenue growth was moderate at best. In these markets competitive pressure remains strong and rental rates did not rise, or decreased slightly. Once again the MEWP rental market in the UK outstripped construction, growing by 4% against 2% for the construction sector.

Meanwhile, the Latin American MEWP rental fleet grew as a whole but more slowly than in most other markets. Positivity was underpinned in particular by the sustained recovery in Brazil, which prior to 2016 experienced several difficult years during which the market declined through a period of economic and political turbulence. ■

Website: www.ipaf.org/reports

Growth of MEWP rental market in Asia is being driven by China, Malaysia, Singapore and Thailand. With such progress, IPAF held its Asia Conference in China for the first time in 2017 (pictured) and this year it will take place in Malaysia, also for the first time.

IPAF launches 2018 safety campaign

IPAF recently launched its safety campaign, which emphasises the importance of planning ahead for safety when conducting temporary work at height using mobile elevating work platforms (MEWPs).

IPAF's safety campaign for 2018-19 outlines why operators and managers should carry out full risk assessments, choose the correct equipment for the job, conduct site and machinery inspections, use trained and familiarised operators under proper supervision and implement adequate segregation from other plant machinery and traffic.

"From IPAF's accident data analysis, we've identified four key accident causes that can result in falls from the MEWP platform. These accidents can be prevented by proper planning and safely managing the use of MEWPs. We are highlighting these factors so that managers and operators know the risks and know their responsibilities," explained Andrew Delahunt, IPAF's technical & safety director.

The key points of guidance in the campaign cover: Risky operator behaviour; exiting the platform at height; setting up near other machinery or vehicles; and mechanical failure. ■

IPAF launches its safety campaign for 2018-19 at the Intermat Paris exhibition in April 2018.

IPAF to join Intermat ASEAN 2018

The first IPAF Thailand Seminar will be held in conjunction with the Intermat ASEAN 2018, to take place from 6 to 8 September at the Impact Exhibition and Convention Centre in Bangkok. The seminar will cover a range of relevant topics and latest developments in the powered access industry, aiming to raise awareness of industry safety and the importance of quality operator training.

According to IPAF, Thailand has an estimated active fleet of 3,500 MEWPs and around 30 major MEWP rental companies; however, currently there are no standards or guidance, or specific legislation regarding the safe use of MEWPs in this country. It is therefore essential that the industry remains safe and for this reason, operatives and supervisors must be made aware of best practices to ensure safe use of machines.

The IPAF Thailand Seminar 2018 will serve as a platform for IPAF members and anyone interested in becoming a member; it is also an opportunity to discuss any concerns or issues and to share best business practice. ■

Enquiry: sea@ipaf.org

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IMER ACCESS
The AWP's WHOLE RANGE

Gomaco Commander II is back

Gomaco has brought back its two-track curb and gutter machine, the Commander II. It offers the simplicity of a two-track paver with Gomaco's operator-friendly G+ digital control system. There are users who prefer the Commander II over any other paver, says Gomaco.

The operator platform is now isolated to eliminate vibration. A new, pivoting control console allows the operator to have hands-on control and excellent visibility, no matter what application is being slipformed. The G+ control enables independent track drive for the ultimate paver control experience.

Powered by a 102 hp Tier IV Kohler engine, the Commander II features a travel speed of up to 25 m/min to quickly traverse any jobsite. It is equipped with a 1,524 mm wide sectional direct drive trimmerhead for exacting grade preparation.

The Commander II is well suited to a variety of applications and is designed to simultaneously trim and pour for maximum concrete utilisation. It can easily convert from project to project with applications such as curb and gutter, safety barrier, irrigation canal, recreational path, shoulders and more.

The new Gomaco Commander II two-track curb and gutter machine at work slipforming at the Banyan Cay Resort & Golf in West Palm Beach, Florida.

The first new Commander II was recently put to work on a curb and gutter project for a contractor in southern Florida, the US. On its first day, the Commander II was slipforming over 12.2 m/min, as logged by the Gomaco remote diagnostics (GRD) system. Concrete is fed into the hopper by a 508-mm-wide, 1.8-m-long conveyor belt. It has a belt speed of 106.7 m/min to quickly move the concrete into the hopper. The contractor was unloading 6.1 cu m trucks through the machine in nine minutes. ■

Website: www.gomaco.com

Bauer redesigns BG 15 H ValueLine drill rig

The newly designed Bauer BG 15 H is a highly functional and cost-effective machine in the small drilling rig segment. This model also features compact transport dimensions and has all the advantages needed to face the challenges of small construction sites.

The BG 15 H ValueLine drill rig is available in two different configurations, making it flexible and versatile. The standard model delivers a drilling depth of 32 m as well as the option of 'drilling under the mast.' The upgraded version provides users with the option of a drilling depth of up to 44 m and the CFA drilling process.

A highlight of the BG 15 H is the BT 50 base carrier, completely redesigned and remanufactured by Bauer, which now offers a range of benefits even for small machines. The integrated service platform allows easy access to all maintenance and service points in the uppercarriage and, at the same time, meets the highest standards in terms of occupational safety. It has a transport width of just 2.5 m.

The new Bauer BG 15 H is a highly functional and cost-effective machine in the small drilling rig segment. The completely redesigned and remanufactured BT 50 base carrier includes an integrated service platform.

Other key areas of redesign focus on operator comfort. Thanks to the new operating concept, all essential work functions can be controlled via joystick. Displays, operational controls and the air-sprung operator seat form an ergonomic unit.

The BG 15 H also brings a new level of comfort to servicing: a deep centre tunnel guarantees a transport height of just 3.3 m and also serves as a service tunnel. This means that all maintenance and service points can be accessed conveniently from both sides. ■

Website: www.bauer.com

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Our involvement in the South Pole dates back to 1956, when the first team of the Japanese Antarctic Research Expedition was dispatched with our snowmobile, capable of deployment in minus 60 Celsius and at an altitude of 4,000 meters. For over half a century, we have supported Japanese expeditions.

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www.komatsu.com

Brokk introduces four new demolition robots

Brokk has launched four new demolition robots, along with a Brokk hydraulic breaker range and three new concrete crushers from Darda. These latest machines include Brokk 170, Brokk 200, Brokk 300 and Brokk 520D, all of which are equipped with the new Brokk SmartPower technology.

The Brokk 170 replaces the Brokk 160. Featuring the SmartConcept, the Brokk 170 is well suited to the construction industry. With a 24 kW SmartPower electric powertrain, this lightweight machine comes with 15% more demolition power than its predecessor, and is fitted with the new Brokk BHB 205 breaker and Darda CC440 crusher. Still, the Brokk 170 retains the same compact dimensions as the Brokk 160 and the wide range of attachments are fully compatible between the two models.

The Brokk 200 fills the gap between the Brokk 170 and Brokk 300. It delivers the power of a 3,100 kg Brokk 280 into a 2,100 kg package, enabled by the SmartPower technology. Compared to the smaller Brokk 170, the Brokk 200 comes with the new Brokk BHB 305 breaker that hits 40% harder, as well as the new, stronger Darda CC480 crusher.

The 27.5-kW Brokk 200 has 15% longer vertical and horizontal reach while retaining most of the compact dimensions of the Brokk 160. It is ideal for heavy-duty but difficult-to-access applications.

The Brokk 300, which replaces the Brokk 280, comes with the more powerful Brokk BHB 455 breaker delivering 40% more hitting power. The SmartPower technology allows the machine's power output to be increased to 37 kW, providing the hydraulic flow and pressure to fully power the heavier and more powerful attachments it is paired with.

Slightly longer than the Brokk 280 and weighing 500 kg more, the Brokk 300 retains the same width and height, giving it access to the same confined jobsites. A new arm system increases the machine's vertical and horizontal reach to 6.5 and 6.1 m respectively.

Finally, the Brokk 520D diesel machine offers a larger hydraulic breaker that packs 40% more hitting power than the Brokk 400D it is replacing. This new 5-t machine comes with two diesel engine options - a Stage 4/Tier 4 Final Kohler unit meeting the new EU and North American emission standards, and a Kubota model available for the rest of the world.

Brokk has launched four new demolition robots, including (from left) Brokk 170, Brokk 200, Brokk 520D and Brokk 300, all of which are equipped with the new Brokk SmartPower technology.

The new Brokk 520D is slightly heavier and longer than the previous Brokk 400D, boasting a bigger BHB 705 breaker and a 250-mm longer work reach. Its heavier-duty boom system and increased hydraulic performance means that it can handle the same wide range of heavier, more powerful attachments that are already available for the Brokk 500 released last year. With the Brokk SmartDesign, the Brokk 520D can simplify daily maintenance and increase machine uptime.

Shipments of the new Brokk machines are expected to begin between June and August 2018.

SmartConcept technology

Brokk's new SmartConcept technology offers significant improvements in power management, reliability, maintainability and ergonomics to the latest generation of machines. It consists of three areas: SmartPower, SmartDesign and SmartRemote.

Now available on all but two of the model range, the SmartPower combines power management software with custom-designed hardware to maximise the hydraulic power output of a given motor size while boosting reliability. For example, the power generated in the B260, Brokk's former flagship 3.5 t model, was a constant 24 kW. The next generation unit, the B280 with SmartPower, improves the output to just below 30 kW.

In addition, the integrated power management software automatically monitors the system and adjusts the motor speed to prevailing temperature conditions. This means that the machines can operate continuously even in the harshest, hottest environments.

Besides the power management features, SmartPower includes completely redesigned electrical systems with 70% fewer cables and a reduction in connection points from 170 to about 50, and hardened components specifically designed to withstand the rigours of vibration and heat generated in demolition robots. Together, these improvements increase the overall life of the machine's electrical and hydraulic components and guarantee greater uptime in real world conditions.

With the SmartDesign, Brokk's new models include a number of design improvements that extend the life of the machines and improve the operators' day-to-day maintenance routines. All grease points are accessible from the outside, without removing any covers. LED headlights have special protections built in. Machine covers are formed steel, and hydraulic hoses are easily accessible for replacement. All Brokk machines can rotate 360 continuous degrees, but they can also operate 'over the back' and work unencumbered.

Brokk's SmartRemote uses a wide adjustable belt to hold the remote-control box comfortably around the operator's waist. Intuitive controls allow the operator to run the machine without having to spend time watching the display. The system uses professional grade radio technology, with frequency hopping capability, and has a working range of up to 300 m. ■

Website: www.brokk.com

New Vermeer D8x12 HDD

Vermeer has expanded its line of utility installation equipment with the new D8x12 Navigator horizontal directional drill (HDD). Equipped with two drill rod options for higher versatility, this compact machine is ideal for small service installations such as gas distribution, power, water and telecommunication networks.

The D8x12 is powered by a 48 hp Kohler diesel engine and offers 1,355.8 Nm of spindle torque and 34.9 kN of thrust/pullback. It has basic hydraulic pilot joystick controls with only essential electrical components, simplifying operation and routine maintenance.

Featuring a low noise emission level of 85 dBA and sound power of 104 dBA, the D8x12 is an excellent machine for working in urban environments. It can fit through a 91.4 cm gate or onto a trailer with other jobsite essentials.

While on the job, the D8x12's tracks provide optimised traction for operations with little ground disturbance. With a forward travel speed of 4.5 km/hr, the machine can quickly be repositioned between bores.

The Vermeer D8x12 also gives contractors multiple drill rod options, such as a 3.4 cm diameter Firestick drill rod when tight steering is required, or 4.2 cm diameter drill rod for more demanding ground conditions and longer drill shots. In addition, it can share tooling with several current and previous Vermeer models, including the D6x6, D7x11 Series II, D9x13 S3 and D10x15 S3 Navigator HDDs. ■

Website: www.vermeer.com

Vermeer's new D8x12 Navigator horizontal directional drill features a low noise emission level of 85 dBA and sound power of 104 dBA, making it excellent for use in urban areas.

Express 150T glass lifter improves safety and efficiency

Quattrolifts' new Express 150T allows users to lift glass weighing up to 100 kg above doorways and entrances with greater safety and efficiency. The machine is lightweight and can be easily transported to site by one person. It can also be assembled quickly, resulting in cost- and time-savings.

The highlight of Express 150T is its removable mast extension, which is used for the installation or removal of glass above entrances and doorways. When the mast is removed, the machine's lifting capacity increases to 150 kg, making it a versatile tool for most basic glazing jobs. Additional features include the 2 mm x 250 mm vacuum cups, an extendable wheelbase for better stability, the ability to pivot glass 90° to the side for doorways and rotate glass 360°.

The Express 150T can also be fitted with other optional features such as a side shift, lower forward extension, frame lifter for handling windows and a battery powered vacuum pump.

The Quattrolifts range of products was developed by Ricardo Carlei, a chiropractor who runs his own health and safety consultancy in Australia, Quantum Workhealth Programmes that specialises in minimising occupational manual handling risks. Through his extensive work with some glass manufacturers and glazing businesses, Mr Carlei became aware of the risks and injuries associated with the manual handling of glass. As a result, he established Quattrolifts to develop mechanical devices that would reduce the risk of injury while handling heavy glass.

There are currently more than 10 standard machines in the Quattrolifts product range, with options and modifications that expand the range to over 20 product lines. These products are available globally - in Australia, the US, Europe and Asia, among others. ■

Website: www.quattrolifts.sg

LEFT: **Quattrolifts' new Express 150T allows users to lift glass weighing up to 100 kg above doorways and entrances with greater safety and efficiency. The machine can be easily transported to site by one person.**

The highlight of Express 150T is its removable mast extension, which is used for the installation or removal of glass above entrances and doorways. The machine can be seen here with its mast attached (above) and without the mast (left).

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Sandvik develops new surface drill technologies

Sandvik has expanded its i-Series line of intelligent drills to offer a broader range of hole diameters with single-pass, multi-pass, high- and low-pressure options. The i-Series family is built around an advanced Can Bus design with enhanced control systems, helping to reduce troubleshooting time and increase availability. The scalable (non-bundled) surface drill automation architecture allows for a customised path to the level of automation users need.

The OptiMine solution is an analytics and process optimisation suite, which provides a collection of digital solutions targeted to improve efficiency of mining operations. It also offers advanced analytics to help identify process improvements via predictive insights. According to Sandvik, drills equipped with its compressor management system can save customers up to 30% on fuel with a proportional increase in engine and compressor life.

The Sandvik DR412i blasthole drill is designed to improve conservation and deliver dependable penetration in harsh mining conditions. It is automation-ready and built to guarantee reliability while bringing a new level of safety and productivity to any operation. The DR412i is designed for rotary and down-the-hole drilling (DTH) applications with a hole range of 216-311 mm. High- and low-pressure versions are available with single-pass maximum hole depth of 31 m and multi-pass maximum hole depth of 75 m.

Scheduled to be launched in the first half of 2018, the Sandvik DR416i rotary blasthole drill is the largest surface drill in the company's portfolio, capable of drilling up to 406 mm holes while offering the highest rotational torques and pulldown forces at the lowest possible operating cost.

The DR410i, slated for release in 2019, is the next addition to the i-Series line of intelligent drill solutions from Sandvik. The model is designed for rotary drilling applications with a hole range of 200-225 mm and DTH applications with a hole range of 152-225 mm. High- and low-pressure versions are available with single-pass maximum hole depth of 14 m and multi-pass maximum hole depth of 56 m.

Set to be introduced in September 2018, the Leopard DI650i completes Sandvik's surface DTH drill offering for the construction and mining markets. It is designed for superior mobility, excellent operator comfort and serviceability and an intelligent DTH control system, which can be scaled up in the future with more automated features.

Sandvik DA555 rod loader for both core drilling and reverse circulation enhances safety and productivity. Its remote-control function combines a whole new level of safety, production and economy. Based on the Sandvik DA554 rod loader, the DA555 reduces manual lifting of drill rods. Standard equipment on the DE800 iSeries, the DA555 rod loader is also available as a retrofit for older Sandvik DE800 hydraulic models.

