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CONSTRUCTION
SEPTEMBER - OCTOBER 2019

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Construction of Clement Canopy residential project in Singapore
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ISSN 2345-7082
9 772345 708002

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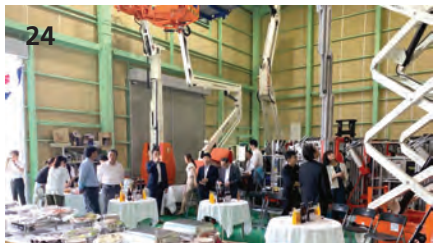

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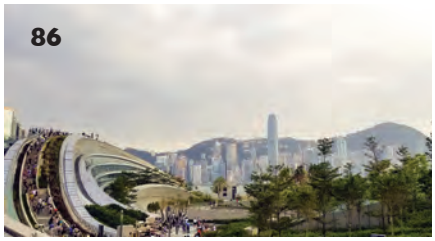

SOUTHEAST ASIA CONSTRUCTION is published six times a year by:

Trade Link Media Pte Ltd. RCB Registration no: 199204277K
Address: 101 Lorong 23, #06-04 Prosper House, Singapore 388399
Tel: +65 6842 2580, Fax: +65 6842 2581 /+65 6745 9517
Website: http://seac.tradelinkmedia.biz
Email: info@tradelinkmedia.com.sg

The magazine is available free-of-charge to applicants in the building and construction industries who meet the publication's terms of control. For those applicants who do not qualify for free subscription, copies will be made available, subject to the acceptance by the publisher, of a subscription fee which varies according to the country of residence of the potential subscriber. Airmail (per year): Singapore - S$45; Malaysia and Brunei - S$90; Rest of Asia - S$140; Japan, Australia, New Zealand, Middle East, Europe and USA - S$170 (Incl. 7% GST Reg: M2-0108708-2).

Printed in Singapore by Refine Printing Pte Ltd.
MCI (P) 043/06/2019 • ISSN 2345-7082 (Print) and ISSN 2345-7090 (E-Periodical) • KDN No: 1560 (1271)-(6)

INTERNATIONAL SALES OFFICE:
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Hong Kong's Heung Yuen Wai Highway opens for traffic

The Heung Yuen Wai Highway in Hong Kong has recently opened to the public. This major transport infrastructure project aims to promote the development of the Greater Bay Area through enhanced connectivity for passengers and cargos alike. It features an approximately 11-km dual two-lane carriageway linking the Fanling Highway and the Heung Yuen Wai Boundary Control Point.

The Heung Yuen Wai Highway is comprised of about 4.8-km Lung Shan Tunnel, 0.7-km Cheung Shan Tunnel, and a 4.5-km viaduct and 1-km at-grade roads. Atkins has been supporting Dragages Hong Kong Limited as the detailed design consultant for the major design and build project of the Lung Shan Tunnel section since 2013.

"The project is unique and represents many firsts for tunnelling in Hong Kong. Innovative design and close collaboration were key to the success of the record-setting project," said Ray Chan, Atkins' project manager.

The 4.8-km Lung Shan Tunnel is said to be the longest twin-tube road tunnel in Hong Kong. The project also engaged the largest EPB (earth pressure balance) TBM (tunnel boring machine) in Hong Kong, with a diameter of 14.1 m.

Following the breakthrough of the southbound tunnel section on 1 March 2017, the TBM went on to complete a 180-degree U-turn to start the construction of the northbound section just three months later. This 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.

LEFT AND BELOW:
The 4.8-km Lung Shan Tunnel is part of the newly opened Heung Yuen Wai Highway. It is said to be the longest twin-tube road tunnel in Hong Kong.

According to Atkins, the TBM U-turn operation allowed the construction progress to remain in line with the tight project programme, reducing construction costs and environmental impact.

The project's innovative approach for Hong Kong's first application of TBM U-turning method in underground rock caverns was recognised by the ACEHK Annual Award 2018. The ACEHK Annual Award honours projects that prove to be the epitome of engineering excellence, incorporate ingenuity, and take considerable measures to ensure sustainability. ■

Keppel Land and Phu Long to develop residential projects in HCMC

Singapore-based developer Keppel Land Limited, through its wholly-owned subsidiary Monestine Pte Ltd, has entered into an agreement with Vietnamese developer Phu Long Real Estate Corporation to acquire a 60% interest in three land parcels spanning 6.2 ha in Nha Be district, Saigon South, Ho Chi Minh City (HCMC), Vietnam.

The three sites are situated within 400 m of each other, along the Nguyen Huu Tho arterial thoroughfare. Here, both partners plan to develop a total of about 2,400 premium apartments with ancillary shophouses, which will offer around 14,650 sq m of commercial space. The total development cost for the project, inclusive of land cost, is expected to be in excess of VND 7,400 billion.

The project will be built in three phases, according to the partners. Phase One, comprising about 910 apartments and some shophouses, is scheduled to commence in the first quarter of 2020, after the relevant approvals have been obtained.

"The agreement signed between Phu Long and Keppel Land marks a great start for our strategic cooperation, which will help build more timeless construction projects and contribute to Vietnam's modern urban development," said Phung Chu Cuong, CEO of Phu Long Corporation. ■

The agreement was signed between Linson Lim (seated-right), president (Vietnam) of Keppel Land and Phung Chu Cuong (seated-left), CEO of Phu Long.

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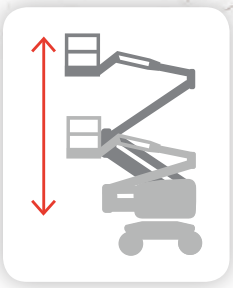

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Surbana Jurong joins Nongsa Digital Economy Hub

The upcoming Nongsa Digital Economy Hub in Batam, Indonesia, is jointly undertaken by two of Indonesian leading developers, Sinar Mas Land and Citramas Group. Surbana Jurong has been selected by the joint venture as the masterplanner for the project.

The new hub is envisioned to be a digital bridge between Indonesia and Singapore, to attract start-ups, local and international companies undertaking digital-related activities to set up in Indonesia. It is strategically located in the Nongsa district, about 30 minutes from Singapore by ferry and 15 minutes from the Hang Nadim international airport.

Surbana Jurong's work includes the development of a concept masterplan of the hub that occupies a total area of 62 ha, comprising an Eco Digital Project, the Nuvasa Bay Town Centre, and the Nongsa Digital Park (NDP). The consultancy scope covers urban design and architectural conceptualisation.

With technology and creative industries as key drivers of Indonesia's economy, the digital economy hub in Nongsa is expected to contribute directly to strengthening Indonesia's tech and innovation talent pool, job creation and revolving door commerce. It also offers Singapore-based companies opportunities to work with local Indonesian talent and grow their tech businesses, leveraging on complementary strengths.

Mike Wiluan, president director of Sinar Mas Land – Citramas Group JV said, "The appointment of Surbana Jurong as our masterplanner is another step in a forward-looking journey that both Citramas and Sinar Mas have been committed to since our tie-up last year. With this appointment, we are able to eloquently materialise our long-term vision to turn Nongsa into a next-generation destination, in tune with the region's emerging prowess in digital commerce, creativity and connectivity.

"Starting with NDP, the vision of a larger ecosystem will incorporate all aspects of work, live and play with a focus towards Indonesia and Singapore's combined strategy of developing mutual and complimentary digital economy sectors. Batam is a gateway between Singapore and Indonesia. The NDP and its surrounding real estate aim to be the launch pad for both country's growth needs and market expansion."

Wong Heang Fine, group CEO of Surbana Jurong commented, "Our strong track record in developing masterplans for projects in over 30 countries enables us to understand and meet the requirements of Nongsa development. For this project, we are pleased that our creative vision aligns well with the desired market positioning which the JV has. We look forward to delivering well to this project, which is expected to further transform Nongsa into a vibrant and sustainable economic and cultural business hub."

Dr Beh Swan Gin, chairman of Singapore Economic Development Board (EDB) added, "A well-designed masterplan plays an important role in attracting investors, businesses, workers, residents and visitors. With its vast experience and expertise, Surbana Jurong will be able to contribute to the development of Nongsa as an exciting work-live-play location that is only 30 minutes away by ferry from Singapore.

"This project will complement the NDP, which was launched in March 2018 by Singapore's Minister for Foreign Affairs Dr Vivian Balakrishnan and Indonesia's Minister of Foreign Affairs Retno Marsudi. We will work with Sinar Mas Land and Citramas Group to grow Nongsa into a vibrant digital hub that will serve as a digital bridge between Indonesia and Singapore." ■

An artist impression of the aerial view of the concept masterplan of the entire Nongsa Digital Economy Hub. Surbana Jurong is the masterplanner for the development.

The key executives at the signing ceremony included: Mike Wiluan (seated - left), president director of Sinar Mas Land - Citramas Group JV; Michael Widjaja (standing - centre), group CEO of Sinar Mas Land; Wong Heang Fine, group CEO of Surbana Jurong (standing - far right); and Dr Beh Swan Gin (standing - 2nd from right), chairman of Singapore EDB.

Hunton Andrews Kurth to play role in Cambodian expressway project

Hunton Andrews Kurth has been commissioned as lead transaction counsel to China Road and Bridge Corporation (CRBC) in a US$1.8 billion public-private partnership (PPP) development of a 190-km expressway in Cambodia.

CRBC closed financing on the deal with the Cambodian government on 31 May 2019. The project is said to be one of the largest PPP motorway infrastructure projects to reach financial close in 2019. It will link Cambodia's capital Phnom Penh to Sihanoukville. Construction is anticipated to take four years to complete.

Hunton Andrews Kurth has experience across the entire range of contractual arrangements for PPP projects. The company has represented project lenders, investors, developers, sponsors and governments throughout Africa, Asia, Latin America and the US on PPP transactions and other project matters for more than 20 years. It has also worked extensively with governments and their parastatals, using financing and other programmes provided by the World Bank and other governmental, multinational, multilateral and bilateral export credit, risk insurance and lending agencies. ■

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Vietnam's Ninh Thuan solar power project completed

Sunseap International has commissioned one of Vietnam's largest solar farms, having completed construction of the project ahead of schedule. It was jointly developed with InfraCo Asia - an infrastructure development and investment company of the Private Infrastructure Development Group (PIDG) - and is majority owned by Sunseap.

The plant in Ninh Thuan province, on the south-central coast of Vietnam, will generate 168 MegaWatt-peak (MWp) of solar energy, enough to power approximately 192,000 homes and reduce carbon emissions by about 240,000 t/yr.

"Developing the Ninh Thuan solar power plant in partnership with Sunseap supports InfraCo Asia's aim to serve as a catalyst for future infrastructure development in the countries and sectors in which we work," said Allard Nooy, CEO of InfraCo Asia. "We hope this project will serve as a benchmark for future investors, demonstrating the commercial viability, development impact, and environmental benefits that can be achieved."

Construction of the solar farm has reportedly created employment opportunities for more than 2,000 local workers, benefitting Vietnamese communities economically. Sunseap and InfraCo Asia said they have also contributed VND 3 billion as part of the Corporate Social Responsibility (CSR) initiative, which funded the construction of concrete roads surrounding the site along Phu Thuan Hamlet and Tan My Hamlet, My Son Commune, Ninh Son District. The roads, which feature more than 2 km long, help improve connectivity for the province, especially for the local farmers who rely on the roads to transport their agricultural produce. ■

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An aerial view of the completed solar farm in Ninh Thuan province.

Rolls-Royce and Yuchai Machinery expand collaboration

Rolls-Royce Power Systems and its Chinese partner Guangxi Yuchai Machinery Company have signed an agreement to further intensify their collaboration in the construction and sale of engines.

The two companies are already partnering closely in their joint venture MTU Yuchai Power, which was founded in 2017 and manufactures MTU S4000 diesel engines in the southern Chinese city of Yulin. The joint venture has been manufacturing MTU engines for power generation applications in the Chinese market since 2018.

"The successes we have had so far are a good basis for working together to develop further areas of collaboration for the benefit of all involved," said Tobias Ostermaier, president for Greater China at Rolls-Royce Power Systems.

"In Rolls-Royce Power Systems, we are happy to have found a globally successful partner and a technology leader. Combining this with the local market knowledge and production capability of Yuchai Machinery is an ideal way to address the future together," said Yan Ping, chairman of Yuchai Machinery. ■

Rolls-Royce Power Systems and its Chinese partner Yuchai Machinery are extending their collaboration in the construction and sale of engines.

Vinci secures contract for City Rail Link project in Auckland

The Link Alliance, which includes Vinci Construction subsidiaries - Vinci Construction Grands Projets (main contractor) and Soletanche Bachy International - along with their partner Downer and designers AECOM, WSP-Opus and Tonkin & Taylor, has signed the Design-Construction Alliance contract for Package 3 of the City Rail Link project in Auckland, New Zealand.

The NZ$1.658 million contract is for the design and construction of 3.45-km-long extension of a train line, including a 3.2-km-long tunnel, to link the existing Britomart station to the existing Mount Eden station. Along that line, three new stations will be built, two of which are underground. The tunnels will be made using an earth pressure tunnel boring machine (TBM) with a diameter of 7.18 m.

The signed contract is an 'Alliance' type, meaning the designer-constructor consortium and the client, City Rail Link Limited, can create a single and integrated team to deliver the project to Auckland residents in 2024.

Totalling NZ$4.419 billion, the City Rail Link project is expected to double the number of people who can reach downtown Auckland in under 30 minutes. This new train line has been designed to accommodate 54,000 passengers per hour at peak travel times, which is the equivalent of two double four-lane motorways. ■

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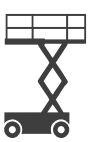

Lendlease announces US$1 bil data centre partnership

Lendlease has announced a partnership to invest in data centres across Asia Pacific – it will be funded 20% by Lendlease and 80% by a large institutional investor. The company did not mention the name of the institutional investor. The initial equity commitment by both parties is US$500 million, but combined with leverage will enable the partnership to invest US$1 billion in the sector.

Completed assets and new development opportunities will be targeted across Australia, China, Japan, Malaysia and Singapore – all markets in which Lendlease has significant presence. The company said the commencement of the partnership is currently subject to the relevant regulatory approvals.

Lendlease's integrated capability across development, construction and investment is well placed to execute on the significant growth forecast for the data centre sector. Accordingly, the company has been appointed as development, construction, property and investment manager for the partnership.

"A data centre platform is a strategic fit for the group, aligning with our targeted key trend of infrastructure, our telecommunications strategy and our integrated business model. This partnership will enable us to leverage our track record of project managing, designing and building data centres with the strong growth potential for this sector, which is evolving into a mainstream real estate asset class," said Tony Lombardo, Lendlease's CEO for Asia. ■

Goldhofer receives new orders from Taiwan

Taiwanese company Chi Deh Crane Engineering Co Ltd has ordered an FTV 550 blade transport device from Goldhofer, and the delivery is expected to take place soon this year.

The wind power industry is reportedly growing in Taiwan, and thus demand for logistics services for wind parks and turbines has increased significantly. With the Goldhofer FTV 550, Chi Deh will be able to perform its rotor blade transport operations efficiently, sending them to the most remote locations without any problems.

Headquartered in Hsinchu City, Chi Deh has been a Goldhofer customer since 2000. The company's fleet currently consists of mechanically steered PST/SL self-propelled vehicles, modular THP/SL heavy-duty systems and electronically steered PST/SL-E self-propelled vehicles.