The design of Sandvik DA555 incorporates internal jaws inside the cup, clamping the rod during loading operations. This process ensures that the rod joint is secured and torqued correctly to the rotation unit before the rod loader is removed, therefore reducing rod falls.

The DA555 loads 3- and 6-m N, H and P sized diamond core and 6-m 2.875, 3.5, 4.0, 4.5 size reverse heavy circulation drill rods remotely, keeping the operator at a safe distance of 50 m. Simple to operate and easy to learn, it is ideally suited for both coring and RC applications.

ABOVE: **Sandvik DR412i blasthole drill is automation-ready and is designed for rotary and down-the-hole drilling applications with a hole range of 216-311 mm. The picture here shows the DR412i cabin.**

LEFT: **Sandvik DA555 rod loader for both core drilling and reverse circulation enhances safety and productivity. Based on the Sandvik DA554 rod loader, the DA555 reduces manual lifting of drill rods.**

In addition, Sandvik's new Ranger DXi series is equipped with several new high-performing features to improve the drilling process. The Ranger DX top hammer drill rigs enable drilling coverage of 55 sq m, which saves working time and minimises the need to reposition the rig. Despite the rig's ability to rotate 290 degrees, its counterweight structure ensures stability by maintaining weight opposite the boom.

Higher productivity is possible with other new features, including: new rockdrill family with 21-27 kW power; Sandvik GT 60 tools delivering higher productivity with straighter 92-127 mm holes; iTorque control system that enables users to tackle difficult rock with ease; and improved operator ergonomics with easy-to-use joysticks and control panels and super-low cabin noise emission levels. ■

Website: www.rocktechnology.sandvik

Manitowoc launches Grove GMK6300L-1 crane

Manitowoc has launched the successor to its popular Grove GMK6300L all-terrain crane, the GMK6300L-1. Several improvements have been made to the structural strength of this new 300 t capacity model. Its load charts have been improved by over 7% on average when compared with the GMK6300L. At height, the improvements are even better, with advantages of over 16% in the boom length range of 70 –80 m.

The new GMK6300L-1 features a maximum tip height of 120 m when working with its full 80 m main boom and 37 m of jib. When lifting with the main boom, it can lift up to 14 t at full height and also handle this within a 14 -28 m working radius, offering a flexible range for such applications as tower crane rigging.

The crane is powered by a 430 kW Mercedes Benz (Euromot 4/EPA Tier 4 final) engine in the carrier that features improved fuel economy over its predecessor. This is paired with an Allison torque converter transmission. A 210 kW Mercedes Benz (Euromot 4/EPA Tier 4 final) engine powers the superstructure.

The previous model, GMK6300L, was launched in 2010 and became an immediate worldwide hit. According to Manitowoc, the crane raced to sales of 100 units in just two years and to date more than 400 have been delivered. With its significantly improved load charts and specifications, the new GMK6300L-1 is expected to be just as popular.

Like its predecessor, the GMK6300L-1 is equipped with Megatrak suspension, along with Manitowoc's standard all-wheel steering. Its counterweight slabs and auxiliary hoist are interchangeable with the GMK5180-1, GMK5200-1, GMK5250L and GMK6300L, making it a particularly attractive investment for existing Grove customers. ■

Website: www.manitowoc.com

BOTH IMAGES: **The new GMK6300L-1 has a maximum tip height of 120 m when working with its full 80 m main boom and 37 m of jib. When lifting with the main boom, it can lift up to 14 t at full height, and also handle this within a 14 -28 m working radius.**

Apollo ValueTec asphalt plant offers simple operation

The Apollo ValueTec asphalt plant is suitable for users who want a straightforward process and the ability to further customise with options. The plant ranges from basic to advanced versions, depending on the users' needs.

Several key features of the ValueTec plant include: a fully modulating burner with a simple and easy-to-adjust mechanism to set air-to-fuel ratio for efficient combustion and pollution control; direct coupled geared motors at most places that reduce fuel and maintenance costs; a screen that uses robust vibratory motors, enabling uniform distribution of aggregate on the screen mesh surface; and an efficient burner and baghouse that ensure suspended particulate matter (SPM) levels are within limits and the carbon footprint is minimal.

The ValueTec plant is also equipped with remote assist, which is available at any location in the world, and incorporates customised options that include utilisation of up to 40-45% RAP. In addition, the plant features a future-ready design that enables the seamless addition of upgrades. ■

Website: www.apollo-equipment.com

The Apollo ValueTec asphalt plant is ideal for users who prefer a straightforward process and the ability to further customise with options.

Enerpac cylinders for heavier lifts on harsher jobsites

Enerpac offers its range of high tonnage cylinders (HTC) to meet the rising demand for heavier lifts in harsher environments. The Summit Edition cylinders provide excellent durability, longer service life, and greater side load resistance for increased heavy lift capability.

Highlights of Enerpac HTC include advanced bearing and sealing technology to extend the boundaries for eccentric loads, and reduced cylinder maintenance intervals. The effects of corrosion and scoring are no longer a concern because of a nitrocarburization surface treatment for improved load and wear resistance, plus corrosion protection.

Enerpac cylinders are designed with safety in mind. Mechanical securing of the load, side load absorption, certified lifting eyes for safe handling, an overflow port and safety valve, and a collar thread and base mounting holes for securely attaching the load, are just some of the safety features of the cylinders.

Simultaneously raising the benchmark for cylinder design and engineering, while maintaining outstanding safety features, the Enerpac high tonnage cylinder range is built to meet a high durability standard. With longer service life, reduced maintenance, and greater side load resistance, users should be able to take on the most demanding heavy lift applications. ■

Website: www.enerpac.com

ALL IMAGES: **Enerpac offers its range of high tonnage cylinders (HTC) to meet the rising demand for heavier lifts in harsher environments. The Summit Edition cylinders provide excellent durability, longer service life, and greater side load resistance for increased heavy lift capability.**

Maeda MC815C spider crane now available in SE Asia

The Maeda MC815C mini spider crane is now available from JP Nelson for the Singapore and Malaysia markets. The company said it is also the first unit to arrive in Southeast Asia.

The crane has a capacity of 8.09 t x 2.4 m, maximum lifting height of 19.6 m (on the ground) and 25.5 m (with the fly jib), and pick & carry capacity of 1.0 t. It delivers a gradeability of up to 23° and maximum working radius of 18.8 m x 0.3 t.

The MC815C is compact, weighing only 9.46 t (9.7 t with its electric motor). It is fitted with a fully automatic five-section telescopic boom, with a length ranging from 5.52 to 19.40 m. The boom offers a hoist angle of 0 to 80°.

Powered by a Stage III Yanmar engine, the MC815C is suitable for use in restricted areas. The crane is equipped with a power lifting mode, joystick-type radio remote control, self-levelling function and auto-crane stow function. The cab also comes with a new 10.4-in touchscreen multi monitor.

There are optional items available with the MC815C as well, including a crawler rubber pad, single fall hook, 1.0 t searcher hook and 1.5 t hydraulic type fly jib.

In addition, several safety features are incorporated as standards, such as outrigger interlocks, MSOS (Maeda Safety Operation System), overwind protection, load indicator, hydraulic safety valve, machine body inclination alarm, EMO switch, moment limiter, rotary lamp and slew restriction system. ■

Website: www.jpnelson.com.sg

ABOVE:
The Maeda MC815C mini spider crane is now available from JP Nelson for the Singapore and Malaysia markets. It is also said to be the first unit to arrive in Southeast Asia.

Ideal for use in restricted jobsites, the compact Maeda MC815C spider crane has a capacity of 8.09 t x 2.4 m, maximum lifting height of 19.6 m (on the ground) and 25.5 m (with the fly jib), and pick & carry capacity of 1.0 t. It delivers a maximum working radius of 18.8 m x 0.3 t and gradeability of up to 23°.

Wirtgen cold milling machines for road rehabilitation

Wirtgen offers an extensive line-up of cold milling machines, with milling widths from 14 mm to 4.40 m. Users can choose from over 30 different machine types, each also available with a variety of milling widths. The lower performance class starts with the small 45-kW milling machines and extends through compact machines with engine outputs of between 257 and 298 kW, to large milling machines in the upper performance class delivering power reserves of up to 753 kW.

The Wirtgen Multiplex levelling system has a wide range of sensors. Three sensors on each side of the machine scan the height at wide intervals along the same reference line. The automatic levelling system averages the three measurements to create a perfectly even milled surface, while meeting the target milling depth. This is considered a highly effective way of levelling out longitudinal undulations. What's more, defined surface profiles can be created, such as specified cross slopes or crowns.

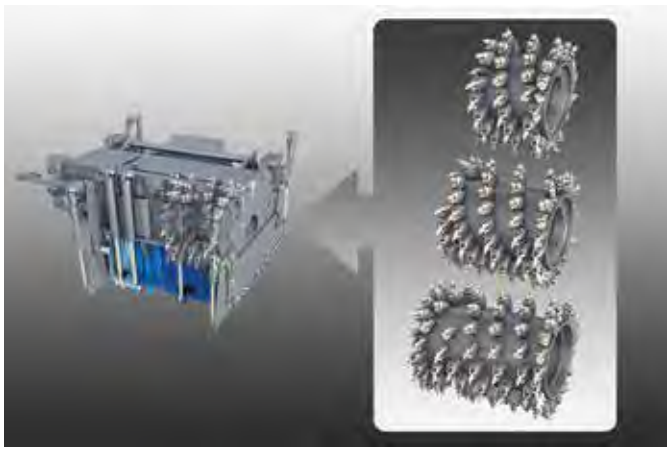
Completely new surface profiles can be created by means of 3D milling, says Wirtgen. A new digital surface profile generated on the computer can be transferred directly to the company's cold milling machine using 3D levelling systems. Increased quality and cost-effectiveness are believed to be major benefits offered by 3D milling technology.

Wirtgen further explains that the progressive automation of technical processes plays a key role in optimising the milling result. To achieve optimum results, the levelling parameters for the respective machine are saved, linked to the Level Pro automatic levelling system and retrieved during the working process. Nowadays, the widest variety of pavement layers are removed and separated in highly selective processes. The removal of problematic construction materials is possible, as is the standard separation of premium-quality surface courses with a high bitumen content, or the removal of road markings prior to the actual separate milling of the asphalt courses. The surface, binder and base courses can be returned separately to the material cycle, increasing the sustainability of RAP recycling.

Selective milling does not entail significant time disadvantages, says Wirtgen. Due to the shallower milling depth, the cold milling machines work more quickly when removing the individual layers than when removing the complete pavement at maximum milling depth in a single pass. Milling off surfaces in two or three layers can sometimes be just as fast – in some cases even faster – than complete pavement removal, depending on the type of machine and pavement and on ambient conditions. Modern cold milling machines have also been specifically tuned to typical selective milling – for example in regard to machine weight.

In addition, different milling drums support a wide range of milling applications on different road surfaces. The standard milling drums provide tool spacings of 12 mm, 15 mm or 18 mm. Fine milling drums usually have a tool spacing of 8 mm; in micro-fine milling drums the tooling space is 6 mm. The Eco Cutter milling drums developed by Wirtgen are designed for maximum milling output. They can even mill extremely hard materials such as concrete or rock cost-efficiently. ■

Website: www.wirtgen-group.com/singapore



ABOVE LEFT: **Modern cold milling machines, such as those of Wirtgen, are designed to improve quality and cost-effectiveness of complete road rehabilitation.**
ABOVE RIGHT: **Wirtgen's flexible cutter system (FCS) offers high machine utilisation. Depending on the machine, it takes as little as 0.5 to 1.5 hours to change the drum – swiftly converting the cold milling machine from a standard to a fine milling machine.**

FAR LEFT: **Fully integrated into the machine control system, the Level Pro Plus levelling system is an in-house development from Wirtgen and ensures precise, high-quality milling results.**

LEFT: **With the help of advanced machine technology, the surface, binder and base courses can be removed separately and also returned to the material cycle separately. This increases the sustainability of RAP recycling.**

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Creating 'invisible' connection for precast concrete

The Invisible Connections (IC) system from Halfen-Moment is an innovative method to connect precast concrete without using corbels or steel angles. The system mainly consists of TSS and BSF ranges of telescopic connectors, which are designed for precast stairs/landing connections and precast beams respectively.

These 'invisible' telescopic connectors are ideal for precast concrete manufacturers who require fewer customised moulds, in-situ concrete frame contractors who appreciate an increased connection speed, and architects who desire the aesthetic appeal of 'clean lines' wherever concrete elements are joined.

The TSS range is used for concrete components with an exposed finish such as stair landings. When erecting the elements on site, the inner tube is pulled out with a wire to fit a recess in the wall with a safety device to ensure the inner tube is correctly located in the recess.

The BSF range is used for transferring heavy loads from beams into columns, walls or other beams. These three-part telescopic connectors have individual capacities ranging from 225 to 700 kN. When the BSF connectors are used in pairs (optional but better torsional resistance), loads of up to 1,400 kN can also be catered for. Larger bespoke solutions are available on request.

One of the projects where the IC system is currently working on is the construction of BB Tower in Kuala Lumpur, Malaysia. When completed, this 32-storey building will be the new headquarters for YTL Corporation Bhd, featuring a total built-up area of 25,800 sq m. Here, the IC TSS41 system is being applied to connect all precast concrete staircases with hidden connections in the walls for the entire building, providing clean streamlined aesthetics architecture without using integral corbels.

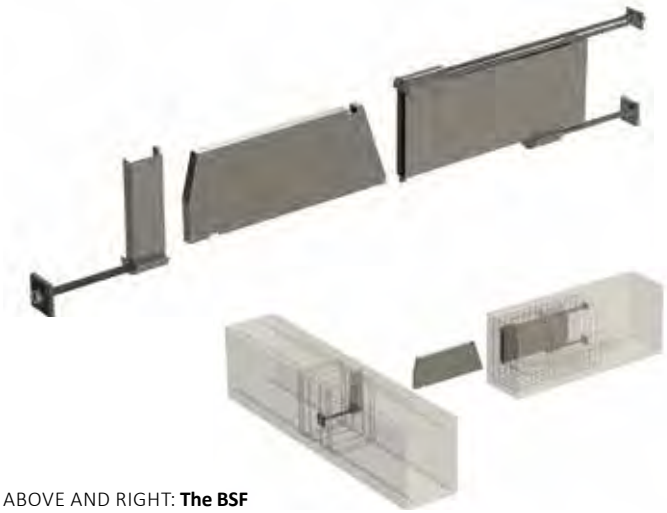
The IC system is is independently tested and comes with a European Technical Assessment (ETA). The product is manufactured by Norwegian company Invisible Connections AS and is available in Southeast Asia through its distributor, Halfen-Moment. A major player in the building industry, Halfen-Moment is based in Malaysia with subsidiaries in Singapore, the Philippines and India. ■

Website: www.halfen-moment.com

LEFT: **The TSS range of Invisible Connections is suitable for precast stairs/ landing connections.**

BELOW: **The TSS system being used on the BB Tower project in Malaysia.**

BOTTOM: **A staircase built with the TSS system features no visible corbels.**



ABOVE AND RIGHT: **The BSF range of Invisible Connections is designed for transferring heavy loads from beams into columns, walls or other beams. These three-part telescopic connectors have individual capacities ranging from 225 to 700 kN.**

BELOW: **Using the BSF system eliminates the need for corbels, resulting in an architecturally 'clean' lines at concrete intersections.**

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Linnhoff paves the way to Panglao Island Int'l Airport

The Panglao Island International Airport - also known as New Bohol International Airport - is located on the Panglao Island in the Philippines province of Bohol. When completed, the airport will provide a capacity of up to two million passengers per year and it is also intended to replace the nearby Tagbilaran Airport.

The project is funded by the Japan International Cooperation Agency (JICA) under the New Bohol Airport Construction and Sustainable Environment Protection Project, which is owned by the Department of Transportation and Communications of the Republic of the Philippines.

Construction work commenced in June 2015 and is expected to be completed by August 2018. The airport is being built on a 230-ha land and has a 2.5-km runway, which can be extended to 2.8 km in the future. The runway is designed to accommodate up to seven aircrafts at a time, including large international aircrafts.

Main contractor on the project, Chiyoda-Mitsubishi Joint Venture, subcontracted the civil portion of the project to provide the asphalt-treated base course, asphalt concrete surface and binder course for the runways and also for the access roads, perimeter roads, maintenance roads and carparks. Total area of asphalt works is approximately 350,000 sq m, requiring about 100,000 t of hot mix asphalt.

To help complete the job, the subcontractor chose two TSD1500 mobile asphalt plants from Linnhoff Technologies Pte Ltd, one of which was transferred from the previous project for the airport in Caticlan. This asphalt plant model is considered a suitable option for similar short-term projects due to its full mobility features. The TSD1500 is easy to assemble and disassemble, making it convenient for jobsite transport. It delivers an average capacity of 80-100 t/hr at 5% moisture.

The basic Linnhoff mobile asphalt plant unit consists of four modules with built-in axles. These mobile modules are designed to conform to international road haulage standards for faster and easier mobility. As such, the use of Linnhoff TSD1500 in this project allows the distance between the plant and the jobsite, as well as the land area for plant installation, to be reduced. The close proximity of the plant to the jobsite is important in order to meet the strict requirement of the temperature for the hot mix asphalt.

According to the subcontractor, Linnhoff asphalt mixing plants provide less air, less noise pollution and less maintenance cost. The Linnhoff screen drum technology combines the drying and screening of aggregates in one drum, so there is no need for a hot elevator or vibrating screens. Due to this, maintenance on Linnhoff asphalt plants can be lower compared to other asphalt plants because they do not require chains, extra motor or buckets. Furthermore, Linnhoff asphalt plants provide accurate weighing of mineral aggregates, bitumen and filler by load cells, resulting in good quality homogeneous hot mix asphalt.

Aside from mobile asphalt plants, Linnhoff also offers asphalt mixing plants for stationary and portable use, such as the CompactMix asphalt plant (CMX series) and TransitMix asphalt plant (TRX series), as well as Lintec containerised asphalt plant (CSD series) with various capacities, along with ancillary equipment, such as bitumen tank, bitumen decanter, hot storage silo and foreign filler silo. ■

Website: www.linnhoff.com.sg

ABOVE: **The basic Linnhoff mobile asphalt plant unit consist of four modules with built-in axles. These four modules can be seen here being transported on their prime movers.**

BELOW: **Two Linnhoff TSD1500 mobile asphalt plants are currently in operation at the new Panglao Island International Airport to help build the runways and several roads on the project. Both plants are placed in close proximity to the jobsite, in order to maintain the strict requirement of the temperature for the hot mix asphalt.**

GCP systems 'protect' HK-Zhuhai-Macao Bridge

The 55-km Hong Kong-Zhuhai-Macao (HKZM) Bridge, which will be among the world's longest, is scheduled for opening in the second quarter of 2018. It is expected to cut travel times between Hong Kong and Zhuhai from three hours to just 30 minutes; further integrating the three cities in the Pearl River Delta and boosting the local economy.

Constructing and waterproofing such a high-profile bridge is not without its challenges. Not only did the bridge deck waterproofing solution need to meet the strict construction and technical compliance of three government authorities (Mainland China, Hong Kong and Macau), complete stringent lab-testing, but the product also had to be available in large volumes and delivered within a tight deadline.

For the project, the Hong Kong-Zhuhai-Macao Bridge Authority selected several waterproofing solutions from GCP Applied Technologies, including the Eliminator bridge deck waterproofing system (previously Stirling Lloyd, now GCP); Ice & Water Shield self-adhered roofing underlayment; Preprufe pre-applied waterproofing membrane; and Bituthene post-applied waterproofing. Adva concrete admixture from GCP was also used for the concrete portion of the bridge.

The Eliminator waterproofing system is designed for easy installation. Two coats of waterproofing membrane were applied to three steel sections of the bridge. The first coat was a distinctive yellow followed by a second coat that is white. The cold-spray-applied system is fast, effective and able to seal complex, critical details and penetrations with ease.

The Eliminator system forms a tough, flexible and seamless membrane with no vulnerable joints, allowing it to perform throughout the design life of a structure while simultaneously reducing maintenance costs. According to GCP, its installation causes minimal disruption and it is capable of supporting traffic just an hour after application. The system allows for wet film thickness gauge checks to ensure the specified film thickness is achieved across the area before curing.

Other parts of the bridge also harnessed GCP products. On the boundary crossing facility in Hong Kong, for example, the Ice & Water Shield self-adhered roofing underlayment was applied to protect the roof from the tropical rain that can sometimes turn torrential. On the tunnel running deep under the Lingding Ocean, the Preprufe pre-applied waterproofing membrane and Bituthene post-applied waterproofing were selected to safeguard several tunnel passageways, including at the Hong Kong boundary crossing facilities and staff subway section. In addition, Adva high-range water-reducing admixtures were used on the concrete portion of the bridge, to enhance the concrete's durability. ■

Website: https://gcpat.com

Once opened, the Hong Kong-Zhuhai-Macao Bridge will be among the world's longest.

© ACPEL Ltd.

The Eliminator bridge deck waterproofing system from GCP Applied Technologies being used on the project. This cold-spray-applied system is fast, effective and able to seal complex, critical details and penetrations with ease.

XCMG cranes on Malaysia East Coast Rail Link project

The East Coast Rail Link (ECRL) in Malaysia, which is currently under construction, aims to connect Port Klang on the Straits of Malacca to Pengkalan Kubor in Kelantan. Here, XCMG cranes are being used by the contractor on the project, China Communications Construction Company Limited, to carry out some lifting works. One of the cranes - the QY55KA - is seen here (above and right) working at a tunnel construction. The model has been designed to help increase productivity and manoeuvre easily on a steep slope. The ECRL is reportedly one of the flagship projects along the Belt and Road Initiative (BRI). ■

Website: www.xcmg.com

Quiet crushing in London city centre with Rubble Master

A building next to a school near the Camden Market in London, the UK, was to be demolished. The area was so confined that there was hardly space to manoeuvre, let alone access to the site through the approximately 2.5 m narrow entrance. Here, an RM 70GO! 2.0 crusher from Rubble Master was in operation to produce final aggregate in a single pass. This final aggregate was used again immediately on the jobsite.

The machine was supplied by Rubble Master's British dealer, Red Knight 6 Ltd. Delivering an average throughput of 125 t/hr, the RM 70GO! 2.0 only needed five days to crush the 4,000 t of material. Featuring a width of only 2,200 mm, the machine was also able to drive through the narrow gateway into the site between two multi-storey buildings and turn around.

As the final aggregate was used for re-piling onsite, the delivery of piling material could be reduced to a minimum and it saved the residents from unnecessary lorry traffic, thereby protecting the environment from noise, dust and other emissions. Other benefits are provided by the RM drive concept, which maintains low fuel consumption and in turn reduced emissions and running costs.

With its noise-reducing design, the RM 70GO! 2.0 is ideal for noise-sensitive areas like inner cities. Rubble Master has developed and optimised various noise reducing components such as the engine cladding, mounting and ventilation louvres. The company says test results of standardised measurements verify that the average sound pressure level (Lp) is 80.6 db(A) at a distance of 10 m and 60.6 db(A) at a distance of 100 m. ■

Website: www.rubblemaster.com

Both images © Rubble Master

ABOVE AND LEFT: **The RM 70GO! 2.0 crushes 125 t/hr quietly with low emissions near the Camden Market in London. The machine can easily drive through narrow gateways and restricted areas.**

Volvo EC210D chosen for Indonesia hydropower plant

The PLTA Batang Toru hydropower plant in Sumatra, Indonesia, is currently under construction with a Volvo EC210D playing a key role in the construction of the access road to the new facility. The excavator belongs to equipment rental company Tapanuli Adya Citra, which is leasing it to main contractor Sinohydro Corporation on a five-year rental deal. The EC210D excavator is the second Volvo unit for Tapanuli Adya Citra, with the company also adding an SD110B compactor to its fleet in recent years.

Attached to the 20-t EC210D is a Volvo HB21 breaker, which will be used for a range of breaking work. The new access road will serve the power plant, which is being developed by PT North Sumatera Hydro Energy.

For a productive work shift, the EC210D excavator is equipped with a spacious and safe cab for the operator, offering enhanced all-around visibility, an adjustable seat and ergonomic controls. The improved interior also features a new I-ECU monitor that displays a range of information for efficient operation.

The HB21 can be either top- or side-mounted and is capable of breaking even the most demanding of materials, delivering consistent power and high breaking force, said Volvo CE. The auxiliary lines on the EC210D facilitate the correct flow and pressure of hydraulic oil to the attachment.

In addition to the HB21, Volvo CE offers a comprehensive range of other attachments for use with the EC210D. A selection of buckets and breakers are available, all of which work in harmony with the base machine to ensure optimal performance and profitability.

Once completed, the PLTA Batang Toru power plant will have a capacity of 510 MW and supply energy to the majority of North Sumatra. It is scheduled to open in 2022. ■

Website: www.volvoce.com

The Volvo EC210D excavator, fitted with a Volvo HB21 breaker, plays a key role in the construction of the access road to the new PLTA Batang Toru hydropower plant in Sumatra, Indonesia.

Haulotte fleet at work on Istanbul New Airport

Construction of the Istanbul New Airport in Turkey is still ongoing and when completed, it will provide a capacity of 200 million passengers per year. It is the third international airport to be built in Istanbul after Istanbul Atatürk Airport and Sabiha Gökçen International Airport. All commercial businesses that will be located at the Istanbul New Airport are planned to have a green establishment certificate (LEED), making it the world's first green airport.

Local company Acarlar Makine received an order to supply more than 300 Haulotte aerial platforms to the project. The machines range from an electric scissor lift with an 8-m working height to the biggest diesel boom lift with a 43-m working height. The need for Haulotte aerial platforms is said to be increasing day by day paralleled with the rising awareness of the risks of working at height, the complexity of the structural designs of the airport, and the adoption of time saving solutions through safe equipment.

Haulotte diesel articulated and telescopic booms can reach the difficult working areas on top of the elevations and also help to build the complex design of the structure. The HA41RTJ Pro articulated boom has a maximum outreach of 19.80 m and lifting speed of less than 40 seconds. The newly launched HA26RTJ Pro has been designed to meet the expectations of operators in terms of performance, comfort and safety. Thanks to its simultaneous movements, this articulating boom can quickly extend to a full height so that operators save considerable time in reaching the work area. The HT43RTJ Pro telescopic boom, which is known for its rough terrain capabilities, also offers excellent performance and productivity.

For improved safety, all the big booms are equipped with a secondary guarding system, the Haulotte Activ' Shield Bar 2.0. In an entrapment situation, the operator is pushed towards the bar and the machine stops automatically. The large clearance space, the safety gap, protects the operator from entrapment.

The Haulotte H15SX and H18SX diesel scissor lifts feature an ergonomic and spacious platform, thanks to the double extension that can be loaded up to 500 kg. The diesel scissors' 4WD with hydraulic differential lock greatly improves the traction on all grounds, whereas the Haulotte electric scissor lifts have been used for electrical installations, false ceiling, fire sprinkle installation and interior design of the airport. The Haulotte Compact 14 electric scissor is reportedly the most popular model in this project, delivering a 350 kg maximum lifting capacity with the ability to be driven at full height (14 m). Another popular model is the new Optimum 8 electric scissor, AC drive, which can operate outdoors in winds up to 45 km/hr while maintaining a load capacity of 230 kg.

In addition, the Haulotte HA15IP electric articulated boom with an 8.45 m outreach has an excellent turning radius for optimum manoeuvrability in tight space - 3.7 m – and is suitable for both indoor and outdoor use. The Star 10 vertical mast is also widely used on this jobsite. Thanks to its zero-tail swing, the operator can entirely rotate the turret while driving or working at height, without any risks of accidental contact of the turret with external obstacles or risks of being stuck. Thus, the operator can work in total safety and confidence. ■

Website: www.haulotte.com

ABOVE, FAR LEFT AND LEFT: **Acarlar Makine has supplied more than 300 Haulotte aerial platforms to the Istanbul New Airport project. The machines range from an electric scissor lift with an 8-m working height to the biggest diesel boom lift with a 43-m working height.**

Small paver, big savings

The Ammann AFW 150-2 mini paver recently helped with the installation of a water pipeline in the city of Barka, Oman. The machine was deployed by SMC Infra LLC, a local company that specialises in projects such as water pipeline installation, concrete reservoirs, water treatment plants, shopping malls, and commercial and industrial buildings.

Spanning over 8 km, the project was designed to provide access to an improved water system for 130,000 residents. A portion of the existing road was removed and the underground water pipe installed. Aggregate backfilling and compaction were undertaken, followed by closing of the trench with the mini paver – which placed an 80 mm layer of asphalt. Paving widths varied from 600 to 1,000 mm at different stretches and the flexibility of the paver provided significant advantages.

According to SMC Infra, the mini paver delivered 50 percent savings in time and costs. The quality and finish of the project were also greatly enhanced, added the company, in comparison to the paving methods that were initially employed. For example, the asphalt would have been dumped by skid-steer loaders, raked and compacted.

The AFW 150-2 moved at a pace of 10 m/min on the project, said SMC Infra, and it was also able to work in constrained high-traffic locations. The paving work was completed in two months and involved placement of 4,000 t of mix. ■

Website: www.ammann-group.com

Ammann AFW 150-2 mini paver was recently used on a water pipeline installation project in Barka, Oman. Paving widths varied from 600 to 1,000 mm at different stretches and the flexibility of the paver provided significant advantages.

ABOVE: **The paving work took about two months and involved placement of 4,000 t of mix. Spanning over 8 km, the project was designed to provide access to an improved water system for 130,000 residents.**

LEFT: **The Ammann AFW 150-2 mini paver moved at a pace of 10 m/min on the project, and was also able to work in constrained high-traffic locations.**

Innovative waterproofing solution for Riyadh Metro

The Riyadh Metro in Saudi Arabia is currently under construction and upon completion, it is aimed to play a key role in the city's public transport network. Here, Mapei waterproofing systems are being used on Line 3 of the project.

The project was unique in many ways, explained Mapei. For instance, the underground stations were all below the ground water table level, with some of them even at a depth of 36-40 m. The ground water was contaminated and highly saline. In addition, as the stations were being constructed in extremely congested parts of the city, they required diaphragm wall shoring to support the ground before excavation could be carried out. This was coupled with the fact that all the walls and ground slabs were held in place with tension anchors penetrating into the concrete. These anchors were intended to prevent water pressure from causing the upflit of the structure after completion of the work. A waterproofing system was needed, which must be able to accommodate hundreds of penetrations through it.

With this in mind, Mapei provided various waterproofing solutions in order to overcome several challenges. The first challenge was to ensure the systems would last up to 120 years to meet the design life of the structure. Mapeplan TU S PVC-P membrane was thus selected, as the product has been subjected to accelerated ageing tests that prove its long-life expectancy. The membrane was installed loose laid around the structure and compartmentalised with the highly flexible Idrostop PVC BEC ME 32T waterstops every 200 sq m.

The waterstops also incorporated Idrostop Multi 11 re-injectable hoses in them. This was to ensure that, when casting the concrete, any gap could be filled with Microcem 8000, micro-fine hydraulic binder with pozzolanic action for ground consolidation and ground waterproofing. This way, leakages in any compartment could be effectively reduced.