Apart from the FTV 550 blade transport device, Chi Deh's latest additions include another 16 axle lines of the electronically steered PST/SL-E and three SPZ-GP flatbed semitrailers with pendular axles.

Furthermore, Sea & Land Integrated Corp has added 28 Goldhofer PST/SL-E axle lines to its fleet. The company said the vehicles will be used to transport heavy and outsized plant components for the energy industry and oil refineries.

"In view of the continuing high level of demand for construction site logistics, we have decided to order additional vehicles from Goldhofer for handling ultra-heavy loads," said Charlie Chien, vice president of Sea & Land Integrated Corp.

Based in New Taipei City, Sea & Land Integrated Corp offers integrated services for container and heavy-duty transportation by land and sea, as well as warehousing and engineering services for companies all over the world. ■

LEFT: **Mr Hu, chairman of Chi Deh, standing in front of Goldhofer FTV 550 on show at bauma 2019.**

BELOW: **Sea & Land Integrated Corp has ordered Goldhofer PST/SL-E axle lines to transport heavy and outsized plant components.**

Dragages wins contract for Airport Authority HK office tower

Dragages Hong Kong has been awarded an office tower development contract by the Airport Authority Hong Kong. The HKD 793,888,000 project will house a new office tower for the Airport Authority Hong Kong and Aviation Security Company Limited (AVSECO).

The contract involves the design and construction of a seven-storey office tower, featuring an approximately 23,000 sq m construction floor area. It will provide users with a highly collaborative, open and spacious work environment combined with smart office equipment and breakout areas that promote efficiency, communication and well-being.

The building will sit on the current taxi staging area between the Airport Express Line and Airport Car Park 4. The proximity of the busy airport and the railway tracks would require an excellent project management to prevent impact to the airport operation, train service and the taxi-staging area, while adhering to stringent airport height restriction. The project is scheduled for completion in 2022. ■

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Haulotte Australia builds new headquarters

Work on Haulotte's new headquarters in Australia began in June and it is scheduled for completion in November 2019. The facility will be located in Dandenong South, about 30 minutes from Melbourne, offering 550 sq m of office space, 3,000 sq m of warehouse and 5,300 sq m of container hardstand.

"The new building will offer larger inventory. It will allow the subsidiary to better cater to its clients' logistical demands," said Keith Clarke, general manager of Haulotte Australia. The company will be able to deliver MEWPs and telehandlers all over Australia and New Zealand more quickly. A large repair workshop will also enable Haulotte technical experts to provide complete diagnostics, and perform heavy repairs or machines refurbishments on site.

"Australia is key to our worldwide growth strategy. We celebrate 20 years in Australia, and we look forward to the next 20 years of success in our new sales and service subsidiary," said Alexandre Saubot, CEO of Haulotte Group. ■

FROM LEFT: **Keith Clarke, general manager of Haulotte Australia; Alexandre Saubot, CEO of Haulotte Group; and Damien Gautier, managing director of Haulotte Asia Pacific.**

More orders in Southeast Asia for Haulotte

Singapore-based company Avanz Asia has ordered more than 20 Haulotte machines comprising articulating booms, telescopic booms and scissor lifts. For this order, Haulotte Singapore will deliver a large amount of RTJ machines, including the HA16 RTJ, HA20 RTJ, HA26 RTJ O, HT23 RTJ O and HT28 RTJ O.

Haulotte's RTJ range of articulating and telescopic booms is designed to work in highly restrictive environments and tackle demanding projects. The RTJ booms incorporate the latest innovations to offer the safest solutions on the market for working at heights, increase the productivity of construction sites and optimise the uptime of the machines.

In the Philippines, Haulotte Singapore has also delivered its HA20 RTJ to Siemens Power Operations. Designed to operate on any surface, even on the roughest terrain, this diesel articulating boom can work in very confined areas thanks to its compact architecture. With excellent lifting speed and fully proportional and simultaneous movements, the HA20 RTJ is known for its great productivity and optimal safety. Haulotte's partner in the Philippines is Wilan Merchandising Philippines Incorporated. ■

Avanz Asia in Singapore has put an order for more than 20 Haulotte machines.

A Haulotte HA20 RTJ has been delivered to Siemens Power Operations in the Philippines.

Swiss Re appoints head of engineering & construction for Asia Pacific

Swiss Re Corporate Solutions has appointed Patrice Nigon (left) as its head of engineering & construction (E&C) in Asia Pacific (APAC), effective immediately. He succeeds Andre Martin, who became head of innovative risk solutions APAC.

Swiss Re Corporate Solutions provides risk transfer solutions to large and mid-sized corporations around the world. The company serves clients from over 50 offices worldwide and is backed by the financial strength of the Swiss Re Group.

In his new role, Mr Nigon will oversee the company's engineering and construction business, offering traditional insurance products and innovative parametric solutions that span the entire construction project lifecycle from financing to operation. He will lead the regional team of E&C underwriters based in Australia, China, Japan, Hong Kong and Singapore.

Mr Nigon has 13 years of experience at Swiss Re, initially as a senior products specialist and later as the head of product centre engineering. Before joining Swiss Re, he worked as a senior engineering underwriter, a risk engineer, a loss adjuster for industrial business, and as a technical project manager. Mr Nigon has worked in Hong Kong, Paris and Zurich, and as of 1 December 2019, he will relocate from Hong Kong to Singapore. ■

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Aurecon promotes Gabe Carter to lead Vietnam business

Aurecon has appointed Gabe Carter (left) as its general director and country manager of Vietnam. He will continue to drive market share growth and deliver strong financial performance for the company's local office.

Mr Carter will also be responsible for building the reputation of Aurecon inside Vietnam as well as developing operations at the company's offshoring centre, which serves projects globally. He will oversee both client-facing work and timely project deliveries while still being accountable for business and people management.

Mr Carter joined Aurecon in 2003 and after rising through the ranks, he relocated to Vietnam in 2016 to take on the role of built environment leader. He is a chartered member of the Institution of Engineers Australia with over 17 years of experience in the construction industry.

Mr Carter has been heavily involved in major projects, assuming both leadership and technical roles. Most recently, he served as project leader for Aurecon's work on Vincom Landmark 81 in Ho Chi Minh City – Southeast Asia's tallest skyscraper.

"Over the past three years, it has been very exciting to work in Vietnam's vibrant built environment sector," said Mr Carter. "Developers and owners here are demanding innovative and cutting-edge solutions for their projects and this is developing a unique identity for Vietnam." ■

Nanshan Technology Finance City completed

The completion ceremony of the Nanshan Technology Finance City in Shenzhen, China, was recently held. The masterplan, including the entire complex of buildings, was designed by Foster + Partners. The development is at the centre of the Shenzhen High-Tech Industrial Park (SHIP), Shenzhen Bay Park, one of the six key national science parks in China. It is located along the eastern entrance to SHIP on Shen Nan Avenue, featuring various facilities such as offices, a hotel, shops, restaurants and a range of civic spaces. ■

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The newly completed Nanshan Technology Finance City is located at the Shenzhen High-Tech Industrial Park.

JP Nelson gets major order for Sunward drilling rigs

JP Nelson recently delivered a total of six brand new Sunward SWDM280 rotary drilling rigs to foundation contractors in Singapore, to be used in local construction projects. The machines offer a maximum torque of 300 kNm and are equipped with a high-speed spin-off system. Their main winch's maximum line pull is 280 kN. There are also cylinder and crowd winch features on the SWDM280A model.

According to JP Nelson, although the market condition is currently tough, the company still receives demand for such drilling rigs. "By understanding our customers' requirements better, we could come up with an ideal solution for them, even during difficult periods," said Harry Yong, general manager of JP Nelson Equipment Pte Ltd.

"The SWDM280 drilling rig is a popular range, which is versatile for both soil and rock conditions without compromising reliability," added Mr Yong.

JP Nelson provides a holistic range of machinery for both the construction and foundation sectors, including cranes, vibratory hammers, diaphragm wall grabs, ground improvement machinery as well as general machinery. ■

ABOVE AND RIGHT: **Sunward SWDM280 rotary drilling rigs have recently been delivered to foundation contractors in Singapore.**

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Ahern Japan opens new Osaka branch

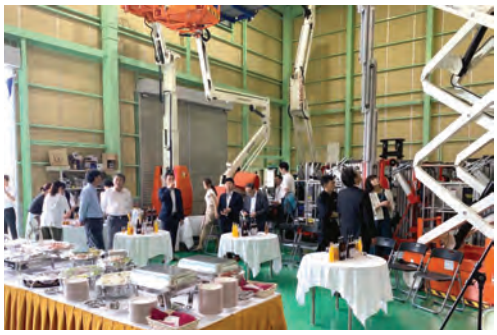
Ahern Japan, part of the Ahern International division owned by Don Ahern, has relocated to a new branch in Osaka. The 500 sq m facility is more than double the size of the original branch, which was located a few minutes' drive away.

The new branch will support Ahern's business as the company grows its presence in the region, enabling it to hold larger stocks of new machines and spare parts, as well as an expanded workshop for pre-delivery inspections and equipment repairs and rebuilds.

Ahern Japan was founded in 2000 and currently has three locations - in Tokyo, Yokohama and Osaka. Formerly known as Snorkel Japan, it was rebranded as Ahern Japan in 2014. The company, led by Masashi Sakuma, has built a strong reputation for the sales, service and support of Snorkel lifts and Instant UpRight scaffolding products, and earlier this year, became the exclusive provider of Ruthmann Bluelift tracked spider lifts in Japan.

"It gives me great pleasure to open this fantastic brand-new facility, which is representative of our long-term commitment to our customers and provides a custom-built environment for our valued team. This really sets the stage for how we plan to support this market in future, and I wish Masashi and the team continued success," said Matthew Elvin, CEO of Snorkel.

"This is a significant and exciting development for Ahern Japan, which will enable us to meet the growing demand in this region for high reach equipment in the long-term, and ensure we have the products and spare parts in stock locally to win reactive business," said Masashi Sakuma, managing director of Ahern Japan.



ABOVE: **Ahern Japan's new branch in Osaka features more than double the size of the original facility.**

LEFT: **The company recently held the grand opening of the new branch.**

Snorkel strengthens sales efforts in EMEA

Snorkel has promoted Andrew Fishburn (left) to the newly created role of vice president of strategic accounts EMEA.

Mr Fishburn joined Snorkel in 2016, bringing significant industry experience to his role as divisional managing director for Snorkel UK. Prior to joining the company, he worked with JLG, as well as providing sales training and consultancy services.

In the past three years, Mr Fishburn has successfully developed Snorkel UK to be a leading provider of both Snorkel lifts and Ruthmann Bluelift tracked spider lifts for the UK and Ireland. This laid a solid foundation for the opening of Ahern Ireland, a dedicated sales, service and parts facility supporting Northern Ireland and the Republic of Ireland.

In his new role, Mr Fishburn will be responsible for managing strategic accounts within the Europe, Middle East and Africa (EMEA) region, reporting directly to the CEO, Mr Elvin. This will include both cultivating existing relationships, and identifying and developing new business opportunities through the implementation of a long-term, commercial strategy, to drive the future growth of the business.

"The strategic accounts position in EMEA is the next important step in ensuring our long-term success in this region. It is designed to be complimentary to the roles of our existing EMEA territory managers and distributors, and will focus on maximising our relationships with multi-national accounts," said Mr Elvin.

Mr Fishburn commences his new position with immediate effect, however he will retain oversight for the Snorkel UK and Ahern Ireland divisions. ■

AECOM wins contract for Saudi Arabia's Neom Bay megaproject

AECOM has been awarded a multi-year contract to provide project management consultancy (PMC) services for Phase 1 of Neom Bay, a US$500 billion megaproject being developed in Saudi Arabia.

AECOM's scope will include project management, contract administration, technical and environmental support services, and site supervision over the entire design and construction phases of the project.

Located in the northwestern part of Saudi Arabia, at the intersection with Jordan and Egypt, Neom Bay will be a special economic zone and diverse society offering world-class education, healthcare and culture for a new way of living. Once complete, Phase 1 will span a 45-sq-km area and comprise several thousand residential units, leisure, retail, commercial, public and entertainment facilities with supporting infrastructure and utilities. ■

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Kobelco celebrates 10,000th hydraulic excavator in India

Kobelco Construction Equipment India Pvt Ltd (KCEI), a subsidiary of Kobelco Construction Machinery Co Ltd (KCM), recently rolled out its 10,000th hydraulic excavator. The company is headquartered in Noida Uttar Pradesh, with its factory located at the Sri City Industrial Park, 75 km north of Chennai in Andhra Pradesh.

"We are very proud that we succeeded in manufacturing 10,000 hydraulic excavators in less than 10 years in India. Our goal for the next 10 years is to be a top-class factory among all Kobelco factories in terms of safety, quality and productivity," said Koji Nakagawa, president of KCEI.

KCEI provides sales and services of construction machinery in India, Nepal and Bangladesh. The company manufactures 14- to 50-t-class hydraulic excavators as well as 5- to 260-t-class crawler cranes. Its local factory commenced the operation in January 2011, in anticipation of growth in demand in India.

KCEI's initial production capacity was two units per day, and now it has increased to 10 units per day. While the company is currently working on improving its capacity to 12 units per day, the accumulated number of excavators manufactured at the factory has already reached 10,000.

The demand for hydraulic excavators in India has reportedly continued to increase due to the country's economic growth and infrastructure progress. According to KCM, its sales of hydraulic excavators in India have also been rising and the demand in the market is expected to remain strong. ■

ABOVE AND LEFT: **Kobelco Construction Equipment India celebrates its 10,000th hydraulic excavator, produced locally at its factory.**

Last section of Gebze-Orhangazi-Izmir motorway in Turkey inaugurated

The last section of Gebze-Orhangazi-Izmir motorway in Turkey is now open. The project involves the construction of 426 km motorway using the BOT (Build - Operate - Transfer) scheme, with an operation period of 21 years.

Awarded by the Turkish Ministry of Transport and Infrastructure to the Otoyol AŞ joint venture comprising Astaldi and four Turkish companies (Nurol, Özaltin, Makyol and Göçay), the project lasted for 6.5 years and it was completed 10 months ahead of schedule.

The work was divided into separate lots and carried out in phases: Phase 1 (53 km) was open to traffic in July 2016; Phase 2-A (25 km) has been operational since March 2017; Phase 2-B was open to traffic partly in December 2018 (69 km) and partly in March 2019 (54 km); and the last section was recently inaugurated.

The new motorway plays an important role in freight traffic between the capital Istanbul and Izmir. It allows the travelling time between Gebze (near Istanbul) and Izmir (on the Aegean coast) to be halved, from eight hours to 3.5 hours. ■

The last section of Gebze-Orhangazi-Izmir motorway is now operational.

Timor-Leste starts Baucau–Venilale–Viqueque road upgrade

Work on upgrading the 58 km of the Baucau–Venilale–Viqueque road corridor in Timor-Leste has begun, supported by the Asian Development Bank (ADB). "The Government of Timor-Leste received a loan of US$44 million from ADB for the purpose of rehabilitating and maintaining the national roads in Timor-Leste. Rehabilitation and maintenance of these two road sections will generate employment opportunities to communities. Almost 26,500 households and their adjacent sub-districts and villages will benefit directly and indirectly from this improvement of the roads," said Timor-Leste's Public Works Minister, Salvador Eugenio Soares dos Reis Pires. "The new roads will also provide better access to markets and economic services. Therefore, the project is important and a high priority for the Government of Timor-Leste."