The second challenge was to devise a system that would allow repair of the membrane in case of damage. For this, Mapei supplied its double-layer system combining Mapeplan TU S 20 and Mapeplan PVC Protection 15 membranes.

These layers were welded at the edges of the compartments to enable injection between the two layers in case of leakage. To facilitate this, Mapeplan injection valves were installed- five in every compartment - to cover the whole surface area of each compartment. These were then filled with Mapegel UTT (hydro swelling acrylic resin) to flood the compartment. This resin gels and then swells when it comes into contact with water, thereby keeping the water out of the structure.

The tension anchors penetrating through the slab and retaining walls posed an immense challenge to the designers when accommodating the waterproofing system. To solve this, Mapei found an innovative solution to treat the ground anchors. Collars were fabricated using Mapeplan TU S 20 membrane, and these collars were filled to one third the depth with Mapegel UTT, which is a hydrophilic gel. Both the gel and collar were then encapsulated with Planigrout 300 ME PCT free-flowing grout to contain the swelling action of the Mapegel UTT.

The solution for anchors was applied to all stations on the Line 3. It was also used for the anchors in the shoring diaphragm walls. The work required considerable time, said Mapei, but it provided an excellent solution to stop leakage through the anchors. ■

Website: www.mapei.com.sg

ABOVE: **Mapei provided its waterproofing solutions for the Line 3 of Riyadh Metro, including Mapeplan TU S and Mapeplan PVC Protection 15 membranes, as well as Mapeplan injection valves, among others.**

RIGHT**: Connection of the waterproofing system at the tunnel entrance.**

LEFT: **The tension anchors posed an immense challenge to the designers when accommodating the waterproofing system. To overcome this, Mapei found an innovative solution to treat the anchors using Mapeplan TU S 20, Mapegel UTT and Planigrout 300 ME PCT.**

The article courtesy of Realia Mapei International no. 68

Sennebogen joins Grand Paris Express project

The Grand Paris Express is a group of six fully automated metro lines that are being built in Greater Paris, France. The project is scheduled to be completed in phases up to 2030. Among the machines helping on the jobsite are Sennebogen 673 E telescopic crane and 655 E duty cycle crane, which are working together to remove soil and gravel, as well as perform lifting tasks where space is confined. The 673 E is the latest addition to the machine pool of Enco, a company specialising in the rental of construction equipment.

Along the entire metro line, various shafts are sunk for the tunnel boring machine (TBM) and also for the maintenance of the railroad infrastructure. As the construction sites are located within the city, some of the shafts need to be integrated into extremely confined spaces. For this, the compact Sennebogen 624 HD duty cycle crane is an ideal solution. Based on a wheeled or crawler undercarriage, the machine's robust design with the two free-fall winches is well suited to operate mechanical dual rope attachments.

Construction work for future line 15 south of the Grand Paris Express commenced at the end of 2017. At this site, Spie Fondations has chosen two 140-t Sennebogen 6140 E duty cycle cranes to carry out a special underground construction work, to build a tunnel more than 8 km long.

Sennebogen 673 E telescopic crane works on the Grand Paris Express project.

The family-owned company Sarl Gras also owns several Sennebogen material handling machines, one of which is the 850 E that will be used to handle 45 mil t of materials excavated during the underground work. According to Sennebogen, this model can save up to 30% of operating costs thanks to its innovative Green Hybrid energy recuperation system. ■

Website: www.sennebogen.com

Liebherr's slurry wall package for Milan metro expansion

Saos srl is currently installing slurry walls for new metro stations in San Babila area, Italy, which form part of the Milan metro expansion project. For this job, the company is relying on a Liebherr HS 8100 HD duty cycle crawler crane with an HSG 5-18 L hydraulic slurry wall grab. The confined space at the Piazza San Babila is a major challenge for the construction work. In this section, Saos has to install 6,300 sq m of slurry walls. Using the Liebherr machine, the company can achieve 130 sq m per day.

Saos is excavating bites of 2,800 x 1,200 mm with depths of up to 54 m. Layers of gravel, sand and loam have to be penetrated. One bite requires 16 hours, whereby half of the time is required for excavating. Subsequently the reinforcement is inserted and concrete is filled. During the work for the new M4 line, Saos has to install slurry walls totalling 84,000 sq m.

Liebherr's hydraulic slurry wall grabs include the HSG 5-18 C and HSG 5-18 L, which allow slurry walls with thicknesses between 500 and 1,800 mm to be installed, depending on the composition. The term 'C' (compact) refers to the compact standard design, while the base body of the 'L' (large) version is 2.5 m longer.

The resulting total height of the grab (9.5 m) and the high weight with low centre of gravity provide better vertical positioning, and are especially advantageous when installing larger dimensioned slurry walls. When working in difficult ground conditions, the work can be improved through increasing the dead weight of the grab with an additional weight of 7 t. The heavy weight of the grab is possible, thanks to the synchronisation of the free-fall winches. The slurry wall solution can also be adapted to the conditions on the jobsite. In addition, the duty cycle crawler crane still maintains its multifunctionality – for example, it can be quickly converted for chisel application or operation as a lifting crane. ■

Liebherr HS 8100 HD with hydraulic slurry wall grab on Milan metro project.

Website: www.liebherr.com

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Doka helps to 'form' Omniturm tower

The Omniturm building is being developed by Tishman Speyer, providing office, residential and public spaces. It will reach approximately 190 m in height and is scheduled for completion in early 2019. Architect on the project is Bjarke Ingels (BIG), and the main contractor is Adolf Lupp GmbH & Co KG.

Safety requirements on the new mixed-use development are quite high due to its location in the middle of the bustling inner city. For this reason, formwork manufacturer Doka is providing a protection screen with hydraulic rams for climbing vertically, but also has the ability to tilt forward, backward and even to the side to climb those offset levels – with no modifications required. From level to level at the spiralling offset, the building steps up to 1.35 m round the perpendicular. Depending on the direction, the protection screen can tilt up to 21° in all directions. This system not only protects pedestrians from falling objects, but also protects the site crew against falls and adverse weather conditions.

At the level of maximum offset, the residential section is more than 5 m off the baseline. The slab edges on these residential floors will also serve as balconies and as projecting roofs, so they are only 15 cm in thickness. To carry the high live loads for concreting and the weight of the protection screen, extremely strong shoring was used. In fact, taking the weight under the corners of the residential-section floors are girderframe units and load-bearing systems otherwise found only on bridge-building projects, says Doka.

The internals of the Omniturm are two high-rise cores (for elevators and stairways), which are climbing skyward from two independent platforms. The SCP platform system including hydraulics is in use in both cases. With this method, the core is formed and cast ahead of the subsequent storey floors. The site equipment, complete with the reinforcement, is more or less stored on the platform. Powerful hydraulic cylinders raise the platform, formwork and equipment containers to the next pouring section, in only one lift and without a crane.

Space is an issue not just on the topmost construction level but on one level down as well, where formworking is in progress. The platform maximises opening travel for suspension of the panels – another benefit along with the convenience of the all-round enclosure. It protects the workers from adverse weather conditions and dangers, especially on the topmost level. ■

Website: www.doka.com

LEFT: **The protection screen developed by Doka can be tilted 21 ° forward, backward and also to the side.**

BELOW: **From level to level at the spiralling offset, the building steps up to 1.35 m round the perpendicular.**

Both images © Doka

© TS Tessuto Sàrl

The Omniturm mixed-used development, designed by Bjarke Ingels (BIG), is scheduled to be completed in early 2019.

INTO THE FUTURE 'THE MANITOWOC WAY'

SINCE MANITOWOC SEPARATED FROM ITS FOODSERVICE DIVISION TO BECOME A SOLELY CRANE COMPANY, IT HAS FOCUSED LARGELY ON GLOBAL INNOVATIONS. THE COMPANY HAS ALSO STRENGTHENED ITS OPERATIONS IN ASIA PACIFIC THROUGH DEALER EXPANSIONS AND NEW PRODUCT DEVELOPMENTS TO SUIT THE CHANGING JOBSITE CONDITIONS. *SOUTHEAST ASIA CONSTRUCTION* TALKS TO BRIAN WANG, MANITOWOC'S SENIOR VICE PRESIDENT FOR ASIA PACIFIC, ABOUT THE LATEST CRANE TECHNOLOGIES, INDUSTRY TRENDS AND WHERE THE COMPANY IS GOING.

1. Mr Wang, the construction industry in Asia Pacific has been facing a tough time in recent years. This situation has badly affected many equipment manufactures in the region, which made them re-evaluate their business goals. Has it also changed Manitowoc's strategic plans?

Brian Wang (BW): We remain committed to Asia Pacific and our customers in this region. We have a regional headquarters in Singapore, manufacturing plant in China, regional offices across a variety of markets and a network of experienced dealer partners.

In terms of our strategic plans, nothing has really changed. We want to produce new models at faster speeds and focus on bringing the lowest possible total cost of ownership to customers. At the same time, we also want to be faster in how we react to changing market conditions and that's something we're getting better at.

2. Two years ago, Manitowoc became a standalone crane company after selling off its Foodservice division. What has growth been like since then?

BW: Globally, the market has remained quite challenging but we are finally seeing activity levels pick up. Our own financial performance has seen dramatic improvements over the past year, a direct result of our implementation of 'The Manitowoc Way'. This concept is built around 'innovation' and 'velocity' and as a result, we've been able to introduce groundbreaking new models at fast speeds. An example would be the Potain MCH 125 luffing jib crane, which entered production just a few months ago. Already there are dozens of these machines across this region and feedback from customers has been positive.

Here in Asia Pacific, the market has remained relatively tough in many places but there are bright spots, for example Australia and the Philippines. In line with The Manitowoc Way concept, we've changed our structure and operations in this part of the world - one of these changes has been my appointment. In general though, things are looking good for Manitowoc in Asia Pacific.

3. Speaking of changes, the Zhangjiagang factory is one of Manitowoc's major facilities serving the global market. What sort of adjustments did you have to make here?

BW: Our Zhangjiagang manufacturing plant serves Asia Pacific, the Middle East, Africa and Latin America. It has certainly seen a number of changes since we became an independent crane company - especially as a direct result of The Manitowoc Way concept. There is such a strong focus on lean operations that it impacts almost everything that happens at the manufacturing plant. From automated welding through to material flow and on to testing and shipping, we've re-evaluated everything we do in the production of our cranes.

In the final quarter of 2017, the Zhangjiagang team implemented 46 improvements to lean operations or processes.

ABOVE: **Brian Wang joined Manitowoc last year as senior vice president for Asia Pacific to lead the company's operation in the region, except India.**

LEFT (BOTH IMAGES): **Manitowoc's China factory in Zhangjiagang manufactures Potain tower cranes, serving customers in Asia Pacific, the Middle East, Africa and Latin America.**

In 2018 we expect that number to be over 200. Ultimately, we're committed to bringing the lowest possible total cost of ownership to our customers - and one important way to do that is by being more efficient in our manufacturing, along with ensuring better reliability of design and testing.

4. Apart from Potain tower cranes, is there a plan to manufacture Grove- and Manitowoc-brand cranes at the Zhangjiagang plant?

BW: Right now, there are no immediate plans to manufacture other crane lines at the plant. As an organisation, we are concentrating on making ourselves as agile and flexible as possible. So it's impossible to say what will happen further down the line.

5. Manitowoc has developed quite a number of innovations lately, including the Potain MCH 125 topless luffing jib crane, as you mentioned earlier. Do you see new emerging trends in the crane industry, particularly in Asia Pacific?

BW: Asia Pacific is like many markets in that crane owners are focused on doing more with less. In practical terms, this means a crane that can be turned to more applications. A good example is our Hup self-erecting cranes, which have more configurations than any previous generation of Potain cranes. Customers can use them on a wider variety of jobsites and with the latest lifting technology included, they're also more productive. These cranes have drawn a lot of interest in Asia Pacific, which surprised us a little. Asia Pacific is not traditionally a strong market for self-erecting cranes, but the capabilities of the cranes are attracting new customers.

Similarly, the Potain MCH 125 is unique to us: a luffing jib and topless crane in a single package; and the first in the world to use hydraulic power for its articulating movement. The crane has enjoyed a successful launch in this region and we expect big things from it. Into the future we are looking at higher capacity cranes and we will be making some exciting announcements around this later in 2018. We're seeing more buildings make use of precast concrete components in their design, and this necessitates higher capacity tower cranes.

For mobile cranes, we're seeing more attention on transportation in Asia Pacific, as we are in other markets. Owners often face restrictions on either highway travel or use in urban centres – or both. So our latest generation of Grove GMK cranes, such as the GMK5250L, GMK5150L and GMK4100L-1 are proving very popular. We've also just introduced the new GMK6300L-1, the successor to the hugely popular GMK6300L.

Manitowoc's new topless luffing jib crane, the Potain MCH 125, is believed to be the first in the world to use hydraulic power for its articulating movement.

We've focused hard on giving the customer the best possible crane inside a single vehicle. That means reducing or eliminating the support vehicles required, allowing cranes to travel much more easily – our single engine concept, combined with our unique Megatrak system, has really helped drive this development.

6. In the tower crane segment, do you think that topless and luffing jib cranes could become obsolete in the future, as users would prefer a crane that combines both technologies, just like the Potain MCH 125?

BW: Over the years we've seen the shift in popularity from traditional top-slewing cranes with the cathead design, to cranes with topless designs. In fact in a lot of size classes, topless cranes are already the most popular option. Similarly, as cities become more congested and working restrictions increase, luffing jib cranes will find themselves enjoying stronger popularity.

The combined concept of the MCH 125 is something that we believe has a lot of potential. Into the future we'll certainly be looking at opportunities to develop that product line. But it'll be a long time before topless and luffing jib cranes become obsolete – if that ever happens.

7. We have also seen some autonomous machines being applied in other sectors, such as off-highway trucks and earthmoving. How feasible is this technology for the crane industry?

BW: It is feasible, but because of the nature of crane work – specifically that they transport suspended loads above the ground – any automation of lifting will likely be heavily regulated and introduced after an extended period of testing and assessment.

However, we will clearly see more automation introduced into overall crane operations. In fact, it's already here - if you consider something like the boom configurator mode on Grove mobile cranes equipped with our crane control system (CCS). With this feature, an operator simply inputs the load, height and radius for a lift and the boom will automatically configure to the required length. This was previously a labour-intensive process that required the operator to consult with a manual and then manually set the boom length. Now it's completed in a matter of minutes.

8. Going forward, the global construction industry is undergoing a major transformation driven by higher productivity and digital technologies. How confident are you about the future of this region?

BW: Extremely confident! Asia Pacific remains an important contributor to our global revenue, and is one of the fastest growing regions with huge potential. Infrastructure development will be crucial to ensuring that this region achieves its potential. Lately we've seen how infrastructure has given a boost to the economies of China, Indonesia and Vietnam. So it will be interesting to watch how China's Belt and Road initiative stimulates demand.

I think with the scale of development in this region, you'll also see contractors and crane owners pay much closer attention to maximising efficiency. In recent years, Manitowoc has been developing cranes that are adept at taking on a wider variety of tasks. Also, cranes that are easier to transport and set-up; that are more reliable; and that perform better on the jobsite. I think you'll see our investment rewarded in increased market share as customers recognise that they truly do get a lower total cost of ownership from partnering with Manitowoc.

Asia Pacific is a unique market. You can't apply the same principles here that might apply in Europe or North America. We have a real mix of economies. We have the wealthy markets of Japan, Korea, Australia, Singapore, Hong Kong and New Zealand. Alongside that there are the fast-growing markets, such as Indonesia and Vietnam. Then there's the scale of China or the opportunities we see in places like the Philippines and Myanmar.

ABOVE: **Many countries in Asia Pacific are now adopting the precast construction method. Here, Potain tower cranes with a high capacity are being used to lift heavy precast components on a residential project in Singapore.**

LEFT: **Potain Hup self-erecting crane has also attracted a lot of interest in Asia Pacific. This crane features more configurations than any previous generation of Potain cranes, allowing customers to work on a wider variety of jobsites.**

ABOVE: **The Philippines is one of the potential markets for Manitowoc. A Grove rough-terrain crane can be seen here working at a precast yard in San Felix, Laguna.**

BELOW: **Australia currently enjoys strong demand for Grove range of all-terrain cranes. The latest model from Manitowoc is the Grove GMK6300L-1 (pictured), the successor to the hugely popular GMK6300L.**

ABOVE: **Manitowoc crawler cranes perform heavy lifting at a petrochemical refinery in Vietnam.**

There's such a rich variety here, and that's what makes it such an enjoyable place to do business! ■

Website: www.manitowoc.com

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KEEP DIGGING

THE NEXT GENERATION 320 AND 320 GC EXCAVATORS FROM CATERPILLAR ARE DESIGNED TO INCREASE OPERATING EFFICIENCY, LOWER FUEL AND MAINTENANCE COSTS, AND IMPROVE OPERATOR COMFORT. THE CAT 320 IS IDEAL FOR MEDIUM- TO HEAVY-DUTY APPLICATIONS, WHILE THE CAT 320 GC IS INTENDED FOR LOW- TO MEDIUM-DUTY APPLICATIONS.

Higher efficiency

The 20-t class Cat 320 is equipped with integrated Cat Connect Technology, which can increase operating efficiency by up to 45% over traditional grading operations, according to Caterpillar. Offering guidance for depth, slope and horizontal distance to grade, the Cat Grade with 2D system helps operators reach desired grade quickly and accurately. Using the system's E-fence feature enables the machine to work safely under structures or near traffic by preventing

ABOVE LEFT: **Equipped with a choice of Comfort, Deluxe or Premium cab packages, the new spacious cab has large front, rear and side windows to enhance visibility to the front and side of the excavator.**

ABOVE (BOTH IMAGES): **The cab comes fitted with standard features like keyless push-button start, large 203-mm touchscreen monitor with jog dial keys for control and sound-suppressed rollover protective structures (ROPS). Programmable joystick buttons for response and pattern also allow the operator to dial in productivity settings.**

LEFT: **All daily maintenance checks for engine oil, fuel water separator, fuel tank water and sediment, and cooling system level are performed from ground level, making the routine faster, easier and safer.**

any part of the excavator from moving outside operator-defined set points. The standard 2D system can be upgraded to Cat Grade with Advanced 2D or Cat Grade with 3D.

Standard Grade Assist automates boom, stick and bucket movements, so operators can stay on grade simply and effortlessly with single-lever digging. Cat Payload on-board weighing, integrated on the Cat 320 at the factory, delivers precise load targets and increased loading efficiency with on-the-go weighing and real-time payload estimates without swinging to prevent truck over/under-loading. Cat Link hardware and software connect jobsites to the office and provide customers with machine-critical operating information.

Fuel savings

The new excavators consume 15 to 20% less fuel than the previous, corresponding models, says Caterpillar. New Smart mode operation automatically matches engine and hydraulic power to digging conditions, optimising both fuel consumption and performance. Engine speed is automatically lowered when there is no hydraulic demand to further reduce fuel usage.

The new cooling system employs multiple electric fans, which independently monitor hydraulic oil, radiator and air-to-air after-cooler temperatures to deliver the exact airflow required. With a new hydraulic system built for responsiveness and efficiency, the Cat 320 GC and 320 feature a new main control valve that eliminates the need for pilot lines, reduces pressure losses and lowers fuel consumption. Caterpillar says that fewer hydraulic lines on the excavators also result in 20% less oil required, lowering long-term operating costs.

Offering extended and more synchronised maintenance intervals, the new Cat excavators do more work at a lower cost and reduce maintenance costs by up to 15% over the previous series. Featuring higher dirt capacity, the new Cat hydraulic return filter boasts a 3,000-hour service life, a 50% increase over previous filters. A new Cat air filter with integrated pre-cleaner and primary and secondary filters extends service life to 1,000 hours, a 100% increase over previous designs, while a new fuel tank cap filter extends service life to 2,000 hours. The three-fuel system filters each offer a 500-hour service interval.

All daily maintenance checks for engine oil, fuel water separator, fuel tank water and sediment, and cooling system level are performed from ground level, making the routine faster, easier and safer.

New cab

The next generation Cat excavator cabs come fitted with standard features like keyless push-button start, large 203-mm touchscreen monitor with jog dial keys for control and sound-suppressed rollover protective structures (ROPS) to offer excellent operator comfort, safety and quiet operation. Programmable joystick buttons for response and pattern allow the operator to dial in productivity settings. New advanced viscous mounts are designed to minimise cab vibration by up to 50% over previous models, thus reducing operator fatigue.

Equipped with a choice of Comfort, Deluxe or Premium cab packages, the new spacious cab has large front, rear and side windows to enhance visibility to the front and side of the excavator. Optional 360-degree visibility combines images from multiple machine-mounted cameras to enhance the operator's sightlines in all directions. In addition, automatic climate control maintains internal cab temperature settings, regardless of external ambient temperatures. ■

Website: www.cat.com

GROUTING MADE SIMPLE

CHEMGROUT OFFERS A WIDE RANGE OF STANDARD AND CUSTOM-BUILT GROUTING EQUIPMENT FOR VARIOUS MATERIALS AND CAPACITIES, SPECIALLY DESIGNED TO BE USER-FRIENDLY AND TROUBLE-FREE. *SOUTHEAST ASIA CONSTRUCTION* TAKES A CLOSER LOOK AT SEVERAL MODELS THAT ARE AVAILABLE IN THE ASIA PACIFIC MARKET.

CG-680 HP

The ChemGrout CG-680 high-pressure (HP) series is a high-pressure, high-capacity, skid-mounted colloidal grout machine for mixing and pumping slurries of cement, fly ash, bentonite and lime flour. It is designed to provide a continuous mixing and pumping operation, with a 0.5 cu m homogenising colloidal mixer, 0.5 cu m agitated storage tank and 120 l/min grout pump. The CG-680 HP is commonly used in tunnelling, dam foundations, soil compaction and encasements, among others.

The high-capacity, double-acting plunger grout pump is connected directly to the agitated storage tank to provide a continuous pumping operation. The colloidal mixer is equipped with a 2X3X12 high-shear centrifugal diffuser-type pump that disperses the cementitous material down to its finest particle size to achieve complete particle wetness.

The mixing tank is also equipped with a bridge breaker to break apart the material before entering the colloidal mixer. The agitated storage tank has a variable-speed, high-efficiency paddle mixer that maintains a thoroughly mixed grout while waiting to be pumped.

CG-460/2X8 HP

The ChemGrout CG-460/2X8 HP colloidal series is specially designed for the grouting of hollow bars, tiebacks and ground anchors. The machine has two high-shear colloidal 265-l mixing tanks, and a double-acting, high-pressure 2X8 plunger grout pump. This pump is fitted with fasteners that can significantly reduce disassembly time for quick cleaning and maintenance.

TOP: **ChemGrout's CG-680 high-pressure, high-capacity, skid-mounted colloidal grout machine is designed for mixing and pumping slurries of cement, fly ash, bentonite and lime flour.**

ABOVE: **The CG-680 HP being used on a jobsite in Bangladesh for bridge footings.**

LEFT: **The CG-680 HP is ideal for applications in tunnelling, dam foundations, soil compaction and encasements, among others.**

The dual colloidal mixing tanks allow for independent mixing of flushing and structural grouts. Each mixer is equipped with variable-speed, high-efficiency, high-shear disks rotating at speeds of up to 3,000 rpm for rapid and thorough mixing. The tank outlet valves feature a large 4-in butterfly type that assures full material flow into pump suction. The 2X8 plunger grout pump delivers 57 l/min and 138 bar, and an optional 3X8 pump delivers 76 l/min and 69 bar.

The CG460 series is available in a variety of power options, including air, hydraulic, electric/hydraulic (25 hp electric motor), and diesel/hydraulic (33 hp Kubota engine). Both electric and diesel models require a separate skid-mounted power pack.

The CG-460/2X8 HP colloidal series is specially designed for the grouting of hollow bars, tiebacks and ground anchors.

CG-550/030 Rugged HP

The ChemGrout CG-550/030 Rugged HP series is capable of handling materials ranging from fluid slurries to heavily sanded grouts. The machine can be skid-mounted or trailer-mounted, featuring a 170-l mixing tank, 57-l or 113-l holding hopper and single-acting 3-in piston grout pump.

Each mixing tank is equipped with baffles, bag breakers, and a variable-speed, high-efficiency paddle mixer that provides rapid grout mixing. The tank outlet is a large slidegate that allows viscous grouting materials to flow quickly into the removable holding hopper.

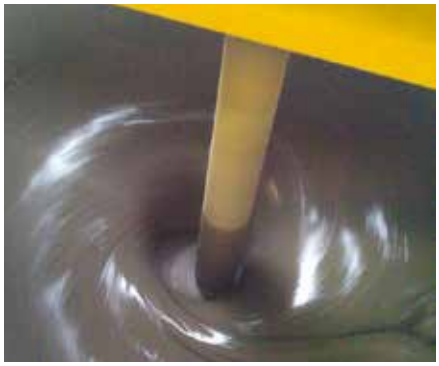
A complete grouting system combines the CG-030 piston pump with the high-efficiency paddle mixer to provide a continuous output of material. Both mixer and pump are equipped with their own variable speed control.

Materials commonly used with the CG-030 include cement slurries, sanded cement mixes, bentonite mixes (with or without sand), most repair mortars, high-strength non-shrink grouts and self-levelling products.

The large capacity hopper is mounted above the suction housing, enabling a new batch to be mixed while the first is being pumped. This helps to provide a consistent 'non-stop' discharge of material, virtually eliminating the clogging of tremmie lines.

The skid-mounted model is offered in a variety of power options, and is also available in a gas/hydraulic or diesel/hydraulic trailer version. The trailer-mounted model is a fully integrated system combining mixer, pump and power system. It is road and jobsite ready equipped with leaf springs, lights and a working platform.

The CG-460's high-pressure grout pump is fitted with fasteners that can reduce disassembly time for quick cleaning and maintenance.



The CG-460 has variable-speed, high-shear disks that rotate up to 3,000 rpm for excellent mix consistency.

The CG-550/030 Rugged HP series is seen here (on the left) working on a foundation project. The machine can be skid-mounted or trailer-mounted, equipped with a 170-l mixing tank, 57-l or 113-l holding hopper and single-acting 3-in piston grout pump.

From contractor to manufacturer

Based in Illinois, USA, ChemGrout was established in 1963 as a grouting contractor providing cement and chemical grouting field services. The company also manufactured grouting equipment for its own use. In 1969, the company began selling and renting its equipment to other contractors while maintaining its field grouting work.

ChemGrout had been involved in more than 350 projects, both large and small, before it stopped carrying out on-site work in 1978 to focus entirely on the design and manufacture of grouting equipment. The concepts of mixer-pump balance, user-friendly operation and ease of maintenance are emphasised in the design of its grouting systems, reveals ChemGrout. Enough technology is incorporated to maximise efficiency, yet not so much as to compromise ease of operation or maintenance.

"ChemGrout builds machines that are simple to operate and maintain. This means the learning curve is much lower than our competitors. At the same time, the machines have more uptime since maintenance is fast and easy," explains Joe Schatz, general manager of ChemGrout.

"Having said that, we do not sell low-cost machines; our machines are built to last for over 20 years," points out Mr Schatz, underlining the importance of good quality. "Customers that focus only on the sales price would miss the most important factor, which is machine uptime. If the machine is broken down, the contractor is not making any money. We are constantly improving our machine designs."

"We also provide material testing for our customers to see how pumpable their material is to our equipment, prior to starting their projects," adds Rob Galbavy, marketing manager of ChemGrout. "We have created a pumpability index to rank the pumpability of many pre-blended grouts through various grout pumps in order to identify the minimum size pump for the material. This effort helps our customers to choose the right equipment, and eventually it will also help to ensure that their projects run more smoothly."

ChemGrout further highlights that each of its machines is made for 'balance' of grout delivery. Complete grouting systems are always designed to allow continuous, non-stop grouting operation at published pumping rates for the machine. That is, the mixing tank is large and fast enough, and the storage hopper has a large enough capacity to keep the pump 'fed' without interruption.

Today, the company manufactures a variety of standard and custom-built grouting equipment to handle a diverse range of materials and capacities (from 3.8 to 284 l/min), with pressures from 3.4 to 138 bar. High-pressure pumps can manage pressures up to 138 bar and flows up to 189 l/min. The machines can be skid- or trailer-mounted with power options that include air, gasoline, diesel, electric and hydraulic.

ChemGrout manufactures a wide range of standard and custom-built grouting equipment to handle various materials and capacities (from 3.8 to 284 l/min), with pressures from 3.4 to 138 bar.

ABOVE: **Joe Schatz, general manager of ChemGrout (on the left) with Rob Galbavy, marketing manager of ChemGrout, at the World of Concrete 2018.**

RIGHT: **The CG-550/030 Rugged HP series is capable of handling materials ranging from fluid slurries to heavily sanded grouts.**

ChemGrout has also expanded its presence globally, including in Asia Pacific. The company now has dealers in Singapore, Vietnam, Myanmar, Thailand, Indonesia, Taiwan, Philippines, Hong Kong, Australia and New Zealand. "Currently Asia Pacific represents about 15% of ChemGrout's overall sales. We expect this number to grow to 20% in the next three years," states Mr Schatz. "Particularly Australia and New Zealand, they make up the largest percentage of the Asia Pacific market. Long established distributors with in-depth market knowledge and machines in-stock account for this fact."

"In general though, distributors with stock machines fair best in Asia Pacific," says Mr Schatz, "because the shipping time would be too long, which is usually the case with our customers that don't plan far enough in advance."

Moving forward, Mr Schatz is optimistic on the future of ChemGrout in the region. "We are generally positive about our future business in Asia Pacific. We see widespread acceptance of our equipment throughout the region, and we continue to see infrastructure spending driving growth." ■

Website: www.chemgrout.com

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HANDLING THE FUTURE

CELEBRATING ITS 60TH ANNIVERSARY THIS YEAR, MANITOU GIVES A SNEAK PREVIEW OF TWO NEW ROUGH-TERRAIN FORKLIFT TRUCKS -THE MC 25 AND MC 30. THE COMPANY ALSO INTRODUCES A RANGE OF SOLUTIONS TO MEET VARIOUS HANDLING REQUIREMENTS AT CONSTRUCTION SITES, INCLUDING TWO UPGRADED AERIAL PLATFORMS AND A ROTATING TELEHANDLER, AS WELL AS GEHL AND MUSTANG LOADERS.

MC 25 and MC 30 forklift trucks

Manitou's new MC 25 and MC 30 forklift trucks offer maximum capacities of 2.5 t and 3 t respectively. They have a ground clearance of 30 cm – believed to be among the highest on the market - resulting in excellent gradeability. There are four-wheel-drive versions of the machines for negotiating rough and steep terrain.

Being compact and only 1.45 m wide, the MC 25 and MC 30 can manoeuvre well around jobsites. With a maximum speed of 25 km/hr, they have been certified as roadworthy and thus can be used over long distances, says Manitou.

The machines' components can be easily accessed via an engine cover located behind the seat, so users no longer have to raise the whole cabin. This repositioning makes maintenance easier, leading to reduced total cost of ownership (TCO) for both models.

The four-wheel-drive buggy version of the MC 25 features a maximum lifting height of 3.7 m (for a mast height of up to 5.5 m) and a turning radius of 3.4 m. Such extremely compact dimensions are useful when manoeuvring in restricted areas – the machine's height is under 2 m. This low height means that the machine can easily clear doorways and perform loading/unloading operations on lower ground floors.