Scheduled for completion in 2022, the Baucau–Viqueque Highway Project will boost Timor-Leste's economic activities, reduce travel times and open access to markets, schools and clinics. It is also making the roads safer and more resilient to the effects of climate change. ■

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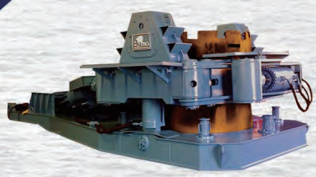

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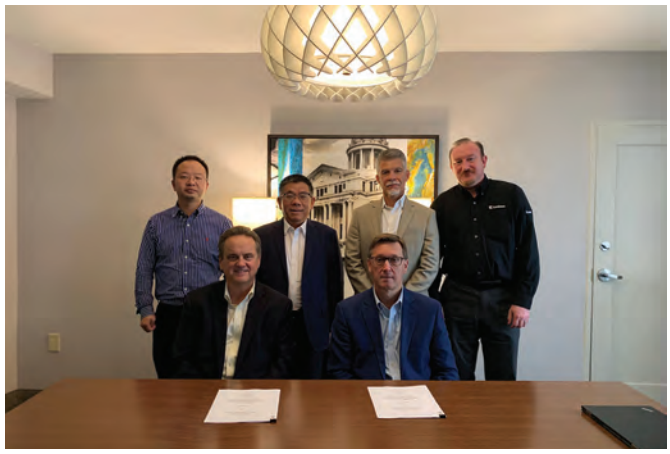
LiuGong and Valvoline establish global alliance

LiuGong and Valvoline have signed a Memorandum of Understanding (MoU) for a strategic global alliance for lubricants. Under the agreement, Valvoline will become the preferred provider of lubricants for markets outside of China.

"Today's announcement with industry leader Valvoline is another step in our mission to provide complete solutions to our customers. And Valvoline is the perfect partner to help us realise this long-term ambition," said Zeng Guang'an, chairman of Guangxi LiuGong Group and Guangxi LiuGong Machinery.

"Construction equipment customers consistently tell us that they want the lowest total cost of ownership. LiuGong already offers a very competitive machine acquisition cost. The Valvoline partnership enhances the ability of LiuGong and our dealers to keep machines running as well as extend the useful life," said Kevin Thieneman, LiuGong's vice president of strategy and aftermarket.

Based in the US, Valvoline Inc is a leading worldwide marketer and supplier of premium branded lubricants and automotive services, with sales in more than 140 countries. "We've established a strong relationship with LiuGong in many markets. We are looking forward to expanding this relationship and delivering solutions to LiuGong and their customers as they further expand their business globally," said Craig Moughler, senior vice president of product supply and OEM at Valvoline. ■



LiuGong and Valvoline have signed an agreement for a strategic global alliance for lubricants.

Rokla acquires Hartl Crusher

German rotary cutter manufacturer Rokla GmbH, which operates under the Rockwheel brand, has acquired Austrian crusher and screening bucket specialist Hartl Engineering & Marketing GmbH - commonly known as Hartl Crusher. The deal, which became effective on 27 June 2019, includes the use of the Hartl brand, inventory and intellectual property. No redundancies are expected as a result of this announcement, and the Hartl family's Modular Solutions Division is not included in the deal.

Hartl Engineering & Marketing GmbH was established in 2011, building on a long history of the Hartl family name in the crushing sector. Under Rokla ownership, Hartl is aimed to remain an agile, entrepreneurial brand. Rokla said it will make available its considerable competences and add resources to allow Hartl Crusher to expand its market coverage and customer base.

Hartl Crusher was founded by brothers Dominik and Alexander Hartl, and quickly established itself worldwide as a leading manufacturer of crusher and screening buckets. Supplying customers in nearly 70 countries, the product range is based on many years of experience and innovations, including the Quattro movement.

Alexander Hartl explained the rationale behind the decision to exit the attachment segment as freeing up resources to concentrate on the family's expanding Xelectrix energy storage brand.

FROM LEFT: **Rokla's Klaus Volkert and Robert Piasecki with Hartl Crusher's Dominik Hartl and Alexander Hartl.**

"With Rokla we have found the ideal buyer. It is a dynamic and owner-driven company that is a market leader in its respective segment. We are confident that Rokla will help deliver Hartl further success, benefiting customers, distributors and suppliers alike," commented Dominik Hartl.

Based in Langenburg, Germany, Rokla has been manufacturing and marketing rotary cutters under the Rockwheel brand since 2013. The company has also been ranked among the fastest growing construction equipment companies in Germany.

Rockwheel rotary cutter (left) and Hartl crusher bucket (below).

"The market for Hartl's product offering has developed well in recent years and this acquisition promises to further strengthen Rokla's position as a leading supplier of excavator attachments," said Robert Piasecki, managing partner of Rokla. "Rockwheel and Hartl products are particularly complimentary, making the rationale behind the deal even more compelling for customers."

Rokla co-owner, Klaus Volkert added, "The focus on innovation, high-quality standards and the uncompromising use of first-class components in Hartl products correspond exactly to our own philosophy. We are particularly pleased to be able to build on this solid foundation." ■

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Volvo CE makes big investments for sustainable future

Volvo Construction Equipment (Volvo CE) has announced SEK 16 million investments at its Eskilstuna site in Sweden, including an arena for customer demonstrations of electric and autonomous machines, a new R&D test track and an energy recovery system for the factory.

Firstly, Volvo CE will add an extra 12 ha to its existing 45 ha demo ground at the Customer Centre, specifically for testing of its electric and autonomous machines as well as for demonstrating current machine offerings. The SEK 8 million investment in the innovation arena will enable the company to show the prototype machines to its customers in a realistic and challenging environment in complete safety, supported by 5G technology and with charging infrastructure installed on site. Volvo CE said the first phase of constructing the nearly 2 km gravel road, which runs in both open and closed forest terrain, will start in the near future.

As Volvo CE transitions to more fossil-free alternatives, the existing fleet of combustion engine machines at the Eskilstuna Customer Centre will be running on HVO (hydro-treated vegetable oils). An alternative to diesel, HVO is made from vegetable and animal fats (typically rapeseed oil or abattoir waste) and reduces CO_2 emissions by up to 90% depending on the raw material. No special modifications to the engines are required, according to the company.

Another development is over at the Technology Centre, where Volvo CE is investing in an electromobility and automation test track for R&D purposes. The SEK 3 million track currently hosts the HX2 electric and autonomous load carriers that were tested last year in the Electric Site project in a quarry outside of Gothenburg, Sweden. The machines are now being optimised to be ready for the first commercial pilot, which is due to start before the end of 2019.

In March this year, telecommunications company Ericsson installed a 5G mast at the Technology Centre so that Volvo CE could test remote-controlled machines with extremely short response times. This was believed to be Sweden's first 5G network for industrial use, launched in partnership with operator Telia.

Other recent developments at the Technology Centre include the opening of four new test rigs at the beginning of 2017, three of which are dedicated to the early stages of software development for electric machines.

Meanwhile at the axle and transmission factory, Volvo CE's focus is on reducing energy consumption to support the company's overall sustainability goals. The two greatest sources of energy consumption at the plant are the 'hardening centre', where machine parts are heated to a high temperature and then cooled to ensure a strong surface and a long life, and the 'paint shop', where components are heated so the paint dries.

The company has invested SEK 5 million in an energy recovery system that will conserve around 60% of the heat generated in the hardening centre and transfer it to paint shop. It is estimated that the system will decrease overall energy consumption in the factory by 4%.

Work began on installing the energy recovery system in April 2019 and is expected to be completed by the beginning of September. Volvo CE said it will continue to investigate new processes for the painting process to further reduce energy consumption.

"These excellent examples from the Eskilstuna site are part of our roadmap towards becoming a carbon neutral and landfill-free site," said Anne Bast, vice president of corporate communications, who is responsible for driving sustainability strategy in EMEA (Europe, Middle East and Africa). "It is in our power to continue to push the boundaries of innovative and sustainable solutions for a better tomorrow. This makes good business sense for us and our customers because these solutions improve efficiency and uptime, while reducing cost – but it's also the single most important mission we have for the future of our planet." ■

LEFT: **Aerial view of the existing demo ground at the Customer Centre in Eskilstuna. Volvo CE will add an extra 12 ha to this area.**

BELOW: **The HX2 electric and autonomous load carrier on the new Eskilstuna R&D test track.**

ABOVE LEFT: **At the axle and transmission factory, Volvo CE has invested in an energy recovery system that will conserve around 60% of the heat generated in the hardening centre (pictured) and transfer it to paint shop.**

LEFT: **Aerial view of the axle and transmission factory, where Volvo CE will focus on reducing energy consumption to support the company's overall sustainability goals.**

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Tadano completes acquisition of Demag

Tadano Ltd recently completed its US$215 million acquisition of Demag mobile cranes business from Terex Cranes. This transaction brings together two of the major players in the lifting equipment industry.

As a subsidiary of Tadano Group, the Demag mobile cranes business' legal entity name will be changed to Tadano Demag GmbH in the coming weeks. It will be led by Jens Ennen, who has been named CEO of the company.

"The Tadano Group's strategy is to become the global leader in the lifting equipment industry and the premier choice with our customers. The Demag mobile cranes acquisition is one vital step toward achieving that goal," said Koichi Tadano, president and CEO of Tadano Ltd. "It expands our penetration into many markets throughout the world, adds lattice boom crawler cranes to our overall product line, and enhances the capacity range of our all terrain cranes. By working together, we can better respond to our customers' needs and give them greater added value than ever before."

In addition to technological and manufacturing excellence, Demag mobile cranes give Tadano one of the most complete ranges of lifting equipment solutions available from a single manufacturer. It expands the product line with eight lattice boom crawler crane models with lift capacities from 400 to 3,200 t. Also, Demag's 15 all terrain crane models enhance Tadano's maximum lift capacity in-segment to 1,200 t.

Upon acquisition, Tadano's total lifting equipment line now includes more than 80 models, including rough terrain cranes, all terrain cranes, lattice and telescopic boom crawler cranes, truck cranes, and more.

In seeking to lead the industry, Tadano will build synergy with the Demag line to increase efficiencies and drive innovation. Tadano plans to unite and further enhance the strengths of Demag and Tadano Faun GmbH (TFG), a pillar of the Tadano Group since 1990. With highly complementary offerings between the two brands' all terrain product lines, Tadano Ltd is able to leverage tremendous synergies throughout the value chain.

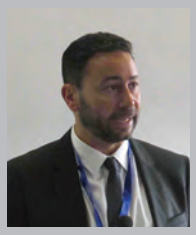
"Demag's dedicated stakeholders, including customers, distributors and suppliers, among others, infuse the company with great value. As our journey with Demag begins, our most immediate goal is ensuring 'Business as Usual' for current Demag customers," said Mr Tadano. "We are committed to a seamless transition that allows these stakeholders to continue with their important business smoothly and successfully, while we continue on with the Tadano Group vision of 'Pursuing Further Excellence for the World and Future." ■

FAR LEFT: **Demag mobile cranes business is now part of Tadano Group.**

LEFT: **Jens Ennen has been named CEO of Tadano Demag GmbH.**

BELOW: **Demag CC 2800-2 lattice boom crawler crane.**

Steve Filipov leaves Terex Cranes



Following the completion of the sale of Demag mobile cranes business to Tadano Ltd, Terex Corporation confirmed that Steve Filipov (left) has left his role as president of Terex Cranes and also left the company, as of 1 August 2019.

"We are grateful to Steve for leading this transition," said John L. Garrison, Jr, chairman, president and CEO of Terex Corporation. "Steve kept the business on course through the transfer and helped ensure that virtually all of the affected team members had the opportunity to stay with the Demag mobile cranes business after the transaction."

The rest of the businesses within the Terex Cranes segment have successfully transitioned within the company: Terex Utilities is now part of the Aerial Work Platforms segment; Franna pick-and-carry cranes in Australia are part of the Materials Processing segment; and the tower and rough terrain cranes businesses in Italy are part of corporate.

Mr Filipov worked for Terex for nearly 25 years, and in that time he positively influenced virtually every part of the business. He started with PPM Cranes in France, served as president of Terex Cranes twice, led developing markets and strategic accounts, and was president of Material Handling and Port Solutions (MHPS).

"I am grateful to Terex for giving me the opportunity to continually do new and exciting things," said Mr Filipov. "I am looking forward to the road ahead – for myself, for my colleagues who will become part of the Tadano organisation, and for everyone at Terex. I believe Terex is well positioned for a bright future." ■

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Sennebogen invests in new customer service centre

Sennebogen is investing over €25 million in a new customer service centre near Straubing, Germany. It is expected to be completed by the end of 2020, occupying 87,000 sq m of site that consists of two office buildings, spacious halls and a spare parts warehouse.

Upon completion, all of the company's services comprising spare parts, customer service and Sennebogen Vertriebs GmbH & Co KG (SVG) will be located in the new facility. SVG is responsible for global rental and used machine business as well as direct sales of material handlers and telescopic loaders.

The new customer service centre is situated at the intersection of A3 motorway and B20 federal highway, offering easy accessibility. Its new warehouse will have space for 5,300 pallets and 37,400 small parts containers, built with advanced automation technology to optimise logistics processes.

Sennebogen's current customer service centre will move from its location in Straubinger Hebbelstraße to the new facility, along with around 100 jobs. In the medium term, another 50 jobs are expected to be created in the new facility including qualified specialists, particularly agricultural and construction machinery mechanics as well as technicians and engineers. ■

ABOVE: **Sennebogen's new customer service centre is located at the intersection of A3 motorway and B20 federal highway, Germany.**

LEFT: **Erich and Walter Sennebogen, managing directors of Sennebogen.**

Dingli strengthens partnerships with Platform Basket and Magni

Chinese manufacturer Zhejiang Dingli and Italian manufacturer Platform Basket have signed a cooperation agreement that sees Dingli become the exclusive distributor of Platform Basket spider lifts in China. This partnership has reinforced Dingli's position as one of the leading aerial platform suppliers in the Chinese market.

Platform Basket, founded in 2005, specialises in the design, development, manufacture and sales of spider lifts covering working heights from 13.4 to 43.18 m. By collaborating with Dingli, the company is now able to serve the needs of the Chinese market.

In 2016, Dingli also became the exclusive distributor of Magni in China; the Italian manufacturer is well known for its telescopic handlers. Dingli has acquired 20% shares in Magni and as a result, Dingli European (Italy) R&D centre was established. Since then, the design teams from the two companies have been working together. Such an effort has enhanced Dingli's design capability, which eventually led to the launch of its new boom lift series. It also helps Dingli enter the European market.

To deepen its collaborations with Platform Basket and Magni, Dingli recently led a team of 15 Chinese rental companies (customers) to visit the facilities of both Italian manufacturers. In the future, Dingli will continue to strengthen its cooperation with Platform Basket and Magni not only through Dingli European (Italy) R&D centre, but also with the development of more high quality, intelligent aerial platforms. ■

Xu Shugen (right), chairman of Dingli and Riccardo Magni, founder of Magni.