The MC 25 is versatile and easy to use, making it ideal for numerous applications such as masonry, building frameworks and cladding, as well as for assembling structures for use at events. The model has also been designed to provide operators with wide visibility: the top of the cabin features a panoramic roof.

"As forerunners in the rough-terrain forklift truck segment, our group has always succeeded in innovating, providing our customers with products designed to meet their needs. These needs change, and that's why we have expanded our range to include these extremely compact, high-performance models. We have completely rethought their design and made their total cost of ownership even lower – all the arguments we need to shore up our leadership position in this market," said Jérémy Gachon-Guérin, Manitou's forklift truck product manager.

MRT 2470 rotating telehandler

The Manitou MRT 2470 rotating telehandler is also a highlight of the company's latest innovations. It won an Intermat Innovation Award earlier this year for its stabilisation system.

Well suited to heavy high-rise construction, the MRT 2470 has a lifting capacity of 7 t and a maximum reach of 24 m. This model also benefits from a new chassis, just like the MRT 3050. According to Manitou, fitted with a newly designed counterweight, the MRT 2470 rotating telehandler can maintain good stability, even with a maximum load at 24 m.

ABOVE AND LEFT:
The MC 25 forklift truck has a maximum capacity of 2.5 t.

RIGHT:
The MC 30 forklift truck has a 3 t maximum capacity.

Having a hydrostatic 'shift-on-fly' transmission option, the MRT 2470 allows the operator to choose either a manual or an automatic gearbox. With two ratios, the maximum speed of the machine is 40 km/hr.

For indoor applications, a dual-energy engine with an electrical system is available an option. It can minimise noise pollution and polluting gas emissions, which would eventually lower the TCO.

180 ATJ and 100 VJR lifts

The latest version of Manitou 180 ATJ articulated boom lift is powered by a Stage V engine. The Kubota engine's fuel consumption has been reduced from 26 kWh (on the previous version) to 19 kWh, while the services it delivers have been improved by the incorporation of a variable flow pump.

Equipped with a Stop & Go system and featuring anchoring points that can be easily located for transport, the 180 ATJ has been designed to meet the requirements of the rental industry and has a particularly low TCO – 8% lower than the previous version, says Manitou. The machine also has wider wheels for optimum safety when the platform is moving.

The 100 VJR vertical mast lift is another upgrade in Manitou's range of aerial platforms. With a new counterweight and a modified turret fitted with fork blades, this model can now be moved by a forklift truck. The 355° turret rotation gives the operator greater flexibility.

New anchorage points have been added to the masthead, facilitating slinging operations for transporters. Intended for use when carrying out operations such as maintaining metal roof structures or assembling structures for events, the 100 VJR delivers a maximum working height of 10 m and a maximum capacity of 200 kg. The 24 V / 250 Ah onboard battery combined with electric motors offers long machine autonomy, and the electric drive motors also ensure smooth jerk-free travel.

RIGHT: **The 180 ATJ articulated boom lift has been designed to meet the requirements of the rental industry.**

ABOVE AND LEFT: **Well suited to heavy high-rise construction, the MRT 2470 rotating telehandler has a lifting capacity of 7 t and a maximum reach of 24 m. The machine won an Intermat Innovation Award earlier this year for its stabilisation system.**

MT 420H telehandler

With a width of less than 1.5 m and a height of under 2 m, the Manitou MT 420H telehandler is ideal for confined jobsites with narrow alleys or home renovations – its turning radius is just under 3 m and maximum capacity is 2 t. This model also has a low fuel consumption of 4.13 l/hr.

The hydraulic oil needs to be changed every 2,000 hours. The intelligently positioned anchoring points are easy to locate, so the MT 420 H can be moved from site to site quickly and easily.

The machine is now available with the mini-loader forks carriage as an option, meaning that operators do not require a specific carriage for each brand – it is compatible with all Gehl and Manitou attachments.

LEFT AND BELOW: **MT 420H telehandler is ideal for confined jobsites with narrow alleys or home renovations – its turning radius is just under 3 m. The machine also has a low fuel consumption of 4.13 l/hr.**

Gehl and Mustang loaders

The Gehl RT 215 compact track loader has a range of new controls. Its joystick is hydraulically controlled, providing operators with greater control over their movements. The machine has an operating capacity of 975 kg and a lifting height of 3.25 m, and is powered by a 72 hp Yanmar engine.

Suitable for various jobs, from demolition to landscaping, the versatile RT 215 can be used on all types of terrain. The machine's robust radial-lift design offers excellent performance in excavating, grading below grade applications. Other features include the IdealTrax and Lift Cylinder Lock, making maintenance easier.

INNOVATIVE ATTACHMENTS

Manitou's new Variowinch attachment is equipped with a hydraulic motor, significantly increasing the hook's maximum speed with low loads (the speed is three times faster during loading operations and two times faster during unloading operations), while ensuring normal speed at maximum loads – up to 7.2 t.

The Variowinch system requires no acceleration to increase efficiency, keeping noise pollution to a minimum and preventing excessive fuel consumption. This attachment is initially available for the 3255 and 2470 rotating telehandlers, but Manitou intends to make it more widely available for the whole MRT rotating telehandler range.

Furthermore, Manitou has developed a new basket made entirely of aluminium. The 4200/365 model weighs only 180 kg, with a width of 4.2 m and a total lifting capacity of 365 kg. It is compatible with all MT telehandlers and MRT rotating telehandlers. ■

ABOVE LEFT: **Manitou's new basket is made entirely of aluminium.**
ABOVE: **Manitou's new Variowinch attachment.**

The Mustang 4200V skid steer loader is designed with vertical lift and meets all heavyweight requirements. Launched in 2017, the machine is powered by a 120 hp Deutz engine. It has an operating capacity of 1.9 t and a maximum lifting height of 3.65 m. With a hydraulic flow of 121 l/min, operators can use the machine for a range of different applications like road building, grading/levelling, demolition and construction, and handling operations in ports. The standard Hydraglide ride control system allows the lift arm to 'float' when transporting loads, minimising loss of material and thereby increasing operator comfort and productivity.

In addition, Gehl and Mustang machines now have a new dual-direction levelling bar. With the help of laser sensors, operators can easily control the bar via a control box and a monitoring box located in the cabin. This simplifies levelling operations on both flat and undulating ground. The attachment can be used with two complementary modules: a sonic tracker module, which can be used to follow a marker line - such as a buried cable or a pipe; and a slope sensor module, which can be used to accurately control the bar's slant so as to follow a predefined slope. ■

Website: www.manitou.com

The Gehl RT 215 compact track loader has a range of new controls. Its joystick is hydraulically controlled, providing operators with greater control over their movements.

Mustang 4200V skid steer loader is designed with vertical lift and meets all heavyweight requirements.

Celebration With Style

ABOVE (ALL IMAGES): **The first Manitou truck - the MC5 - was created in 1958, based on the idea of Marcel Braud. Here, the machine was displayed at the Intermat Paris exhibition in April 2018 to mark the company's 60th anniversary.**

ABOVE: **Marcel Braud (on the right), founder of Manitou and honorary chairman of the board at Manitou, and his sister Jacqueline Himsworth, chairman of the board of directors at Manitou, celebrate the company's 60th anniversary.**

BELOW (ALL IMAGES): **The celebration was held at the Musée des Arts Forains in Paris, attended by global dealers, customers and media.**

BUILDING AIRPORT

OF THE FUTURE

THE NEW TERMINAL 4 AT SINGAPORE CHANGI AIRPORT WAS OPENED TO THE PUBLIC IN OCTOBER 2017. IT WAS COMPLETED AFTER THREE YEARS OF CONSTRUCTION, COMPRISING A TWO-STOREY TERMINAL WITH A TOTAL FLOOR AREA OF 225,000 SQ M. RSP ARCHITECTS PLANNERS & ENGINEERS WAS APPOINTED BY CHANGI AIRPORT GROUP (CAG) AS CIVIL & STRUCTURAL CONSULTANT FOR THE PROJECT. HERE, RSP SHARES THE CHALLENGES IT FACED AND HOW THE COMPANY OVERCAME THEM THROUGH INNOVATIVE METHODS.

The new Terminal 4 (T4) has a capacity of 16 million passengers per year, bringing the total annual handling capacity at Changi Airport to 82 million passengers. It is Singapore's first airport terminal that introduces a fully automated departure process – known as FAST (Fast And Seamless Travel) – to enhance efficiency and convenience for passengers. The terminal also has a centralised departure, arrival and pre-board security screening area, which is located on the second storey.

The development of T4 was carried out in three phases, with a total construction cost of S$1.147 billion. Phase 1 took about 30 months, including the main terminal building and south finger pier; Phase 2 was completed within 34 months, comprising the north finger pier and a multi-storey car park; and Phase 3 lasted for 37 months, consisting of another multi-storey car park and the taxi holding area.

Working together with the design and build contractor - Takenaka Corporation - RSP faced several challenges throughout the project. Among them included the tight schedule of 30 months for the first phase, as well as complex roof designs to achieve a spatial and column-free environment such as the 60 m large-span roof at the departure check-in hall, 18.5 m large-span cantilever roof at the departure kerbside and massive transfer trusses at the arrival immigration hall.

Plus, there was a site constraint. The fixed gangway structures are located within airside with live aircraft parking stands, and they have to meet strict security requirements and airside operational needs.

To solve the problems, RSP adopted the DfMA (Design for Manufacture and Assembly) methodology to increase work productivity and safety on the project. BIM technology was used in the design stage to provide better-informed decisions and assess design solutions; identify construction risks before commencement of site works; and maximise site productivity and safety by minimising abortive works on site.

'Hat-first' method

To speed up the construction of Phase 1, the project team implemented an innovative 'hat-first' method for the main terminal building. The second storey and roof were completed first, then works continued on to the first storey and Mezzanine floors - starting at the centre of the building and moving outwards.

Combining the hat-first method with a middle-out approach allowed the internal finishing and M&E works to start quickly, and also enabled an early installation of the baggage handling system (BHS). This also meant that a temporary roof was not required and the works could be sheltered from the rain.

"Back in 2014 when we first started, the hat-first method was considered new in Singapore for such a massive scale project, and it required an early contractor involvement," said Er. Lai Huen Poh, senior managing director at RSP who oversaw the T4 project. "The traditional way we build here has always been a bottom-up approach," pointed out Er. Lai, "but it wouldn't have helped us to finish this project on schedule."

There were also other benefits gained from the hat-first method, added Er. Jessica Lim, director at RSP and also a key engineer in charge of the T4 project. "It allowed us to perform a multiple slab construction. Upon completion of the second storey and the roof, the team could proceed with the slab construction for the first storey, Mezzanine 1 and Mezzanine 2 at the same time."

RSP was appointed as civil & structural consultant for the construction of Changi Airport Terminal 4. Lai Huen Poh (left), senior managing director at RSP and Jessica Lim, director at RSP, were both key engineers in charge of the project.

Furthermore, precast columns could be installed directly on pile caps before the slab construction for the first storey began, continued Er. Lim. Also, because the slab concreting work for the first storey was carried out under the shade, it produced a good quality of concrete. What's more, facade works could be completed earlier, even before the internal finishing and M&E works commenced.

'First beam shoe connectors in Singapore'

RSP also adopted a full precast system using mechanical connectors, which comprised beam shoes and anchor bolts. Manufactured in Finland, it was the first of its kind to be used in Singapore, revealed Er. Lim. "Although the system has been

LEFT AND RIGHT: **Singapore Changi Airport's new Terminal 4 has a capacity of 16 million passengers per year and it utilises a fully automated departure process – known as FAST (Fast And Seamless Travel) – to enhance efficiency and convenience for passengers. The terminal also features a centralised departure, arrival and pre-board security screening area.**

The project team implemented the 'hat-first' construction method for the main terminal building. The second storey and roof were completed first, then works continued on to the first storey and Mezzanine floors - starting at the centre of the building and moving outwards. This approach allowed the internal finishing and M&E works to start quickly, and also enabled an early installation of the baggage handling system.

applied to a number of precast projects in Europe, it was the first time we brought it to Singapore, and so we needed to conduct several tests in advance."

According to RSP, the full precast system with mechanical beam shoe connectors was selected in view of its buildability and flexibility for future upgrading of the airport. The system was easy to install without compromising the robustness of the precast elements, and it allowed the continuity of rebar at the bottom.

A total of 2,829 precast elements were used in the Phase 1 of the project, including 555 precast columns (22 t each); 159 precast main beams (55 t each); 502 precast secondary beams (13.5 t each) and 1,613 precast planks. These occupied 70 percent of the second-storey main terminal building, covering 36,000 sq m out of 46,300 sq m area. Overall, RSP managed to achieve about 64 percent of time savings using the precast system compared to the conventional cast in-situ method.

A full precast system with mechanical beam shoe connectors was adopted in the project - the first of its kind in Singapore. The system was chosen in view of its buildability and flexibility for future upgrading of the airport.

Prefab roof trusses and 'magic carpet'

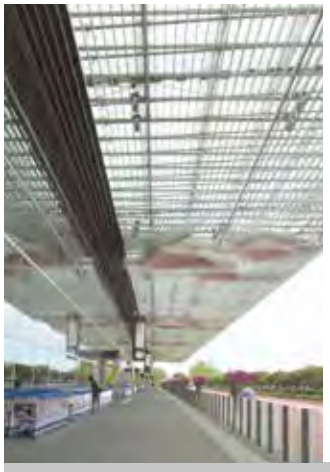
The complex roof structure at the T4 was another challenge for RSP, which involves a 60 m large-span column-free roof at the departure hall, an 18.5 m large-span cantilever roof at the departure kerbside, a hanging 70 m x 5 m LED immersive screen and a 300-m-long Galleria Skylight.

RSP decided on the slopping top-chord pitched truss design to support the roof with truss heights varying between 3 and 4.05 m. This led to a reduction in steel weight by approximately 20 percent, in comparison to a flat roof design for 60-m span truss.

The use of repetitive plane-frame steel roof trusses with a secondary beam system enabled easy and quick off-site prefabrication and erection. Moreover, the addition of 'knee braces' between trusses gave the lateral restraint for continuous truss bottom chord in compression at column supports.

To mitigate risks on site, the project team also created a mobile hanging platform – named 'magic carpet' – that was able to move along the entire Galleria Skylight for easy and quick installation of glass panels. "The magic carpet replaced scaffoldings, making works safer and more productive, and it saved 40 percent of our time," stated Er. Lai.

ABOVE IMAGES: **A total of 2,829 precast elements covered 70 percent of the second-storey main terminal building, including precast columns, precast main and secondary beams, and precast planks.**



The 18.5 m large-span cantilever roof at the departure kerbside (left) and the 60 m large-span column-free roof at the departure hall were among the challenges faced by RSP.

'Magic carpets' being used to install glass panels on the Galleria Skylight. These mobile hanging platforms were able to move along the entire roof safely.

He further mentioned that for the Galleria Skylight, the magic carpet was deemed safer than mass climbing work platforms. Takenaka received the SCAL WSH Innovation Gold Award 2015 for the innovative use of the mobile hanging platform.

Extensive catwalks have also been incorporated throughout the roof, in order to provide safe and easy access for regular building inspection and maintenance.

Prefab gangways

There are 21 fixed gangways at the T4, comprising 17 single/double gangways and four MARS (Multiple Apron Ramp System) long-span gangways. They are located within airside with live aircrafts parking stands, and must meet strict security requirements and airside operational needs.

To simplify works at the airside, the gangways were prefabricated offsite and assembled onsite – two at a time and without any welding works, given they are located just metres away from where aircrafts are parked. This prefabricated steel volumetric design and construction method not only eliminated steel welding works, but also reduced temporary works and in turn improved productivity in general. ■

Website: www.rsp.com.sg

Fixed gangways were prefabricated offsite and assembled onsite – two at a time and without any welding works. This method improved productivity in general.