LEFT: **Dingli recently led a delegation of Chinese customers to visit Platform Basket's factory.**

BELOW: **The Chinese delegation also visited Magni's factory.**

BOTTOM: **Various boom lifts from Dingli. The company also serves as the exclusive distributor of Platform Basket and Magni in China.**

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New president and CEO for Astec Industries

Astec Industries has appointed Barry Ruffalo (left) as its president and chief executive officer (CEO), starting from 12 August 2019. Richard Dorris, currently interim CEO, will then resume his role as chief operating officer.

Mr Ruffalo has also been elected to the board of directors, joining as a Class I director and will stand for re-election at the company's 2020 annual meeting.

Prior to his appointment, Mr Ruffalo worked for Valmont Industries - a diversified global producer of highly engineered fabricated metal products - where he served in group president roles since 2016, having previously joined as its executive vice president for operational excellence beginning in 2015. Before that, Mr Ruffalo was with Lindsay Corporation, a global leader in proprietary water management and road infrastructure products and services.

"After a comprehensive search that included a number of highly qualified candidates, we are excited to hire Mr Ruffalo," said Bill Gehl, chairman of Astec. "Barry brings a wealth of experience to Astec. He is a leader that has driven change, understands infrastructure and will add tremendous value."

"I am excited to join Astec as its CEO and a member of the board of directors," said Mr Ruffalo. "I look forward to moving forward with measures to make Astec more profitable and agile while building on the strength of its world-class products."

Astec is a manufacturer of specialised equipment for asphalt road building; aggregate processing; diversified industrial applications and concrete production. The company's manufacturing operations are divided into three primary business segments: road building, specialised industrial products and related equipment (Infrastructure Group); aggregate processing and mining equipment (Aggregate and Mining Group); and equipment for the extraction and production of fuels, commercial and industrial burners, concrete production and water drilling equipment (Energy Group). ■

Björn Rosengren to leave Sandvik

Sandvik has announced that its president and CEO, Björn Rosengren, will resign and leave the company as of 1 February 2020. In a separate statement, Switzerland-based ABB has appointed Mr Rosengren as its new CEO, joining the company on 1 February 2020.

"This has not been an easy decision. Sandvik is a great company with a lot of future potential and I will continue to lead the organisation with a strong commitment until end of January," said Mr Rosengren.

"Björn Rosengren has, since he joined Sandvik in November 2015, established a solid decentralised business model for the company and made the organisation more flexible and efficient. The board is very grateful for his and all the employees' work during these years. We will initiate the process to assign a very experienced and competent industrial leader that can succeed Björn in the role as president and CEO and continue to develop the company even further," said Johan Molin, chairman of the board for Sandvik. ■

Björn Rosengren.

Kobe Steel establishes European headquarters

Kobe Steel has established its European headquarters, Kobelco Europe GmbH (KEU), located in Munich, Germany. It is led by Tsuyoshi Uesugi - the company's managing director - and employees about 15 staff.

KEU has grown out of an existing company, Kobelco Machinery Europe GmbH (KME), which was founded in 2012 as a base for Kobe Steel's machinery business in Europe, mainly the marketing of non-standard compressors and tyre and rubber machinery. KEU plans to continue the business activities of KME, while strengthening the management of Kobe Steel's operations in Europe, starting with corporate governance and compliance.

KEU aims to enhance the coordination among Kobe Steel Group companies in the region. Thanks to good access, KEU will also be responsible for the Group's locations in the Middle East.

Kobe Steel began to expand into Europe in the 1960s and now has 10 locations in five countries. In recent years, the Group has been accelerating business development in the region. Its subsidiary Kobelco Construction Machinery Co Ltd re-entered Europe after it ended its alliance in 2012 with the former CNH Global NV (currently CNH Industrial NV) and subsequently established a base in the Netherlands in 2013. In its machinery business, Kobe Steel acquired Sweden's Quintus Technologies AB, a world leader in isostatic presses, in April 2017 and turned it into a wholly owned subsidiary.

With the formation of KEU, Kobe Steel has now established headquarters in major regions where it conducts business. The regional headquarters further promote business development by providing support to the Group companies in their respective regions. ■

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Date	Events in Asia	Organiser & Contact
18 to 20 Sept 2019	Cambuild 2019 Diamond Island Exhibition & Convention Centre Phnom Penh Cambodia	AMB Tarsus Events Group Tel: +855 023 901 579 Email: somaly@ambtarsus.com Website: www.cambuildexpo.com
29 to 31 Oct 2019	MBAM OneBuild 2019 Kuala Lumpur Convention Centre Kuala Lumpur Malaysia	MBAM OneBuild Sdn Bhd Tel: +603 7981 0288 Email: info@mbamonebuild.com Website: www.mbamonebuild.com
6 to 8 Nov 2019	Konstruksi Indonesia 2019 Jakarta International Expo - Kemayoran Jakarta Indonesia	Tarsus Indonesia Email: sales@constructionindonesia.com Website: www.constructionindonesia.com
28 to 30 Nov 2019	Myanbuild 2019 Myanmar Expo Hall Yangon Myanmar	AMB Tarsus Events Group Tel: +959 2503 71296 Email: ei@ambtarsus.com Website: www.myanbuild.net
11 to 13 Dec 2019	World of Concrete Asia 2019 Shanghai New International Expo Centre Shanghai China	Informa Exhibitions Tel: +86 21 6157 7250 Email: info@wocasia.com Website: www.wocasia.com
11 to 13 Mar 2020	BuildTech Asia 2020 Singapore Expo Singapore	Sphere Exhibits Tel: +65 6319 4035 Email: buildtechasia@sph.com.sg Website: www.buildtechasia.com
18 to 22 Mar 2020	Worldbex 2020 World Trade Center Metro Manila Manila The Philippines	Worldbex Services International Tel: +632 656 9239, Fax: +632 477 1899 Email: inquire@worldbexevents.com Website: www.worldbex.com
19 to 22 Mar 2020	Megabuild 2020 Jakarta Convention Centre Jakarta Indonesia	PT. Reed Panorama Exhibitions Tel: +62 2556 5000 Email: megabuild@reedpanorama.com Website: www.megabuild.co.id
3 to 6 Nov 2020	bauma Conexpo India 2020 Huda Grounds Gurgaon, Haryana, New Delhi India	Messe München Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bcindia.com Website: www.bcindia.com
24 to 27 Nov 2020	bauma China 2020 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
Date	**Events outside Asia**	**Organiser & Contact**
4 to 7 Feb 2020	World of Concrete 2020 Las Vegas Convention Centre Las Vegas, Nevada USA	Informa Exhibitions Tel: +1 972 536 6368 Email: contactus@worldofconcrete.com Website: www.worldofconcrete.com
10 to 14 Mar 2020	Conexpo-Con/Agg 2020 Las Vegas Convention Centre Las Vegas, Nevada USA	Association of Equipment Manufacturers Tel: +1 414 274 0644 Website: www.conexpoconagg.com *(email enquiries should be made online.)*
26 to 29 May 2020	Bauma CTT Russia Crocus Expo International Exhibition Centre Moscow Russia	Messe München Tel: +49 89 949 20251 Email: info@bauma-ctt.com Website: www.bauma-ctt.ru/en

Note: *The show organisers may change the dates of the event or postpone/cancel it without prior notice, so readers are advised to visit the show websites regularly for the latest information.*

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Bentley's Year in Infrastructure returns to Singapore

Bentley Systems will host its Year in Infrastructure (YII) 2019 Conference and awards ceremony at the Marina Bay Sands Expo and Convention Centre in Singapore. Taking place from 21 to 24 October, the event will be themed 'Advancing BIM through Digital Twins.'

The YII Conference is an annual global gathering of leading executives of infrastructure design, construction and operations focused on best practices and technologies for going digital. This year, it is expected to have nearly 100 speakers and more than 150 informative sessions, including keynotes by leading industry experts, user success stories, interactive workshops, panel discussions and technology demonstrations.

One of the guest keynote speakers will be Dr Ayesha Khanna, co-founder and CEO of ADDO AI, an artificial intelligence (AI) advisory firm headquartered in Singapore. She has been a strategic advisor on AI, smart cities and fintech to clients including SMRT, SOMPO and Smart Dubai.

Another guest keynote speakers will be Keith Clarke, chairman of the board for UK-based Forum for the Future. He is a chartered architect with more than 40 years of experience in construction and engineering and was formerly the chief executive of the global engineering and design consultancy firm, Atkins. Mr Clarke is a non-executive director for Sirius Minerals plc, chair of Future Cities Catapult and Tidal Lagoon Power plc, vice president of the Institute of Civil Engineers, and patron of the Environmental Industries Commission at Oxford.

Attendees will also hear from other industry thought leaders and learn about technologies and best practices that are shaping the future of infrastructure delivery and operations. Speakers from Bentley's strategic partner organisations, such as Microsoft, Siemens and Topcon, will participate in technology demonstrations, presentations and discussions on numerous topics.

New to this year's conference is Accelerate sessions led by Bentley's application experts. With more than 20 topics, the sessions give infrastructure experts exclusive insights into how their organisations can master the latest enhancements and key capabilities of Bentley applications to help drive efficiency through multidiscipline workflows.

In addition, attendees will learn best practices through Academies Day sessions led by industry experts. There are six sessions: digital advancement, construction, constructioneering, research, reality modelling and process industries. The academies team will also conduct live, interactive sessions in the Technology Pavilion throughout the conference.

ABOVE: **Winners of Bentley's 2018 YII Awards.**

LEFT: **This year, the YII event will be held at the Marina Bay Sands in Singapore for the second time.**

Along with the YII Conference, the 2019 finalists in Bentley's YII Awards programme will present their projects during industry-focused forums: Buildings and Campuses, Digital Cities, Industrial Infrastructure, Rail and Transit, Roads and Bridges, and Energy and Water Utilities. Winners will be announced at an awards ceremony at the conclusion of the conference.

"Singapore is a leader in innovative use of technology for the delivery and operations of infrastructure and was named a Smart City in 2018, so it is a fitting and inspirational location to host an event that explores the innovations and best practices of technology use for outstanding infrastructure projects around the world," said Chris Barron, chief communications officer for Bentley Systems. This will be the second time the event is held in Asia - the first one was in 2017, also in Singapore. ■

Website: yii.bentley.com

Inaugural HK Construction Innovation Expo to be held in December

The inaugural Construction Innovation Expo (CIExpo) in Hong Kong is planned to take place from 17 to 20 December 2019 at the Hong Kong Convention and Exhibition Centre, bringing together professionals, products and innovations in the industry.

Featuring four key themes - offsite construction, mechanised construction, digital construction, and advanced materials and technologies - the CIExpo is expected to draw over 8,000 visitors and more than 100 exhibitors, with the objective of promoting innovative and advanced construction design methods, devices, processes, materials, systems and applications.

There will also be conferences with topics on Design for Manufacture and Assembly (DfMA), Robotics and Automation, Building Information Modelling (BIM), and Modular Integrated Construction (MIC), as well as construction technical tours.

The event is jointly organised by the Development Bureau of the Hong Kong Government, Centre of Science and Technology Industrial Development, Ministry of Housing and Urban-Rural Development of China, and Hong Kong Construction Industry Council (CIC).

During the CIExpo, the CIC Construction Innovation Award 2019 presentation ceremony will be held on 18 December, along with technical seminars. The awards are focused on three main areas: safety, productivity and sustainability. ■

Website: www.cic.hk

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Caterpillar seeking 'the best operator' globally

Caterpillar has launched its 2019/2020 Global Operator Challenge competition, where operators will test their skills against those of fellow operators around the world to determine who can claim the title of 'best'.

In each stage of the competition, operators will be challenged to test their agility, mental toughness and versatility, as well as their competence in using integrated technology to enhance machine performance, such as Cat Production Measurement and Cat Grade systems.

"We hope the Global Operator Challenge will attract more individuals to join our industry," said Jessica Nunley, global marketing innovations manager for Caterpillar Global Construction and Infrastructure division. "This competition will also highlight the Cat Next Generation machines that are transforming jobsites by increasing productivity to new levels, providing a new experience of comfort, and ease of operation through technology."

Thailand competes

In Asia, Metro Thailand has successfully completed the Caterpillar Global Operator Challenge Thailand National Finals on 6 July 2019 in Bangkok, comprising 12 finalists. Held in conjunction with Metro Thailand's annual roadshows, the qualifying events were staged in six different locations across the country from end-May to July.

All operators had to compete in a trenching challenge using the Next Generation 320 hydraulic excavator, where they had to use Grade 2D to dig a trench. The operators were scored based on speed and accuracy.

The Operator Challenge events in Indonesia took place from 11 July to 15 August, and in the Philippines on 23 August and 10 September. The top three winners from Thailand, Indonesia and the Philippines will participate in regional semi-final competition - held in Japan between 19 and 21 November 2019 - against other challengers from Japan and China.

The winners in each regional semi-final will then take part in the global finals representing Asia Pacific, which will be hosted at Conexpo-Con/Agg in Las Vegas, USA, in March 2020. The crowned champion will be awarded an all-expense, VIP trip for two to a global Caterpillar facility of his or her choice. ■

Website: www.cat.com/operatorchallenge-sea

ALL IMAGES: **Metro Thailand has recently completed the Caterpillar Global Operator Challenge, comprising 12 finalists.**

IADC seminar on dredging and reclamation comes to Asia

For the first time, the International Association of Dredging Companies (IADC) will organise its international seminar on dredging and reclamation in Asia. It will take place at the Radisson Mumbai Andheri MIDC Hotel in Mumbai, India, from 26 to 28 November 2019.

The seminar is designed for all professionals in the dredging and related industry, such as government and port authorities, offshore companies and dredging contractors. The in-depth lectures will be given by dredging experts from IADC member companies.

Among the subjects covered will include: the development of new ports and maintenance of existing ports; project development: from preparation to realisation; descriptions of types of dredging equipment; costing of projects; site and soil investigations; types of dredging projects; and environmental aspects of dredging.

At the end of the seminar, each participant will receive a Certificate of Achievement in recognition of the completion of the coursework - but full attendance is required to attain the certificate. With such an event, IADC aims to educate and encourage the younger generation to enter the field of dredging, as well as to improve knowledge about dredging throughout the world. ■

Website: www.iadc-dredging.com

BeyondX – digital technology showcase

Singapore-based company Ong&Ong recently held its digital technology event, BeyondX, designed for the architectural, engineering and construction (AEC) industry. Featuring leading experts in the field of digital design, it took place on 11 July 2019 attracting over 500 delegates.

BeyondX showcased how the built environment is improved through the harnessing of artificial intelligence (AI), 3D-printed structures, and immersive reality technologies for transformational growth. Attendees were encouraged to embrace an agile mindset and adopt disruptive technologies, so as to bring about innovative changes for the AEC industry.

Trinity Methodist Church and Bedok Public Library were among several projects in Singapore cited as developments that were designed using new technologies, ensuring greater levels of sustainability and efficiencies across their construction process.

Speakers including Adriel Sim from URA DCG, Patrick Janssen from NUS (National University of Singapore) and Felix Raspall from SUTD, AIRLAB (Architectural Intelligence Research Lab at the Singapore University of Technology and Design) introduced an array of future-forward solutions, such as 3D technologies, computational design and digital fabrication respectively. ■

Website: www.beyondx.digital

ABOVE AND LEFT:
The BeyondX digital technology event is designed for the architectural, engineering and construction (AEC) industry.