The slopping top-chord pitched trusses supporting the terminal roof were also prefabricated offsite.

Note: *Changi Airport Terminal 4 is one of the winners of this year's BCA Design and Engineering Safety Excellence Awards (please see page 102 for details of the award and other winners).*

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ON TOP OF BANGKOK

The Iconsiam mixed-use development in Thailand is currently under construction next to the Chao Phraya River, which runs through the city of Bangkok. The project is being developed by a joint venture between Siam Piwat group, Magnolia Quality Development and Charoen Pokphand Group. It is expected to open this year.

Two residential towers are among the highlights of the project. With 52 floors and almost 269 m in height, 'The Residences at Mandarin Oriental, Bangkok' will be the shortest of the two. The other tower, 'Magnolias Waterfront Residences', is set to become the tallest building in Thailand, thanks to its 70 floors and the pinnacle that crowns it. Reaching 318 m in height, it will surpass the MahaNakhon tower, which is currently the tallest in Thailand at 314 m high. Main contractor on the Iconsiam project is Italian-Thai Development PCL (ITD).

Continuous lifting

To complete the residential towers, ITD counted on two luffing-jib cranes from Linden Comansa, the LCL165 and LCL190. They were supplied by Linden Comansa's Thai distributor, Smart (1994) Co Ltd, which also carries out maintenance and services of the cranes.

The LCL165 is working on top of The Residences at Mandarin Oriental with a maximum load capacity of 8 t. The crane was assembled with the internal climbing system and because of this, it is braced to the internal structure of the building and can be climbed easily and safely as the building grows in height.

The LCL165 is also said to be cost saving since it only needs six tower sections, compared to 50 sections that would have been required if it was erected externally. The crane is currently finishing the installation of the crown's cladding and will be disassembled soon.

The Linden Comansa LCL190, with a 12-t maximum load capacity, was used at the Magnolias Waterfront Residences from January 2016 to May 2018. This crane was assembled with the external climbing system, with a final tower height of 287 m.

In order to lift and move the loads to such heights without any problems, the LCL165 and LCL190 were fitted with optional hoist cable drums, with a capacity for 1,000 and 1,280 m respectively.

The construction of both towers has been a challenge for ITD due to the project's tight deadline: only 38 months from the first

THIS IMAGE AND BELOW:
Bangkok's new landmark, Iconsiam, is currently under construction. Two residential towers are among the highlights of the project.

The Magnolias Waterfront Residences (on the left) is set to become the tallest building in Thailand, reaching 318 m in height.

All images © Sirirach Denphaeicharangkul

Two Linden Comansa luffing-jib cranes - the LCL190 and LCL165 - are seen here working on top of the residential towers of the Iconsiam project. The LCL190 was erected with the external climbing system, while the LCL165 with the internal climbing system.

foundation work to the delivery to the client. This pace of work has not only required the cranes to operate for almost 20 hours a day, but also that they do so at high speeds. Therefore, the cranes were equipped with optional high-speed hoisting motors, which greatly shorten the work cycles. The LCL190 was able to reach speeds of up to 303 m/min and the LCL165 was 310 m/min. As a result, the Magnolias Waterfront Residences could achieve a growth rate of one floor every four days, equivalent to seven floors each month. ■

Website: www.comansa.com

The LCL165 luffing-jib crane will be disassembled soon.

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MALAYSIA CALLING

Work on the Four Seasons Place Kuala Lumpur Hotel in Malaysia is under way near the city's iconic landmark, the Petronas Towers. Upon completion, it will have 230 rooms, 242 luxury suites containing up to seven rooms as well as 27 apartments. The hotel is part of a 77-storey high-rise building that reaches a height of over 300 m and also features around 30,000 sq m of retail space. The complex is known as the Four Seasons Place and will dominate the skyline of Kuala Lumpur together with the Petronas Towers.

Formwork solution

A comprehensive formwork and scaffolding solution from Peri was developed in close collaboration with the main contractor, China Railway Construction Company (CRCC). The goal was not only to facilitate efficient work operations, but also to provide a high degree of safety for the personnel on site. The result was a practical and efficient combination of Peri Up scaffold technology, ST 100 shoring towers and the RCS climbing protection panel.

Peri Up shoring was used to temporarily support up to 3.50-m-wide reinforced concrete girders at heights of up to 26 m. This scaffolding system could be adjusted to accommodate the loads to be transferred. Furthermore, the construction site team was able to modify all reinforcing steel ribs – in accordance with the construction progress made.

CRCC used the RCS climbing protection panels to deliver maximum all-round safety for the upper storeys that were under construction. Therefore, any dangerous open edges were completely covered with this enclosure system. Such effort guaranteed a high level of safety for the construction site personnel when working at great heights, which in turn led to increased working efficiency. Moreover, the climbing protection panels prevented any materials from falling to the ground and thus avoiding all possible risk of injury to pedestrians below.

For climbing the protection panels up to the next floor each time, mobile self-climbing devices were used. Due to this, the required crane time could be minimised and thus saving any additional construction time. ■

Website: www.peri.com

The Four Seasons Place in Kuala Lumpur (on the right) features 77 storeys with a total height of over 300 m. When completed, it will dominate the skyline of the city together with the iconic landmark, the Petronas Towers (on the left).

ABOVE LEFT: **Peri Up shoring towers were used on the project to temporarily support up to 3.50-m-wide reinforced concrete girders, at heights of up to 26 m. This scaffolding system could be adjusted to accommodate the loads to be transferred.**

ABOVE RIGHT: **The mobile self-climbing devices allowed the Peri RCS climbing protection panel to be lifted to the next floor without the use of a crane.**

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MOVING THE RIVER

OPENED IN OCTOBER 2017, THE DOWNTOWN LINE 3 (DTL3) IS CURRENTLY THE LONGEST UNDERGROUND AND DRIVERLESS MRT LINE IN SINGAPORE. ARUP LED THE ENGINEERING DESIGN FOR CONTRACT 937 FORT CANNING STATION AND ITS ASSOCIATED TUNNELS. THE COMPANY TACKLED MANY CHALLENGES DURING THE DESIGN AND CONSTRUCTION PHASE, ONE OF WHICH CALLED FOR A TEMPORARY DIVERSION OF THE SINGAPORE RIVER.

Fort Canning station and tunnels

The 21-km-long DTL3 provides greater connectivity for commuters travelling from the eastern part of Singapore to the central and northwest regions. The line comprises 16 stations with three interchange stations: MacPherson, Tampines and Expo. These interchange stations link to the Circle Line (CCL) and the East West Line (EWL).

Arup was appointed by the Land Transport Authority (LTA) as lead engineering consultant for the DTL3's Contract 937 Fort Canning station and its associated tunnels. The company started design work on the project in 2009, and construction began in 2011.

The Fort Canning station is located at the intersection of River Valley Road and Clemenceau Avenue. The Arup team, led by engineers Tan Yoong Heng and Cheryl Lee, faced some of its biggest challenges on the project, including construction of the tunnel under the Singapore River and building a station in close proximity to existing structures and infrastructure. Plus, the project required excavation through varied and mixed ground conditions consisting of Kallang formation, Jurong formation and Fort Canning boulder bed, among others.

Both images © Arup

TOP AND ABOVE: **Arup was appointed as lead engineering consultant for the DTL3's Contract 937 Fort Canning station and its associated tunnels. The station began its operations in October 2017.**


1


2


3


4

All images © LTA

To build the MRT tunnels connecting the Fort Canning and Chinatown stations, part of the Singapore River had to be diverted. The diversion work took about two years, which can be seen here: 1) The original alignment of the Singapore River; 2) A new waterway was formed to divert the 42-m-wide section of the river; 3) Temporary concrete platforms were built to facilitate the debris removal and soil strengthening works, as well as to enable access for machinery and equipment; 4) Once the tunnels were completed, the river was restored to its original course.

Diverting the Singapore River

The MRT tunnels connecting the Fort Canning and Chinatown stations are located under the Singapore River, presenting a massive challenge for construction. To carry out the project successfully, part of the river had to be diverted.

A new waterway was formed to divert the 42-m-wide section of the river. A temporary bridge was built to accommodate pedestrians throughout the diversion stage. "All underground obstructions, like existing river wall piles, and debris such as timber, steel and concrete below the river bed, were also removed so as to mitigate risks during the tunnelling work," said Er. Tan, principal of Arup Singapore.

Given limited soil cover and soft soil conditions below the river bed, Arup also performed ground improvement (by grouting) to strengthen the soil, in order to reduce the risk of water seepage during the tunnelling work.

In addition, temporary concrete platforms were built to facilitate the debris removal and soil strengthening works, as well as to enable access for machinery and equipment. Once the tunnels were completed, the river was restored to its original course. The diversion work started in 2012 and was completed in 2014.

Both images © DTL3 C937 team

All underground obstructions and debris such as concrete (left), steel (right) and timber, which were found below the river bed, were removed so as to mitigate risks during the tunnelling work.

Congested urban area

The Fort Canning station was also built in close proximity to existing and historical buildings, such as the National Museum, State Courts and residential (HDB) blocks. "For the tunnels that undercross the National Museum, we conducted an extensive engineering assessment in advance based on the 3D Finite Element Analysis and modelling of all the soil, building and foundation conditions

© Arup

ABOVE: **Tan Yoong Heng, principal of Arup Singapore, was one of the Qualified Persons (QPs) overseeing the DTL3 Contract 937.**

LEFT: **The Fort Canning station was built in a dense and congested urban area, close to many existing buildings and roads.**

to ensure that the construction works would not have an impact on its structure," explained Er. Tan.

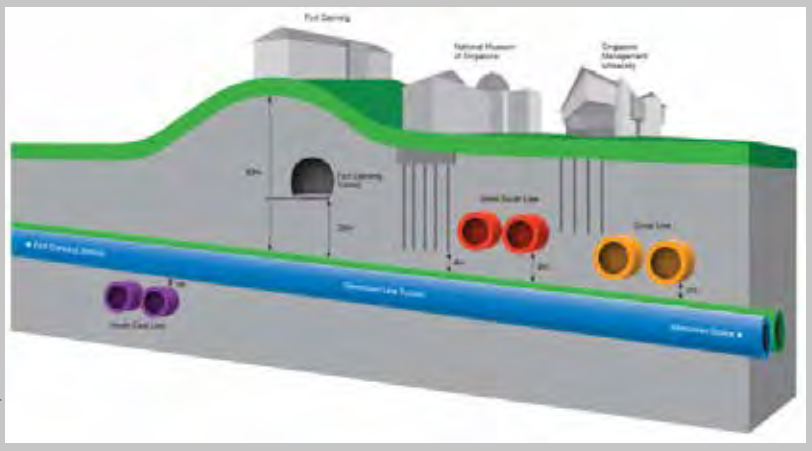
Another difficulty was tunnelling under and over operational MRT lines - the CCL, North East Line (NEL) and North South Line (NSL) - with minimal clearances. The tunnels linking Fort Canning and Bencoolen stations were constructed just 1 m above the NEL tunnels, 3 m below the CCL tunnels and 8 m below the NSL tunnels.

Arup also proposed a shallower station to optimise the available space – two levels, by integrating both the roof slab level and concourse, instead of the typical three-level station. Er. Tan pointed out that this design "reduced cost and time to construct, and also enhances the user's experience at the station."

Furthermore, as opposed to creating standalone structures for cripple sidings (extra tracks used to facilitate withdrawal or storage of trains that are not part of revenue service) on a separate land parcel, Arup developed a cost-effective solution by locating them within the station box. "Although the station is shallower, it is slightly wider, so we were able to incorporate the cripple sidings into one station box," said Er. Tan. As a result, it overcame space constraints in a congested urban area, and avoided the need for extensive construction within Fort Canning Park. ■

Website: www.arup.com

Note: The DTL3 Contract 937 is one of the winners of this year's BCA Design and Engineering Safety Excellence Awards (please see page 103 for details of the award and other winners).



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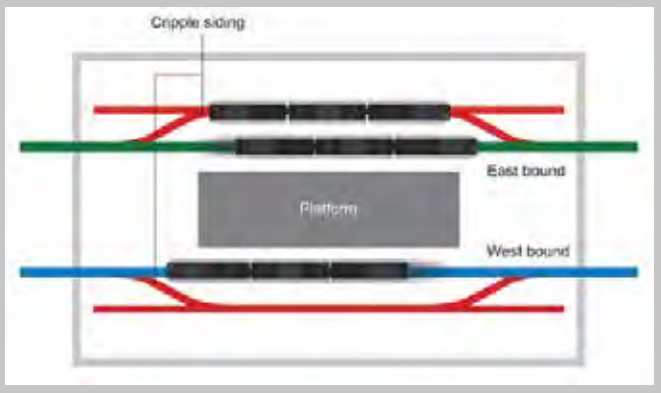
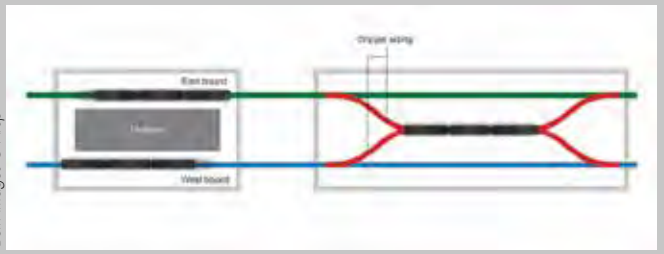
Tunnelling work was also carried out under and over operational MRT lines - the Circle Line (CCL), North East Line (NEL) and North South Line (NSL) - with minimal clearances.





Both images © Arup

Instead of creating standalone structures for cripple sidings on a separate land parcel (below left), Arup developed a cost-effective solution by locating them within one station box (left), thus overcoming space constraints in a congested urban area.

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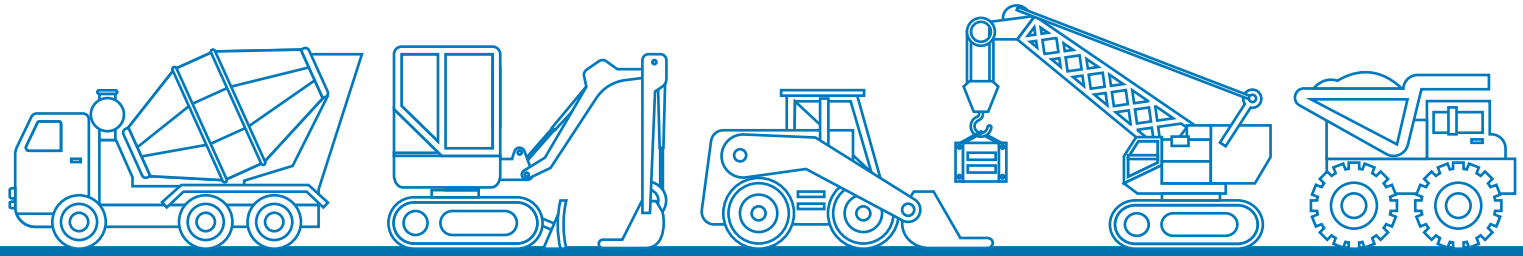
STEPS TO CONSIDER WHEN A CONTRACTING PARTY BECOMES INSOLVENT

By: *Mike Blaylock, Senior Consultant, HKA*



INSOLVENCY ON CONSTRUCTION PROJECTS CAN BE HUGELY DAMAGING TO EMPLOYERS AND CONTRACTORS. HOWEVER, THE RISKS CAN BE REDUCED WITH THE CORRECT STRATEGIC APPROACH AND HAVING A CAREFUL AND THOROUGH REVIEW OF CONTRACT CONDITIONS, WARRANTIES AND BONDS. HKA RECOMMENDS A NUMBER OF STEPS THAT EMPLOYERS, CONTRACTORS AND SUBCONTRACTORS SHOULD CONSIDER IF THEY FIND THEMSELVES IN A SITUATION WHERE A CONTRACTING PARTY BECOMES INSOLVENT.