IPAF Asia conference makes successful return to China

More than 300 delegates attended the IPAF Asia Conference and Showcase, held on 17 and 18 July 2019 in Hangzhou, China. Safety, efficiency, recognising and servicing customer needs and harnessing the power of technology were among the main conference themes.

The event drew attendees from across Asia and further afield to hear a strong line-up of speakers, with Andy Studdert, IPAF's interim CEO and managing director, opening the conference with the question "is a safe company a more profitable company?" The answer was "yes – the aim for everyone should be that their employees go home safely every time."

Jiro Noguchi, general manager of Nishio Rent All and director of North Fork Group Australia, looked at operating a rental business from Japan to the rest of the world. In 1997 the company shifted focus to smaller end-users over large construction firms, and had to relearn, understand and respect the culture of all of their customers in doing so.

Lewis Wu, director of marketing, strategy & product management for Asia at JLG, said customers aren't satisfied with the status quo; they want to do things quickly and technology like its app-controlled mobile elevating work platform (MEWP) is helping deliver this. Tech such as augmented reality (AR) or connected machines, including ones that read IPAF's smart PAL Card, also help make MEWPs more efficient.

Robin Dai, senior service manager of Terex (Changzhou) Machinery Co Ltd, also talked about the need to enhance customer service and machine maintenance, while Jason Zhang Zhi, CEO of Rongfeng Software & Technology, agreed that as a company's fleet grows, good management becomes more difficult. Mr Zhang said, "You need to begin adopting good principles with a small rental fleet; don't wait until your fleet expands."

The first round-table discussion featured second-generation industry leaders, namely Johnson Lai, sales & marketing manager at Keng Guan Skylift; Shawn Ong, COO of Galmon; Taewan Kim, digital strategist/manager at Woolim International; and Xu Zhong, deputy sales director of Zhejiang Dingli.

Bai Ri, IPAF's China representative, opened the afternoon programme. "When you sell or rent machines, safety is the most important aspect," he said. "As a rental company in China you need to make sure the customer knows that safety is important to you." He also gave a brief overview of the new ANSI A92 standards in the US and what they will mean for Chinese manufacturers, equipment buyers and operators.

Ángel Ibáñez, IPAF's global representative for MCWP and related products, said that operators often believe that once a machine is installed, nothing can go wrong; but this is incorrect. He noted that a lack of operator training and education is at the root of why people put themselves into risky situations or cause equipment breakdown.

Geoffrey Lee, director/general manager of Modern (International) Access & Scaffolding, shared his 25 years of industry experience. He said he thinks a boss should be visionary, and needs to give staff the leeway to do their job. Vicki Hall, director technical solutions of Trojan Battery Company, said that choosing a battery is about defining the customers' needs, with knowing what's available in the market and an understanding of technological innovation also key. On the theme of aligning the supply chain to suit a company's strategy, Xu Ziqi, general manager

of TVH China, said it is important to utilise good stock management and an efficient ordering process.

The final round table discussion saw four MEWP rental pioneers, including Kwankamol Duangjun, CEO and founder of Fivebond; Alex Tan, founder of Aerial Global; Vivi Gu, director of fleet, safety & facilities at Hertz Equipment Rental Corporation (HercRentals); and Dzung Tran, president of the TNC Group of Companies.

The following day (18 July) saw more than 150 people attend an informative guided tour of IPAF member and Asia Conference sponsor, Dingli's manufacturing and assembly plant in Deqing, Zhejiang Province.

The IPAF Asia Conference & Showcase 2020 is scheduled to take place at COEX in Seoul on 8 and 9 July – the first time the event will be held in South Korea. ■

Website: www.ipaf.org/asiaconference

IPAF CEO Tim Whiteman steps down

Tim Whiteman (left) has stepped down from the position of managing director and CEO of IPAF, after 15 years leading the organisation. Former IPAF president Andy Studdert is now acting as interim CEO while the search for a new CEO is underway.

Mr Whiteman was recruited by the IPAF board as managing director in 2004 to help grow the organisation globally. At that time IPAF had around 400 members, most of which were in the UK, and earned 95% of its revenue from the UK.

Today, more than 45% of income is from outside the home market, even though UK income and membership has not stopped growing since 2004. IPAF currently has almost 1,400 members in nearly 70 countries and the organisation is in sound financial health.

"It has been a privilege to work with the dedicated IPAF members and team members around the world – the passion to deliver the safe and effective use of powered access motivates so many people and IPAF shares their knowledge and experience to help keep people safe," said Mr Whiteman. "However, after 15 years, I'm looking forward to a change and I thank the board for its support in making this happen." ■

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OHSSAI backs IPAF call for better MEWP training in India

The OHSSAI has amplified calls from IPAF to increase take-up of comprehensive MEWP operator training in India, to help eradicate unsafe practices such as using ground controls to elevate untrained personnel to carry out work at height.

IPAF analyses accidents involving MEWP equipment worldwide to look for trends and learn from them. This research indicates that all too often the underlying cause of accidents is a manager choosing the wrong type of equipment or asking an operator who is not trained to perform a badly planned job.

Writing in a forthcoming OHSSAI publication to coincide with the organisation's 4th Annual HSE Excellence & Sustainability Awards ceremony on 12 July 2019, Jason Woods, IPAF's Middle East & India representative and a trained IPAF instructor said, "In India we see many MEWP operators using this type of equipment from ground controls with the tradesman lifted at height. This creates a safety issue as the MEWP operator should be in the platform to correctly and safely use the equipment.

"The simplest solution is for all managers and supervisors to undergo basic training on how to properly plan and organise the safe use of MEWPs. And the first thing that any manager or supervisor planning temporary work at height using MEWPs should do is to ensure operatives are correctly trained and familiarised on the machines they will use."

Mr Woods continued, "IPAF offers training in multiple languages to suit the local demand, including in Hindi. At minimum, the operator training lasts a full day, to ensure all the relevant points of theory, health & safety and the practical assessment are carried out correctly. On successful completion of the course, the training candidate is certified on a specific

category of MEWP machine, and the training needs to be renewed every five years.

"Many IPAF training centres also offer a six-hour course called MEWPs for Managers; this doesn't teach people how to use MEWPs, but how to plan and manage their use."

Mr Woods further pointed out that "there are many companies that claim they can certify operatives quickly and cheaply, sometimes taking just hours, to minimise employees' time away from the job. However, this really isn't credible and only runs the risk of serious accidents somewhere down the line, ultimately putting workers' lives in jeopardy.

"When things inevitably do go wrong, the work site grinds to a halt while the accident is investigated, so any supposed time and cost savings are a false economy. This also demonstrates that 'operator error' is usually the manager or supervisor's mistake." ■

Website: www.ipaf.org/courses

IPAF to trial virtual reality advanced operator tests using simulators

After several months of development and fine-tuning, IPAF has recently announced it is ready for 'controlled trials' of its PAL+ advanced operator assessment in a virtual reality (VR) environment using MEWP simulators.

In 2018, IPAF led an industry-wide consultation into this new technology and produced a detailed strategy paper based on the findings. IPAF members worked with IPAF to produce a policy document on how VR systems can be effectively and safely harnessed to train MEWP operators. This resulted in a groundbreaking set of recommendations that are being implemented throughout 2019, the first of which was to integrate IPAF's existing globally-recognised operator training into the VR realm.

In July 2019, IPAF said it would commence controlled trials involving some of its training members to deliver PAL+ training that will test candidates using sophisticated MEWP simulators instead of real machines. The other elements of the PAL+ course, notably the theory module of the course and the pre-use inspection, will be conducted as usual at an approved IPAF training centre.

Giles Councell, IPAF's director of operations explained, "Working with some of our largest training provider members in both Europe and the US, IPAF will now embark on proving trials

testing genuine PAL+ training candidates in the way we would do normally, but with the assessment taking place on a simulator rather than a real-life MEWP. If they pass their assessment using the simulator, they will be issued with their certification to PAL+ as usual, so these are not 'dummy runs'.

"If the trials prove successful we will look to fully develop the IPAF PAL+ course into eLearning and VR by developing a digital version of the theory module and simulated pre-use inspection, to be launched later in the year." ■

Website: www.ipaf.org/XRstrategy

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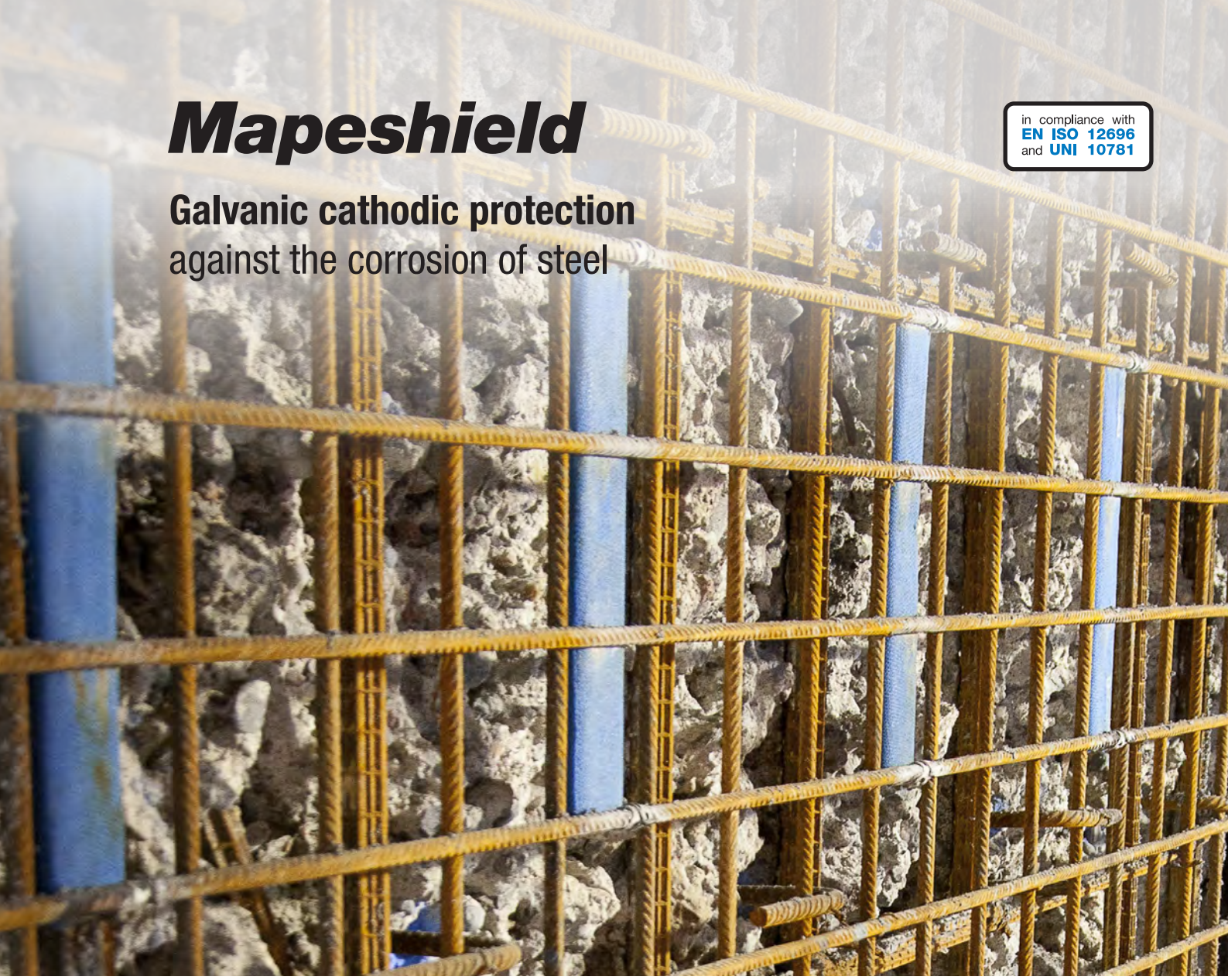

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Vermeer S3 Navigator HDD and MX300 mixing system

The new Vermeer D23x30DR S3 Navigator horizontal directional drill (HDD) incorporates a dual rod technology, allowing it to manoeuvre easily through rock in congested cities, busy neighbourhoods or tight jobsites. Featuring a narrow footprint and a weight of 7,484 kg, the HDD is said to be the lightest rock drill on the market. It is suitable for fibre, electrical, gas and water installation in hard rock, as well as other challenging ground conditions.

The Vermeer Firestick drill rod dual system onboard the D23x30DR S3 reportedly gives operators a 7% downhole steerability. The unit's threaded outer rod has a rotational torque of 4,067.5 Nm, while its hex inner rod delivers up to 1,084.6 Nm. The HDD is equipped with a Deutz TCD3.6L4 diesel engine and a thrust/pullback of 106.8 kN.

New rock tooling for the D23x30DR S3 further enhances the machine's performance and productivity in rocky ground conditions. The Vermeer RH10 drill head provides responsive downhole steering with a two-degree bend located in its forward section. The drill head can be fitted with a 14-cm tricone bit or polycrystalline diamond compact (PDC) bit that is greaseable and can be rebuilt in the field.

Vermeer also offers the new toolless PG5 quick pullback grapple mounted over the top of the RH10 drill head and tricone bit, which reduces the need to remove the drill head after the pilot bore when installing small-diameter pipes.

As part of the Vermeer S3 Navigator HDD series, the new D23x30DR S3 delivers a carriage speed of 53.3 m/min and a rotational speed of 200 rpm. The operator's station combines familiar, convenient-to-use controls with the latest dual rod advancements through the use of controller area network (CAN) technology, which also provides onboard diagnostics and a reduced amount of wiring and fuses. In addition, the D23x30DR S3 has an operator ear noise level of 83 db(A) for a quiet working environment for the crew and the surrounding neighbourhood.

The D23x30DR S3 is Vermeer Fleet-ready and convenient to service. When activated, Vermeer Fleet provides contractors with even more productivity features, including fault recognition, geofencing, fuel usage and more. When it is time to service the machine, a large rear hood offers convenient access to the mud pumps and other service points, while the open-top vice makes it convenient to change out die with rod in vice and have visibility of the joint.

ABOVE: **The D23x30DR S3 Navigator horizontal directional drill features a dual rod technology, allowing it to manoeuvre easily through rock in congested cities, busy neighbourhoods or tight jobsites.**

LEFT: **The MX300 mixing system helps HDD contractors optimise productivity and offers customisable mounting configuration options.**

Another new product from Vermeer is the new MX300 mixing system that features a redesigned, slim rectangular profile tank. It helps HDD contractors optimise productivity and offers customisable mounting configuration options.

Powered by a 23-hp Kohler ECH 7300 EFI gas engine that outputs 1,324.9 lpm of flow, the MX300 mixing system power unit can be paired with up to two tanks at once to decrease time spent mixing and refilling drilling fluid tanks. The unit's narrow rectangular tank design helps maximise fluid volume, and a small footprint enables efficient transporting and storage.

The Vermeer MX300 mixing system is an upgrade to the MX240 model. It can be paired with a 2,839.1 l or 3,785.4 l tank and works with a variety of HDDs. It is fitted with a wide-mouth hopper and suction hose for the convenient pouring of drilling additives.

The tapered bottom of the rectangular tank design prevents additives from settling, building up and assists with efficient drainage. At a width of just 101.6 cm, the MX300 can be mounted to transport two tanks inside a standard-sized enclosed truck.

The MX300 comes with a 60.6-l fuel tank and is convenient to service with access to the roll jets through the top of the tank and two drainage points that are operated by two accessible valves. ■

Website: www.vermeer.com

Snorkel S3019E electric slab scissor lift

The next generation of Snorkel electric slab scissor lift, the S3019E, features a patent-pending design that enables the scissor stack to stow entirely inside the chassis. This sunken scissor stack provides a low step-in height for the operator, which improves the ease of ingress and egress from the platform. It also results in a lower stowed machine height (only 1.76 m), allowing it to be driven through standard doorways without the need for folding guardrails. The unit is already compliant with the upcoming ANSI A.92 standards, which come into effect in December 2019.

New for Snorkel scissor lifts, the S3019E is equipped with both electric drive and electric steer, meaning there are no hydraulic hoses. This eliminates the risk of hydraulic leaks - so the lift is ideal for use in sensitive areas - and improves the duty cycle as there is less energy loss compared to hydraulic driven units.

The Snorkel S3019E can lift up to 250 kg to a maximum platform height of 5.79 m. Measuring just 0.77 m wide, the S3019E is designed with a 0.91 m roll-out extension deck that expands the maximum working area to 0.61 m x 2.6 m. Weighing 1,581 kg, the battery-powered S3019E has non-marking tyres as standard, and is rated for one person plus tools for outdoor use.

The S3019E was initially introduced as a concept at Conexpo-Con/Agg 2017. At bauma in April this year, it was shown as a pre-production unit. Both ANSI and CE compliant versions are available to order, with the model expected to enter US production in the fourth quarter of 2019. ■

Website: www.snorkellifts.com

ABOVE AND BELOW LEFT: **The Snorkel S3019E scissor lift is equipped with both electric drive and electric steer. The machine can lift up to 250 kg to a maximum platform height of 5.79 m.**

Sandvik's new impact crusher and drilling rig

The latest update in Sandvik 2 Series portfolio is the QI442 track mobile impact crusher. The machine features the newly developed CI621 Prisec Impactor, which comes with several innovations for improved efficiency and safety during maintenance, as well as being able to operate in either primary or secondary crushing mode.

Like previous Sandvik Prisec impact crushers, the new CI621 can be configured to work as either a primary or secondary machine, whilst the two hydraulically assisted curtains can be readily adjusted to produce a wide range of high quality product sizes.

The CI621 has further enhancements primarily focused on increased safety during maintenance and serviceability. These include a new rotor position and locking device, new hammer locking wedges for quicker removal and fitting, and a new wedge removal tool to provide safer installation and removal.

The rotor bearings have also been upgraded for easier assembly and clearance setting, apart from an improved sealing system and greater range of adjustment in curtains. This allows greater usage of wear parts and maintains tighter settings in the secondary position.

One of the benefits incorporated into the QI442 is the optional modular hanging screen system. Recently launched on Sandvik mobile cone crushers, this system is interchangeable and offers the flexibility for the crusher to operate in open or closed circuit. The design enables set-up in less than 30 minutes and can be fitted without the use of additional lifting equipment. The hanging screen option delivers multi-functionality as a 1-, 2- or 3-way split screener, as well as a highly productive and efficient impact crusher.

With the double-deck hanging screen, the machine can produce two screened products and recirculate the oversize back into the feed conveyor. The oversize conveyor may be hydraulically rotated for material stockpiling (90 degree) of up to three products on the floor, or removal (180 degree). The tail section can be raised hydraulically to give improved ground clearance for transport when loading or unloading.

The QI442 features Sandvik My Fleet remote monitoring system as standard. My Fleet has been developed to help customers know exactly how their equipment is being utilised. Through the collection and accurate monitoring of a wide array of parameters, this facilitates accurate production forecasting, ensuring that the most efficient use is obtained from equipment.

ABOVE: **Sandvik QI442 track mobile impact crusher.**

LEFT AND BELOW: **Sandvik DD320S underground drilling rig.**

A pre-screen is fitted to ensure maximum scalping capability and to prevent any undersize material passing through the impactor, maximising throughput and reducing wear costs. This also allows a specific sized product to be produced from the natural fines conveyor. The pre-screen has a choice of grizzly or punch plate top deck and mesh bottom, giving the flexibility to suit any application and the underpan feeder drastically reduces spillage generally associated with impact crushers.

In addition, Sandvik's new underground drilling rig - the Sandvik DD320S - is equipped with advanced components such as the THC560 hydraulic drilling controls, B26XLF boom and HLX5 rock drill (20 kW impact power) that will ensure long running hours with minimum downtime. Its carrier components, such as the diesel engine and layout, are similar to the Sandvik DD321 technologies, ensuring common service principles and spare parts across the whole fleet.

The new Sandvik DD320S is designed for robust heavy-duty drilling and bolting applications, optimised for 43 – 64 mm diameter bore holes and 76 – 127 mm reaming holes. It is available with an optional FOPS / ROPS (ISO 3449 / 3471) operator cabin, and comes with ergonomic handrails and anti-slip surface stairs as standard. The platform provides a comfortable drilling control and tramming stations, (optional) movement prevention switch and access detector, as well as a new compressor thermal monitoring system. ■

Website: www.rocktechnology.sandvik

Liebherr LTM 1110-5.1 all-terrain crane

The new 110-t Liebherr LTM 1110-5.1 all-terrain crane features axle loads of 12 t with 13.1 t of ballast, but can also be driven with a gross weight of less than 48 t with a maximum axle load of 10 t. With its maximum ballast of 28.7 t, it remains below an axle load of 15.5 t. A quick-change system for the ballast slabs is available to ensure flexible modifications.

The rear supports of the LTM 1110-5.1 feature a double-stage design and offer a support width of 8.3 m, which is 1.3 m wider than the front supports, increasing the capacity over the rear supports. Liebherr calls the combination of the trapezoidal and variable support base VarioBase Plus.

The five-axle LTM 1110-5.1 has a 60-m-long telescopic boom, with a 10.8- to 19-m folding jib available which, as an option, can be adjusted hydraulically between 0° and 40°. Two 7-m lattice sections can also be installed to extend the telescopic boom to achieve a maximum hook height. As such, the LTM 1110-5.1 features the same system length as the LTM 1130-5.1. A 2.9-m erection jib and a runner, which can be swung to the side, round off the equipment list.

The LTM 1110-5.1 is powered by a six-cylinder Liebherr diesel engine, which develops 400 kW and torque of 2,516 Nm (Stage V). It can also be built to comply with other regulations, for example Tier 4f for the US or stage III for low regulated markets.

High load capacities with a long telescopic boom, plus excellent global mobility, are the main features of the new Liebherr LTM 1110-5.1.

The DynamicPerform version of the ZF TraXon gearbox with an oil-cooled multi-disc clutch is used in the new LTM 1110-5.1. This delivers improved starting and manoeuvring at a level similar to that of a gearbox with a torque converter, said Liebherr. The new LTM 1110-5.1 is also equipped with Eco mode to reduce fuel consumption and noise emissions. ■

Website: www.liebherr.com

Haulotte HTL 3207 compact telehandler

Haulotte's new telescopic material handler, the HTL 3207, is equipped with hydrostatic transmission. It delivers optimal torque, power and speed for excellent driving comfort. The inching pedal allows for smooth and progressive driving to easily approach a structure.

The HTL 3207 offers a maximum lifting capacity of 3.2 t and maximum lifting height of 6.85 m. With a short turning radius and a length of 4.67 m, this new telehandler can operate in narrow spaces. It meets the needs of the construction and industrial sectors where performance and compactness are inextricably linked.

The HTL 3207 is also fitted with a spacious and ergonomic cab for maximum visibility. Because comfort is very important for all-day driving, a fully adjustable seat with shock absorbers help to reduce fatigue at work. The 4-in-1 joystick enables the operator to manage all movements precisely. The controls (including the parking brake button) have been specifically positioned so that they are accessible according to their frequency of use. The load moment indicator includes an automatic cut-off when operating with a tilting risk and an automatic reset in case of dysfunction.

The HTL 3207 can adapt to the ground conditions, allowing the operator to focus on lifting operations in complete safety. Thanks to its 20-in tyres, the machine can easily cross a gap. On worksite mode, speed is limited to 8 km/hr for a higher safety; on road mode, the telehandler runs up to 25 km/hr. Three driving modes assure excellent manoeuvrability in any environment (2 WS, 4 WS or crab steer). The telehandler can be fitted with multiple accessories such as forks, buckets, and so on.

In addition, the HTL 3207 features simple maintenance. The diagnostic tool provides operators with key information about the functioning of the telehandler. A backlit electronic dashboard centralises all information about the operating status of the machine for continuous monitoring. To optimise downtime costs, the engine assembly components are easily accessible. ■

Website: www.haulotte.com

ABOVE AND LEFT: **Haulotte's new HTL 3207 telehandler offers a maximum lifting capacity of 3.2 t and maximum lifting height of 6.85 m.**

Haulotte introduces auto power off system

Haulotte booms equipped with the on-board diagnostic tool Haulotte Activ'Screen Cat.2 will incorporate an auto power off function, which allows the machines to be automatically switched off after four hours of inactivity. Later, the machine and the screen will be able to restart without any difficulty.

Currently when an operator forgets to remove the ignition key from a boom, the machine might still be on and consume energy. It is often impossible to restart the engine after several hours of inactivity.

The new auto power off system offers several benefits. The ignition battery can be preserved, thereby achieving a better performance even in cold weather. Maintenance costs are also reduced, and productivity remains high as there is less downtime.

According to Haulotte, the system will be gradually available as a standard feature on several models (with no additional costs), including the HA16 RTJ, HA20 RTJ, HA20 LE, HA26 RTJ, HT23 RTJ and HT28 RTJ. ■

First Bauer MC duty-cycle crane with electric drive

To meet the demand for environmental sustainability, Bauer has developed an electrically driven cutter based on a Bauer MC 96 duty-cycle crane, which was debuted recently at bauma 2019. This combination is ideal for urban environments, where many strict regulations are now in place with respect to exhaust and noise emissions as well as vibration-free operations.

The 500 kW electric drive is said to offer many advantages compared with diesel drives, especially in relatively stationary specialist foundation engineering applications, such as trench cutting. In these applications, electric drives can deliver excellent savings with high efficiency and low emissions, said Bauer.

The powerful electric drive is fully integrated into the MC unit and enables high system availability. It is designed to adapt to different voltage levels and environmental conditions on the jobsite.

The practicality of the system in inner-city areas is a high priority, stressed Bauer. As such, a patented solution for the external secondary drive of the system has been developed as a useful feature during assembly and disassembly, for example. It ensures fast and easy manoeuvring even on restricted construction sites and works independently of the power supply. Bauer added that even in the event of a power failure, emergency operation of all required loads in the cutter carrier can be easily performed. ■

Website: www.bauer.de

An electrically driven cutter based on a Bauer MC 96 duty-cycle crane made its debut at bauma 2019.

IoT advancements in Thermal Integrity Profiling

Thermal Integrity Profiling (TIP) is a method that has been implemented in drilled shafts and bored piles to offer reliable integrity data for engineers. Shaft excavations have numerous variables to account for, which can impede the installation of a quality concrete pile. Soil inclusions, bad concrete, soil mixing at the bottom, extreme shifting of the reinforcement cage and problems at casting to soil interfaces are just some of the potential issues that might occur. The benefit of using temperature monitoring is being able to detect any abnormalities or major deformities early after casting without having to wait for the information, and this would help speed up the construction process.

The TIP technology from Pile Dynamics Inc provides faster, cost-effective integrity test monitoring. It evaluates the entire cross-section and the entire length of the foundation. The system includes the main unit, Thermal Aggregator Units (TAGs), Thermal Acquisition Ports (TAP Edges), a wire test box and Thermal Wire cables (smart sensing cables fitted with uniformly spaced digital temperature sensors).

The Thermal Wire cables are tied to the rebar cage and cast into the shaft during testing. According to Pile Dynamics, all of the pile can be evaluated by using one Thermal Wire cable sensor every foot along the reinforcing cage, creating a detailed map of data throughout the pile.

The Thermal Wire cables work with TAP Edge to collect data. This data is then transferred from TAP Edge boxes to a TAG unit, sending the data via a cellular modem to the cloud. A TAP Edge or TAG is connected to each Thermal Wire cable and automatically samples data at user selected time intervals, typically every 15 minutes, allowing for real-time data that can be assessed on site or from the office. If an engineer is not on site to review the data, they can quickly access it remotely without holding up the project.

TIP Reporter software displays measured temperatures versus depth, mapped on cross sections of the shaft to provide thermal profiling data. The results of this data include estimated shape of the shaft, the ability to identify regions that are colder than normal, indicating neckings or inclusion, and identifying regions that are warmer than normal indicating bulges. In addition, TIP Reporter estimates the concrete cover along the entire length of the shaft.

The integration of TIP testing and the innovative wireless technology is said to be making strides in the concrete industry, offering faster, more reliable testing methods that save construction time and costs. ■

Website: www.pile.com

ABOVE AND LEFT: **The Thermal Integrity Profiling (TIP) technology from Pile Dynamics provides faster, cost-effective integrity test monitoring. It evaluates the entire cross-section and the entire length of the foundation. The method has been implemented in drilled shafts and bored piles to offer reliable integrity data for engineers.**

ABOVE LEFT: **The TIP system from Pile Dynamics includes the main unit, Thermal Aggregator Units (TAGs), Thermal Acquisition Ports (TAP Edges), a wire test box and Thermal Wire cables (smart sensing cables fitted with uniformly spaced digital temperature sensors).**

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SDLG mini excavators enter Indonesian market

SDLG has introduced two compact excavators for the Indonesian market, the E660FL and E690F. The company recently unveiled the machines at the Grand National Launch held at Senayan Golf Club in Jakarta, attended by customers from across the country.

The 6-t-rated E660FL is powered by a 38.3 kW engine and has a bucket capacity of 0.22 cu m. The machine features a reinforced four-valve structure and multistate air intake filter to provide reliable performance in a wide range of climates and environment.

The 9-t-rated E690F is equipped with a 54.1 kW engine, a bucket capacity of 0.34 cu m and a maximum excavation force of 60 kN. The machine is ideal for excavation of soil, sand, coal and waste, making it a great addition for construction sites, farms and parks.

Both models are optionally available with X1 hydraulic function, which enables hydraulic rock breakers and other attachments to be used with the machines. Rubber track pads are also available as an option, allowing the units to work on asphalt or concrete without damaging the road surface.

In 2018, Indonesia's construction industry grew by 6.1% and is expected to see healthy growth through 2023, according to Global Data, a market research firm. The country is expected to see growth in urban construction and agriculture, which the Indonesian government has listed as one of the five national priorities.

SDLG established its presence in Indonesia in 2011, and since then it has reportedly become one of the most popular wheel loader brands in the country. The company has two local dealers, PT Indotruck Utama and PT Intracopenta Prima Servis. ■

Website: www.sdlg.com.cn

SDLG E690F (above) and E660FL compact excavators.