1 For employers:

- √ Secure the site.
- √ Check and ensure that the works are properly insured.
- √ Record the physical state of the site making a full inventory of all unfixed materials and plant. Obtain video and photographic evidence.
- √ Review the contract to determine the respective rights and obligations of the parties in respect of such matters as payment, ownership of unfixed materials (on and off site) and rights of termination.
- √ Review any performance and/or security bonds to determine entitlement to make calls on any such bonds.
- √ Review any collateral warranties provided by subcontractors and/or suppliers particularly relation to any step-in rights.
- √ Reconcile the progress and value of the works up to the appointment of the insolvency practitioner.
- √ Develop a procurement strategy for completion of the works and/or any defects.

2 For contractors and subcontractors:

- √ Review your contractual rights and obligations in relation to suspension or termination of the contract on grounds of insolvency. Note that an incorrect termination could put you in breach of contract.
- √ Prepare detailed records of your progress and value of works up to the appointment of the insolvency practitioner. This should include measures, marked-up drawings, photographs and video evidence.
- √ Find out the employer's intentions – how will the employer complete the project?
- √ Decide whether it is in your interest to terminate the contract.
- √ Serve any suspension and/or termination notices as required under the contract.
- √ Check the provisions of any collateral warranties, including whether there are step-in rights.
- √ Serve any notices as required by your collateral warranties.
- √ Review the status of any performance bonds, on-demand bonds or parent company guarantees provided (if any).
- √ Review any ongoing insurance requirements with your insurance broker.
- √ Review and comply with ongoing payment obligations to subcontractors and suppliers.
- √ Serve any suspension and/or termination notices to subcontractors and suppliers as required under their contracts.
- √ Review what lawful steps can be taken to recover your plant, equipment and unpaid materials from the site. Find out if you have retention of title clause in place for unpaid materials under the contract.
- √ Review the contract and your plant hires agreements to understand your rights and obligations for plant and equipment that is on-hire and retained on site. Effective communication with the plant hire companies is essential.
- √ For consortia: check your contractual position; who are you under contract with? Are the parties to the JV jointly and severally liable?
- √ Discuss any financial difficulties with your bank at an early stage. ■

NOTE: This article is not intended as legal or contractual advice. Whilst the content is generally relevant to the Asia region, different countries will have different insolvency rules, hence the need to consider the local jurisdiction.

About HKA:
HKA is a new global brand that unites the former Construction Claims & Consulting Group of Hill International and associated subsidiaries – Binnington Copeland & Associates, Cadogans, Hill-PCI Group, Knowles and McLachlan Lister – following its sale and de-merger from Hill International. HKA has years of experience in dealing with insolvency issues, from reviewing and advising on contracts, subcontracts and supply contracts, as well as bonds and collateral warranties. The company can also advise on the correct notices to be issued, and produce the required reports on progress and value of works. ■

Website: www.hka.com

For more information on construction insolvency, contact:
Global: Mike Blaylock (*michaelblaylock@hka.com).*
Mr Blaylock has worked on a wide range of projects for employers, contractors, subcontractors and suppliers - in both public and private sectors. He has been involved in contracts ranging from commercial offices, retail, distribution, education, leisure, residential, local government and central government projects.

Asia: Peter Atkinson (*peteratkinson@hka.com*)
Mr Atkinson is currently partner and country manager at HKA Singapore. He was formerly a registered fixed charge receiver and member of the RICS insolvency committee. Mr Atkinson has worked on a number of major construction insolvency cases, including those in Asia. ■

CELEBRATING EXCELLENCE IN

This year's Building and Construction Authority (BCA) Design and Engineering Safety Excellence Awards have recognised 10 Professional Engineers for their excellent and safe engineering solutions in Singapore's built environment sector. Six of them received the top honour for overcoming project and site challenges with their resourceful and safe engineering designs and construction.

"We are commending 10 Professional Engineers who have displayed great skill and professionalism in overcoming engineering challenges and bringing their projects to completion safely," said Engineer Chew Keat Chuan, BCA group director for building engineering. "Their accomplishments underscore the importance of engineering careers in Singapore, and demonstrate good opportunities are available for aspiring Singaporeans who wish to pursue engineering careers in the built environment."

One of the award winners, Engineer Lai Huen Poh from RSP Architects Planners & Engineers (Pte) Ltd, was faced with the challenge of not only having to complete the iconic Changi Airport Terminal 4 (T4) in 30 months, but also deal with the urgent need to complete part of the first and second storey floors within 12 months to allow other subcontractors to start their works to meet the project's deadline. Er. Lai realised early on that construction productivity would be key for the timely completion of the project and therefore made plans to have most of the T4's structure prefabricated offsite, then transported and assembled onsite.

In addition, Terminal 4's 21 gangways also had to be prefabricated offsite and assembled onsite - two at a time and without any welding works - because they were located just metres away from where aircrafts were parked at the airport. Er. Lai also worked closely with the project team, which suggested and implemented an innovative 'hat-first' construction method for the T4 main building. The roof was completed ahead of the floors below from the 'middle out'. This provided a safe and conducive working environment for early commencement of finishing and services works, and also enabled early installation of the airport's baggage handling system.

Another achievement by Er. Lai was the use of long steel roof trusses to support the roof of T4's departure halls, in order to meet the design requirements of a visually appealing, column-free hall.

Others two award winners, Engineers Tan Yoong Heng and Cheryl Lee, were faced with the challenge of constructing the

BUILDSG TO HELP TRANSFORM SINGAPORE'S CONSTRUCTION INDUSTRY

Following the launch of Singapore's Construction Industry Transformation Map (ITM) in October 2017, it was announced that a new transformation office would be set up to drive the implementation of the ITM strategies in collaboration with tripartite partners including trade associations and chambers, Institutes of Higher Learning (IHLs), and unions.

The name of the new office, BuildSG, was unveiled by Second Minister for National Development Desmond Lee in March 2018. The office started operations in April 2018, with three centres: iBuildSG, weBuildSG and SGBuilds. The BuildSG logo was launched at the BCA Awards ceremony on 22 May 2018.

Three centres

The iBuildSG centre will work with Trade Associations and Chambers (TACs) and key firms to uplift the perception and practices in the sector, in order to attract, develop and retain more talent and provide better jobs for Singaporeans - especially at the professional, managerial, executive and technical (PMET) levels. It will also function as a career office and provide support for interested individuals and those already in the built environment sector.

The weBuildSG centre will serve as the go-to facility for firms and TACs, as they work on translating the ITM into detailed action plans. Their current goal is to build up expertise in the transformation areas identified under the Construction ITM, namely Design for Manufacturing and Assembly (DfMA), Integrated Digital Delivery (IDD) and green buildings. Through various initiatives and government support schemes, weBuildSG will work with firms to build up capacity and capability to meet Singapore's domestic needs and grow to offer their services internationally.

The SGBuilds centre seeks to bring firms together to collaborate in expanding the Singapore brand of development and construction overseas. This facility will support firms in their internationalisation efforts through building stronger networks and cultivating deeper ties in overseas markets, sharing knowledge on overseas opportunities, and facilitating formation of cluster-level consortiums for projects of interest.

The three centres have begun reaching out to industry on the new initiatives that TACs, IHLs and various stakeholders could work on jointly to build capacity and capabilities. One such initiative is the development and implementation of the Built Environment SkillsFuture Tripartite (BEST) Taskforce recommendations.

The BEST Taskforce

Since August 2017, the BEST Taskforce comprising members from TACs, professional boards, IHLs and BCA have met to deliberate on the needs of the industry and how each stakeholder can play its part in equipping the local workforce with the necessary skills and competencies across pre-employment education and training (PET), structured internship, and continuing education and training (CET). This has culminated in a set of recommendations to build up the manpower capabilities to support industry transformation.

Firstly, students can look forward to an updated curriculum of built environment related courses infused with the new industry

ENGINEERING AND SAFETY

Downtown Line (DTL) underground tracks under the Singapore River, historical buildings such as the National Museum, through the Fort Canning Hill, and a narrow strip of land between two HDB blocks and the State Court. An added complexity was the need to ensure that underground construction works near Bras Basah did not affect the integrity of three existing MRT lines - the Circle Line, North East Line and North South Line.

A notable engineering feat by both Er. Tan and Er. Lee included the removal of the embankments and temporary diversion of the Singapore River for two years to facilitate the construction of MRT tunnels running from Chinatown to Fort Canning. They also used a 3D modelling and analysis of the historical National Museum's existing foundations to ensure that the construction works would not have an impact on its structure.

The Design and Engineering Safety Excellence Awards are part of the annual BCA Awards, which were given out on 22 May 2018 at the Resorts World Sentosa, Singapore. A record total of 540 awards were presented by BCA this year, which recognise excellence achieved by firms in all facets of the building sector – development work, architecture, engineering, design and construction. ■

This year's BCA Design and Engineering Safety Excellence Awards were given out on 22 May, during the annual BCA Awards ceremony that was held at the Resorts World Sentosa, Singapore.

transformation areas. The Taskforce recommends the updating of IHLs' curricula with enhanced core modules, new electives and supplementary curricula, e.g. learning journeys, project site visits or sharing sessions on the key transformation areas. This will be supported by TACs, industry firms and iBuildSG, which can provide training resources to make the curriculum more relevant to industry's needs.

Secondly, the Taskforce recommends enhancing internship by moving towards six- month structured internships with pre-defined learning outcomes and good industry mentorship. Relevant guidelines are being developed to help firms with lesser experience in structured internships. The Taskforce is also looking into pre-internship engagement with students, which aims to inspire them to take up built environment careers and impart knowledge on the key areas of transformation. With such enhancement, students can look forward to more enriching internship experience in the built environment sector.

Thirdly, to give students early exposure to real work settings where collaboration across disciplines is paramount, the Taskforce also recommends IHLs to offer inter-disciplinary projects and competitions, supported by the TACs. This gives students from various disciplines (e.g. architecture, engineering, quantity surveying, etc) an opportunity to come together and work as a project team to create more innovative solutions, just as they would in real-life projects.

Existing workforce in the sector can look forward to a stronger collaboration between IHLs, BCA and TACs for CET provision. The Taskforce also recommends the professional boards (Professional Engineers Board and Board of Architects) to infuse transformation areas into pre-registration training. ■

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ABOVE AND BELOW: **The BCA Awards ceremony also saw the launch of the logo for BuildSG, a new office that was set up to drive the implementation of Singapore's Construction ITM (Industry Transformation Map) strategies in collaboration with tripartite partners.**

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CHANGI AIRPORT TERMINAL 4

CATEGORY: INSTITUTIONAL & INDUSTRIAL

Qualified Person: Er. Lai Huen Poh

C&S Consultant: RSP Architects Planners & Engineers (Pte) Ltd

Builder: Takenaka Corporation

Developer: Changi Airport Group (Singapore) Pte Ltd

Architectural Consultant: SAA Architects Pte Ltd

Challenges:

• A tight design and construction schedule. Five blocks of buildings and airport facilities were to be constructed within 37 months.

• Complex roof designs to achieve a spatial and column-free environment, including a 60 m large-span roof structure at the departure check-in counter area, an 18.5 m large-span cantilever roof at the departure kerbside, and massive transfer trusses at the arrival immigration hall.

• A total of 21 fixed gangway structures are located within airside with live aircraft parking stands, and they have to meet strict requirements and airside operational needs.

Solutions and Features:

• Incorporated the Building Information Modelling (BIM) technology and prefabricated volumetric design and construction.

• Adopted a full precast system approach with mechanical beam shoe connectors. Precast beams and planks were designed for both temporary and permanent stage loads to eliminate the need for 9-m-high scaffoldings and props.

• The use of repetitive simple plane-frame steel roof trusses with a secondary beam system enabled quick and easy off-site prefabrication and erection. The addition of 'knee braces' between trusses at roof level provided the lateral restraint for continuous truss bottom chord in compression at column supports.

• Implemented an innovative and game-changing 'hat-first' construction method.

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THE WAVE

CATEGORY: INSTITUTIONAL & INDUSTRIAL

Qualified Person: Er. Teh Hee Seang

C&S Consultant: T.Y. Lin International Pte Ltd

Builder: B19 Technologies Pte Ltd

Developer: Nanyang Technological University

Architectural Consultant: Sembcorp Architects & Engineers Pte Ltd / Toyo Ito & Associates, Architects

Challenges:

• Singapore's first large-scale mass engineered timber (MET) building.

• Huge timber arched roof that spans 72 m is amongst the world's longest span of its kind.

• Familiarity with design codes for engineered timber products.

Solutions and Features:

• Incorporated the innovative and sustainable glulam and cross-laminated timber (CLT) which has high strength-to-weight ratio.

• Choice of three-pin arched roof beams enabled construction without scaffolding and in a short period. This resulted in a safe and fast construction method.

• Simplicity for construction due to a high level of prefabrication and minimum waste, as the timbers were precision cut at a factory and delivered to site.

• Implemented a systematic and coordinated approach to research and gained an understanding of the fundamental technical characteristic and behaviour of timber, plus consultations with the regulating agencies and technical committee to achieve safe and acceptable design solutions.

DOWNTOWN LINE 3 CONTRACT 937 FORT CANNING STATION AND ASSOCIATED TUNNELS

CATEGORY: CIVIL ENGINEERING

© Arup

Qualified Person: Er. Tan Yoong Heng / Er. Cheryl Lee Zi Du

C&S Consultant: Arup Singapore Pte Ltd

Builder: GS Engineering & Construction Corporation

Developer: Land Transport Authority

Architectural Consultant: Aedas Pte Ltd

Challenges:

• Contract 937 - Fort Canning station and associated tunnels was constructed within a very dense and congested urban network, and avoiding impact to it was critical to the project's success.

• The key challenges included the temporary diversion of the Singapore River, tunnel construction overcrossing/undercrossing of existing MRT lines at minimal clearances; and tunnelling in very close proximity to numerous existing underground structures.

Solutions and Features:

• An innovative, first-of-its kind temporary diversion of the Singapore River was designed to facilitate removal of all underground obstructions well in advance, so as to reduce construction risk during tunnelling works.

• As opposed to creating standalone structures for cripple sidings on a separate land parcel, Arup developed an innovative and cost-effective solution by locating them within the station box. This overcomes space constraints in a congested area, and avoided the need for extensive construction within Fort Canning Park.

• Value engineering resulted in the design of a shallower station, which translated into enhancing the overall safety and productivity of the project.

• A stringent tunnelling regime applying tight volume loss controls and real-time monitoring was implemented during tunnel construction.

TANJONG PAGAR CENTRE

CATEGORY: COMMERCIAL

© Ying Yi

Qualified Person: Er. Chia Wah Kam / Er. Jason Tan Bok Leng

C&S Consultant: Arup Singapore Pte Ltd

Builder: Samsung C&T Corporation Singapore

Developer: GuocoLand Group

Architectural Consultant: Skidmore, Owings & Merrill LLP / Architects 61 Pte Ltd

Challenges:

• Tanjong Pagar Centre, one of the tallest buildings in Singapore, is a vibrant mixed-use development that stands at 290 m.

• The development sits on a congested site bounded by a few roads, the busy Tanjong Pagar MRT station and a number of other historic shophouses.

• The tall, slender and inclined building geometry exerts opposing forces at different levels, posing unique engineering challenges.

Solutions and Features:

• A top-down construction approach was adopted so that the progress of superstructures was advanced within a robust design of temporary supports and sequence of works. This allowed the optimisation of basement construction, which translated to time and cost savings.

• To work around the challenge of space constraints, steel was adopted for the office podium and basement structures - an unusual but practical solution to achieve speed and ease of construction.

• Pre-setting was done to take into account the building's movement, overcoming the inclined building geometry.

• At the upper levels where the building transits from office to residential space, an innovative transfer and belt-truss system was designed to achieve stability of the overall tower structure.

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