Elematic WallMES for precast wall production

The Elematic Plant Control solution is designed for precast production's specific needs. The plant can manage, control and optimise the whole production process as well as individual automatic machines with the system. The Plant Control can also discuss with BIM systems such as Tekla Structures.

Elematic WallMES, a part of the Plant Control, is aimed to optimise precast wall panel production. It offers automatic planning, work follow-up and quality control functions for precast wall production plants.

The WallMES provides the factory with table-specific real-time production progress data with comparison to actual work times versus estimates and waiting times, production efficiency figures and work hour estimates, advanced quality control, simple KPI follow-up with automatic dashboard and customisable reports. The system stores all production history data automatically.

The WallMES planning helps factory to balance work plans and available resources per work phase to get smooth and continuous daily workflow. It is also possible to achieve focused quality improvement actions by combining quality issues, hours required for corrections and work processes where issues have occurred.

The design philosophy of the Plant Control - including WallMES - is emphasised on delivering a great user experience, both functionally and visually. The system gives the precast plants freedom to choose a path and pace of digitising their operations - it consists of independent modules that make it easy to proceed step by step, module by module, without any big initial investment.

Furthermore, WallMES - and the entire Plant Control system - also features an easy-to-use visual user interface with a drag and drop function as well as clear icons and buttons that guide the user through different operations. ■

Website: www.elematic.com

ALL IMAGES:
Elematic WallMES, a part of the Plant Control solution, aims to optimise precast wall panel production. It offers automatic planning, work follow-up and quality control functions.

SPT method for analysing soil conditions

ABOVE (LEFT AND RIGHT): **Standard Penetration Testing (SPT) is a geotechnical test widely used to estimate soil, providing clarity to the engineers prior to starting the construction.**

US-based company GRL Engineers offers the Standard Penetration Testing (SPT) for analysing soil strength and conditions. This method uses an SPT hammer to drive a drill string with a split-barrel sampler attached at the bottom of the string. The split-barrel sampler recovers soil samples and the bottom of the borehole, after the borehole has been advanced to the required sampling depth. Such a test provides clarity to the engineers and is essential to understanding foundation conditions.

SPT hammer efficiencies vary, which influences the resulting N-values, explained GRL Engineers. For this reason, many authorities, such as the US Federal Highway Administration require SPT hammer calibration. In addition, period calibration is required by many US Departments of Transportation. ASTM D1586 recommends that a measured N-value be normalised to 60% drill rod energy, N_{60} by multiplying it by the ratio between the measured energy transferred to the rod and 60% of the theoretical potential energy. This compensates for the variability in efficiency, and therefore, improves the reliability of soil strength estimates used in geotechnical designs.

To perform the SPT calibration, GRL Engineers attaches an SPT rod, instrumented with strain gages and accelerometers, to the SPT drill string rod. As the drill string is driven into the ground, the strain gages and accelerometers obtain force and velocity signals with each hammer blow. The signals are transmitted to a Pile Driving Analyzer (PDA) that displays the force, velocity and energy transmitted to the drill string, calculates and displays the maximum transferred energy value, and stores the complete time record of force and velocity for all SPT hammer blows. GRL Engineers typically acquires several SPT energy measurements per hammer at a given test location, in accordance with ASTM.

With this testing, GRL Engineers can provide a quantitative calibration report presenting transferred energies, energy transferred ratios and the SPT N_{60} value for each sample interval tested. ■

Website: www.grlengineers.com

Mapei waterproofing solution for India's Z Morth Tunnel

The Z Morth Tunnel is a 6.5-km-long twin tunnel located along a stretch of the Srinagar-Leh motorway, between Gagangir and Sonamar in north India. It is said that the project received its name from the Z formation between Sonamarg and Gagangir.

Situated at an elevation of 2,637 m above sea level, the tunnel is being built to provide permanent access for the tourist district of Sonamarg throughout the year and improve traffic conditions in the Ladakh region. The main tunnel is a bidirectional road tunnel about 10 m wide, while the escape tunnel is 3.5 m wide.

Construction work started in May 2015. ITNL has been appointed as the EPC (engineering, procurement and construction) contractor, and Apco – Titan JV as the main civil construction contractor.

Mapei has been involved in the project since 2016. The company was selected by Apco – Titan JV as a key supplier of waterproofing products. Certain sections of the tunnel were waterproofed with Mapeplan TU S 20 synthetic membrane made by Polyglass, a subsidiary of Mapei. Various Mapei admixtures were used to make the concrete mixes, such as Mapequick AF 70 and Dynamon SX, as well as Mapefibre BG 55 fibres. Mapefast CF/L chloride-free, anti-freeze admixtures was also added to the concrete used to build the tunnel.

The project has been put on hold since mid 2018 and the Union government is now inviting fresh bids, which are due in August 2019, as reported by the Greater Kashmir. According to Mapei, its collaboration with Apco – Titan JV remains active and once the project reopens, the company will continue supplying its waterproofing products. ■

Website: www.mapei.com.sg

ABOVE AND LEFT: **The Z Morth Tunnel is a 6.5-km-long twin tunnel located along a stretch of the Srinagar-Leh motorway, between Gagangir and Sonamar in north India.**

ABOVE AND LEFT: **Mapei has been appointed by the main civil construction contractor, Apco – Titan JV, as a key supplier of waterproofing products for the project.**

XCMG XTR260 plays role in Dali-Ruili Railway project

After 11 years of construction, the Dazhushan Tunnel of Dali-Ruili Railway in China finally achieved a breakthrough in June 2019. The tunnel reportedly serves as a key link in the Dabao section of the railway. It is thought to be the world's most difficult tunnel project, having encountered many challenges and featuring complex geological conditions.

The Dali-Ruili Railway is also said to be 'the world's most difficult railway project' as it passes through various rivers and mountains, including Nujiang River, Lancang River, Nu Mountain and Cang Mountain. A total of three XCMG XTR260 roadheaders have been involved in the project, working at the Xiuling Tunnel.

The use of XCMG roadheaders is believed to be a better solution, offering a greater efficiency by 30% compared with the borehole-blasting method which could cause collapse, water-mud bursting and other conditions that may seriously delay the construction progress.

The XCMG XTR260 roadheader integrates the traditional blasting, ventilating and slag tapping processes to continuously excavate the surrounding rock and transport the sludge out, making work more stable and safer. According to XCMG, the XTR260 can drill at a depth of no less than 5 m per day without any downtime. ■

Website: www.xcmg.com

XCMG XTR260 roadheaders have been involved in the Dali-Ruili Railway project, working at the Xiuling Tunnel. The machines are said to offer a higher efficiency by 30% compared with the borehole-blasting method.

Volvo excavators hard at work in Southeast Asia

Based in Jakarta, Indonesia, the logistics company PT Escorindo Jasa Prima has supplied equipment and services to a variety of customers across the country. Among its latest projects is for a cement producer that operates a quarry in West Java.

At the quarry, minerals need to be mined before being transported to a cement mixing plant onsite. To help with this aspect, the quarry owner turned to PT Escorindo Jasa Prima, which then selected a Volvo EC200D excavator for the task.

The machine is expected to put in 16-hour daily shifts. Its short cycle times enable it to dig clay, limestone and shale with great efficiency and load them into waiting trucks. Afterwards, they are transported to a cement mixing plant, which produces up to 5.5 mil t of cement annually.

The EC200D proved an instant success, performing so efficiently that the cement producer expanded the workscope of PT Escorindo Jasa Prima. As a result, the company ordered four more EC200D excavators from Volvo's local dealer, PT Indotruck Utama - one of them will be deployed to the quarry, while the other three will be sent to other sites. Besides supporting mining activity, the additional EC200D unit to be deployed to the quarry will also help manage stockpiles of minerals.

Speed and versatility are just two of the EC200D's many attributes. With a typical shift involving various tasks around the site, the fuel efficiency and operator comfort of the excavator stand out.

The EC200D was launched at the start of 2018 and is said to be the fastest excavator in the 20-t class. It offers exceptionally high swing torque and outstanding lifting capabilities, making it ideal for general construction work. The machine is configured with a 5.7 m boom, 2.9 m arm and 0.8 cu m bucket.

In the Philippines, Volvo EC210D excavators are currently working near the Mayon volcano. The heavy-duty machines are building spillways to direct lava, debris and rain away from populated areas, while simultaneously preserving valuable aggregate resources.

The Mayon volcano near the city of Legazpi is one of the most active volcanoes in the Philippines. While volcano soil is extremely fertile for farming, lava flows are always a hazard. Moreover, the wet season from July to December also poses challenges with the large volume of rainwater and debris it brings from the volcano.

ABOVE: **Volvo EC200D excavator being used at a quarry in West Java, Indonesia.**

LEFT AND BELOW LEFT: **Volvo EC210D excavators working near the Mayon volcano in the Philippines, building spillways to direct lava, debris and rain away from populated areas.**

To alleviate this, the local government is financing construction of a network of spillways around the volcano, to direct the flow of rain, debris and lava.

At one of these spillways at the foot of the volcano, Sunwest Construction and Development Corporation is using four Volvo EC210D excavators to manage the construction work. The machines are working around 10 hours a day, removing earth, preparing the ground for foundations and working with pile hammers to drive steel sheet piles.

The project is approximately 5 km long and is expected to be completed in 2019. In addition to diverting rainwater and lava from the villages, the spillways will preserve the sand and stone that erupt from inside Mayon. The high quality volcano aggregate is collected and sold onwards to local construction industries.

Apart from buckets and pile sheet hammers, the EC210D can also be fitted with a selection of hydraulic breakers. The machine features a Volvo D5E engine, which combines with the machine's excellent hydraulics to provide high torque at low rpm for superior performance and fuel efficiency. It is also equipped with five different work modes: Idle, Fine, General, Heavy and Power Max.

Volvo's distribution partner in the Philippines, Civic Merchandising, recently opened a service branch in Legazpi to provide service for Sunwest and other Volvo customers in the region. Today, Sunwest has more than 80 units of the Volvo EC210D in its fleet, plus a large number of other Volvo machines, including the new EC200D. ■

Website: www.volvoce.com

Potain MCT 85 for new temple project in India

Mumbai-based construction company Bhanu Construction is using a Potain MCT 85 crane to ensure on-time construction of a new temple in the town of Shirdi, India. The town is said to be a spiritual centre of India and most famous for being the home of Shirdi Sai Baba.

On-site since December 2018, the Potain MCT 85 is configured at a working height of 34.1 m and with a jib length of 52 m. The crane works 12 hours daily lifting rebar and concrete, with the goal of completing the temple construction in September 2019. According to Bhanu Construction, the MCT 85 is performing well in terms of energy consumption and functionality.

Manufactured at the Manitowoc plant in Pune, India, the MCT 85 is the successor to the hugely popular MCi 85 A. It offers a maximum jib length of 52 m and a tip load of 1.1 t. Its maximum capacity is 5 t.

Founded in 1984, Bhanu Construction manages commercial, residential and industrial construction projects. The company owns seven Potain cranes including both MCi 85 A and MCT 85 models. ■

Website: www.manitowoc.com

RIGHT: **Potain MCT 85 crane helping to build a new temple in Shirdi, India.**

Grove GMK5250L assists in rail corridor project

Australian rental company Metcalf Crane Services has recently used a Grove GMK5250L all-terrain crane with an integrated heavy-duty jib (known locally as a 'machinery runner') to handle the delicate unloading and installation of wall panels for a new rail corridor project in Seaford, Victoria.

Using the machinery runner from the Grove crane, which is integrated into the crane's swingaway jib, allows the use of both main and auxiliary hoists for the operation of two hooks simultaneously. The design of the machinery runner provides greater distance between the two hooks, making it perfect for applications such as panel installations.

The crane served a vital function on the project, as the wall panels, which weighed up to 30.5 t, had to be rotated from their horizontal position on the delivery vehicle to a vertical position for installation. Ideally, this operation had to be completed by a single crane as the congested jobsite meant finding space for a second crane to assist was a challenge.

Adding to the complexity of the project was the delicate design of the precast deflection panels, which required all rigging equipment for the installation to be installed vertically to avoid imposing any potentially damaging side loads on the panels. To ensure this part ran smoothly, Metcalf Crane Services used its own modular spreader bars, designed and manufactured in-house by the company.

The installation of the eight precast deflection wall panels is part of the Seaford Road grade separation project, being managed under the Victorian state government's AUS$6.9 billion Level Crossing Removal project. The project aims to remove 50 of Melbourne's most dangerous and congested level crossings by 2022. Work on the Seaford Road section of the project is being managed by a consortium of Lendlease Group, Acciona and WSP Global.

Metcalf Crane Services has used an integrated heavy-duty jib with a Grove GMK5250L crane to handle the delicate unloading and installation of wall panels for a new rail corridor project in Seaford, Victoria.

The GMK5250L has a maximum capacity of 250 t, a main boom length of 70 m and a maximum tip height of 110 m. According to Manitowoc, the crane remains one of the best-selling five-axle machines in Australia, with over 20 either working or on their way to the country. ■

From glass waste to sand to asphalt mix

Alex Fraser Group, an Australia-based supplier of sustainable construction materials, has opened an innovative glass recycling plant that transforms 'mountains' of problematic glass waste into high-quality construction sand. Later, the sand is used by the adjacent Ammann ABP HRT (High Recycling Technology) plant to produce asphalt mix.

Located in the state of Victoria, Alex Fraser's new recycling facility not only supplies to the Ammann plant, but also provides road base, aggregates and sand for green road and rail projects. Each day, it can recycle up to four million bottles and produce up to 800 t of high-specification sand. According to the company, the source materials come from the most problematic glass waste streams that were previously stockpiled or landfilled.

The recycling facility is capable of producing 200,000 t of recycled glass sand per year – equivalent to a billion bottles, which is effectively putting an end to glass waste stockpiles and landfill in Victoria, said Alex Fraser.

The Ammann ABP HRT furthers these sustainability efforts. The asphalt plant is specially designed to incorporate RAP (Recycled Asphalt Pavement) and other recyclable products as the mainstream materials that can produce more than 500,000 t of green asphalt per year. It features Ammann's proprietary as1 EcoView control system software, which closely monitors energy consumption and emissions; a foaming system for warm-mix capability; and hot asphalt storage up to 72 hours.

Alex Fraser revealed that its greenest asphalt mixes, like Glassphalt (recycled glass) and PolyPave (recycled plastics), are also being produced by the Ammann plant for use in a wide range of projects.

At present, Victorian households reportedly generate high amounts of problematic glass waste every year, known as CSP. Made up of fine particles of glass co-mingled with other waste – including paper, plastics, metals and organics – this waste stream cannot be traditionally recycled back into bottles or jars. Until recently, an enormous volume of glass waste was accumulating, destined for landfills.

Alex Fraser's new recycling plant separates the glass from the impurities and processes it into recycled sand, which complies with VicRoads (the governmental transportation agency) specifications. It directly replaces quarried sand and reduces the need for trucking virgin sand long distances into Melbourne, substantially reducing heavy vehicle movements on congested roads.

Such an effort will have significant commercial and environmental savings, Alex Fraser pointed out, including the reduction of glass as landfill, heavy vehicle movements, and the carbon footprint of new projects, by up to 65%.

LEFT: **Alex Fraser Group has opened a glass recycling plant that transforms problematic glass waste into high-quality construction sand.**

BELOW: **The sand is then used by the adjacent Ammann ABP HRT plant (seen on the left) to produce asphalt mix.**

The Ammann ABP HRT asphalt plant incorporates RAP (Recycled Asphalt Pavement) and other recyclable products as the mainstream materials that can produce more than 500,000 t of green asphalt per year.

Established in 1879, Alex Fraser is one of Australia's longest running companies. In 2019, it celebrates 140 years of operation, having recovered and recycled 50 mil t of material. ■

Website: www.ammann.com

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Liebherr performs deep compaction for Dubai Harbour

To the west of Palm Jumeirah in Dubai, UAE, a new harbour development is currently underway. Featuring almost 2 mil sq m, it includes 1,110 berths for 1,400 yachts, a terminal for cruise ships, luxury hotels, shopping centres, residential buildings and a 135-m-high lighthouse.

To carry out the project successfully, the building ground must be improved along the 2,675-m-long coast. For this reason, Keller Grundbau GmbH is compacting more than 7 mil cu m of sand in an area of 380,000 sq m. Through deep compaction, the load-bearing capacity of the ground to support the construction loads is enhanced and the settlement of the ground reduced.

Keller is regarded as a pioneer in soil compaction and has been involved in a number of large construction sites in the UAE, including 'Palm Islands'. On the new harbour project, the company is using a duty cycle crawler crane from the Liebherr HS series, the HS 8130, which is equipped with a vibroflot for deep compaction.

The long boom of the HS 8130 provides Keller with a large working radius. Without having to change the position of the crane, a wide radius of building ground can be compacted. The radius is a particular advantage for the steep drop into the sea. Work of this kind is usually carried out from a barge, or land is temporarily reclaimed for the task and subsequently restored to the sea. Both methods are said to be more time-consuming and cost-intensive.

LEFT AND BELOW: **A new harbour development featuring almost 2 mil sq m is currently underway in Dubai. For this project, Keller Grundbau GmbH is compacting more than 7 mil cu m of sand in an area of 380,000 sq m, with the help of a Liebherr HS 8130 duty cycle crawler crane.**

With the deep compaction using the HS 8130, Keller is able to improve the building ground down to a depth of 19 m. This is expected to withstand a construction load of 200 kPA. In order to verify the geotechnical requirements of the ground, about 600 compaction points are being tested using SPT (Standard Penetration Testing).

The new Dubai Harbour development is reportedly a cornerstone for the Emirates' vision of attracting 20 million tourists per year from 2020. For this project, Keller also has two drilling rigs and two crawler cranes from Liebherr in operation. ■

Website: www.liebherr.com

ABOVE AND LEFT: **Thanks to the deep compaction work using a Liebherr HS 8130 crane, which is equipped with a vibroflot, Keller is able to improve the building ground down to a depth of 19 m.**

Herrenknecht builds new drainage tunnel at Dubai Airport

International Foundation Group LLC (IFG), working for Dubai Aviation Engineering Projects Corporation under the project management of M.A. Kharafi & Sons, has relied on Herrenknecht tunnelling technology to extend the stormwater drainage system at the Dubai International Airport. In March 2019, they celebrated the successful completion of the project.

Using the pipe jacking method, a Herrenknecht AVND2400AB machine excavated 610-, 765- and 825-m-long sections under the Terminal 2 taxiways. At depths of 13 to 15 m, this micromachine carried out the job while flight operations on the ground and in the air continued smoothly and safely.

The Herrenknecht TBM on the project featured a shield diameter of 3,025 mm, drive power of 315 kW and torque of 1,200 kNm. On the longest drive, an average of 15 m of tunnel per day were excavated through soft soils with sandstone and siltstone. The drive remained exactly on course by precise process and control technology from VMT.

The new drainage tunnel has a total length of 2,200 m, increasing the airport's drainage capacity. The new pipelines will now be able to collect and drain away rainwater, especially during heavy downpours, so it can no longer accumulate on the surface. This is crucial in order to maintain smooth flight operations.

The project is part of the Dubai International Airport Expansion Phase 3. With close to 90 million passengers per year, it is one of the busiest airports in the world. ■

Website: www.herrenknecht.com

A Herrenknecht TBM, with a shield diameter of 3,025 mm, excavated three drives of a new 2,200-m-long stormwater drainage tunnel at the Dubai International Airport.

ABOVE: **The project was completed successfully earlier this year.**

LEFT: **At depths of 13 to 15 m, the Herrenknecht AVN machine crossed under the Terminal 2 taxiways while flight operations on the ground and in the air continued smoothly and safely.**

IN SAFETY AND IN HEALTH...

THE INAUGURAL WORKPLACE SAFETY AND HEALTH (WSH) CARNIVAL AT THE ITE COLLEGE WEST IN SINGAPORE PROVIDED STUDENTS WITH VALUABLE INSIGHT INTO SAFETY AND HEALTH ISSUES AT WORK AND HOW TO MANAGE THEM. JLG AND GALMON JOINED THE EVENT TO HIGHLIGHT THE SAFETY PRACTICES FOR WORKING AT HEIGHTS, AND ALSO INTRODUCE THE STUDENTS TO THE TECHNICAL SKILLS AND CAREER OPPORTUNITIES IN THE LOCAL ACCESS INDUSTRY.

'A fun way of learning'

The Institute of Technical Education (ITE) organised the inaugural WSH Carnival - with the support of the WSH Council - on 25 April 2019 for the students and lecturers at the ITE College West. The event was attended by more than 300 students across six engineering faculties, namely Rapid Transit Engineering, Automotive Engineering, Electrical Engineering, Facility Management and Engineering, Mechanical Engineering and Mechatronics Engineering.

ITE invited Galmon, which partnered JLG, to work together in presenting an entertaining yet educational programme for the students. This comprised a work-at-height safety talk, demonstration of how to wear personal protective equipment (PPE) correctly, and practical experience of operating mobile elevating work platforms (MEWPs).

"The chance to experience a ride on an MEWP is exciting and would be useful for my future career, as I know now that such a machine is available to keep me safe on the jobsite," said one of the students.

"I get reminded to be extra careful when working at heights and always wear protective equipment to protect myself from falling," said another student.

There was also a flash mob to perform safety dance, reminding the dangers (slips, trips and falls) and safety practices (such as wearing PPE - helmet, safety vest and safety harness) while working at heights; as well as showcasing the importance of checking the surrounding conditions of the jobsite prior to commencing work.

With the WSH Carnival, ITE aimed to engage students and lecturers in a fun way to gain insight into the Total WSH solution. Through several activities, students could identify potential hazards and risk controls, recognise safety signages, acquire knowledge of working at-heights, and understand that Total WSH also encompasses health and public safety.

ABOVE AND LEFT: **More than 300 ITE students attended the safety talk at the WSH Carnival.**

BELOW: **The students were also taught how to wear PPE correctly.**

BOTTOM LEFT: **A flash mob performing safety dance took place during the event.**

The industry's involvement was a significant component of the event, helping to make it a success. "The industry is abreast of technology for WSH. It is thus important to engage industry stakeholders to display the latest technology and engineering solutions for knowledge awareness and transfer, if opportunity arises," said ITE.

ITE and the WSH Council have been collaborating to drive awareness and infuse safety and health elements to prepare students as risk management practitioners before they enter the workforce. ITE has progressively incorporated applicable WSH content in modules for courses that involve higher risks, elevated WSH elective modules to core modules, and constantly referenced and adopted WSH Council's content, e.g. safety videos or George and Hazel e-learning modules into coursework.

ITE College West has also initiated a WSH co-curricular activities club to encourage students - who are passionate about safety and health - to contribute to a safer and healthier campus. The WSH Council sees opportunities to boost the profile of the club by having the students double as WSH Youth Champions to play their role on a greater level.

LEFT AND RIGHT: **Students at the ITE College West had the opportunity to experience a ride on the JLG boom, scissor and latest Eco/PecoLifts.**

Work-at-heights safety awareness

One of critical aspects of WSH is work at heights, which take places in various industries especially construction and maintenance. According to the WSH Council, "Falls remain a major cause for workplace fatalities in Singapore, contributing to more than a third of total workplace fatalities yearly. These fall-related fatalities at work are mostly from falling from heights, followed by slips, trips and falls accident types.

"While high-risk industries such as construction traditionally contributed the bulk of such fatal falls, falls leading to workplace fatalities have also occurred in other sectors, for example, tasks that required workers to work on ladders or roofs."

JLG together with Galmon participated in the WSH Carnival to raise student awareness about simple and practical work-at-height approaches, based on the concept of 'Look, Think, Do' - Look out for danger; Think of how you can protect yourself; Do your work safely. This method is to advise students to be more vigilant of jobsite surroundings and potential risks, and take the necessary steps to eliminate them before starting any work.

The WSH Carnival is also an expansion of Galmon and ITE's partnership, which offers an opportunity to introduce students to the technical skills and innovations as well as career opportunities in the local access industry.

Over the past few years, Galmon has hosted ITE students on 10-week internship programmes where they not only picked up technical skills – such as how to troubleshoot and perform quality checks on MEWPs – but also discovered the not-often-seen administrative side of the business. This includes learning how to maintain the spare parts inventory, conducting risk assessments, and preparing technical documents, to name a few.

"We seek to attract the younger generation to the industry, whilst instilling safety consciousness in them - and the best time to do it is when they're still studying," said Desmond Ong, CEO of Galmon. "Therefore once they've graduated, whichever industry they are going to, not only are they already familiar with trade-related safety requirements, but they always have safety in mind."

Mr Ong further explained the challenges the industry is facing when it comes to working at heights. "High costs remain

a major concern for many companies in Singapore. Although the practical guidance on the use of MEWPs (SS 616) is available, safety standards are often compromised to save costs. It's a very competitive business environment here in Asia."

"As a supplier, we believe that when dealing with safety – it's a matter of life and death – we have to look beyond costs," stressed Mr Ong. "It cannot be just all profits without responsibilities."

Mr Ong noted that in general, workplace safety performance in Singapore has progressed throughout the years, with more guidelines and regulations being established. "But there is a lot of room for improvement," he acknowledged. "We need to consider safety as an urgent issue and place it as the highest priority in the workplace. For instance, it would be good to specify safety standards at the start of the project, even during the tender period."

"The government should continue taking the lead, working side by side with the industry to overcome the challenges," said Mr Ong. "Galmon has also teamed up with the government and other industry partners to promote safety at heights. We want to play our part, no matter how small it is, to help cultivate the safety culture in Singapore for the benefit of the nation."

Mr Ong reiterated his message, emphasising that "the only way to reduce accidents and fatalities successfully is by changing our mindset – that is, putting safety as our core value and top priority!" ■

For more information: Galmon: galmon.com.sg | JLG: www.jlg.com
ITE College West: west.ite.edu.sg | WSH Council: www.wshc.sg

TOP AND ABOVE: **The WSH Carnival showcased a variety of products and services for workplace safety and health.**

50 YEARS OF SAFETY EXCELLENCE

At the inaugural WSH Carnival, JLG also kicked off its 50th anniversary celebrations in Singapore – highlighting its continuous commitment to safety.

On 9 January 1969, John L. Grove (JLG) rallied a small group of people around one big idea – to create a safer way to work at height. This resulted in the launch of JLG 1 boom lift, which was regarded as the world's first MEWP. Mr Grove's passion for safety and his pioneering spirit continue to be carried out today by more than 6,000 JLG employees around the world.

Since the introduction of its first MEWP, JLG has reportedly claimed many access industry firsts - including oscillating axles for boom and scissor lifts in 1981, the only fuel-cell powered boom lift in 1999, the first environment-friendly 60-ft electric boom lift in 2000, and the first straight boom lift to reach 150 ft in 2011. The company surpassed its own record in 2014 with the introduction of a 185-ft model 1850SJ, dubbed the world's tallest self-propelled boom lift. In the same year, JLG introduced the first true hybrid diesel/electric boom lift, the H340AJ.

"For more than 2,000 years, people used inefficient and dangerous methods to access work areas," said Guru Bandekar, JLG vice president of global product management and development. "So, when you think that a mere half-century ago no one had invented a way to safely elevate people on jobsites, one realises how remarkable John L. Grove's advancement was."

ABOVE: **John L. Grove, founder of JLG.**
LEFT: **At the WSH Carnival, JLG kicked off its 50th anniversary celebrations in Singapore.**

Mr Grove formed JLG Industries with an inner circle of only three investing partners, and within a few short years, developed an innovative product that filled a huge void in the construction industry. The company soon expanded domestically (in the US) and later internationally. Today, JLG is represented across five continents, with manufacturing facilities in the US, France, the UK, Romania, Australia and China.

In Singapore, Galmon is the authorised distributor of JLG. "Galmon and JLG's partnership stems firmly from the same philosophy – to provide a reliable way for working at heights, deliver professional services and impart quality training programmes," said Galmon.

"We are confident in JLG's innovative and reliable products that advance the access industry, and is proud to promote the brand in Singapore and the wider Asia Pacific region for the past 25 years." ■

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Wirtgen W 380 CRi cold recycler in action.

ROAD REHABILITATION THE WIRTGEN WAY

TO ENSURE THAT ROADS REMAIN FUNCTIONAL OVER THE LONG TERM, THEY ARE INCREASINGLY IN NEED OF STRUCTURAL REHABILITATION. TO MEET THIS REQUIREMENT, WIRTGEN HAS DEVELOPED THE HIGH-PERFORMANCE W 380 CRi COLD RECYCLER.

The cold recycling process – which at a minimum recycles the surface and base course material – has been used globally, and demand for this solution is expected to continue to grow in the future. In the in-place cold recycling process, the asphalt surface is removed either in full or in layers, depending on the level of damage, by a recycling train operating across the entire width of the pavement in a single pass, mixed with binding agents on site, and then paved again immediately. At the heart of this recycling train are tracked cold recyclers, such as the Wirtgen W 380 CRi.

Providing working widths of 3,200, 3,500 and 3,800 mm, the W 380 CRi cold recycler can mill roads between 100- and 300-mm-deep in most applications. At the same time, it granulates the material and transforms it into a new, homogeneous material mixture by adding binding agents such as cement, bitumen emulsion or foamed bitumen.

The W 380 CRi features a mixing capacity of up to 800 t/hr. It can feed enormous quantities of recycled material to a Vögele paver via its swivel-mounted and height-adjustable discharge conveyor at the rear. This makes it possible to complete extremely long stretches of road in a single day of work. Final compaction is carried out by Hamm tandem and tyre rollers.

Wirtgen recyclers can also feed granulate from upstream milling operations into the mixing process, via the adjustable material guide system at the front of the machine.

Wirtgen's solution covers the entire in-place cold recycling value chain.

Wirtgen's tracked cold recyclers use the down-cut process when recycling, in which the milling and mixing rotor rotates in sync. This method is believed to have become an essential part of day-to-day recycling operations, as it allows to selectively vary the particle size of the material being processed – especially in the case of fragile, thin, old asphalt roads.

Durable foamed bitumen mixture

Wirtgen pointed out that roads rehabilitated using the cold recycling process have to meet the same durability requirements as roads designed and built using conventional methods. For this reason, the company has created solutions to guarantee that the rehabilitation measures will be cost-effective and sustainable even before they are carried out. As a result, the recycler offers the capability to define the ideal composition of the RAP, and also to directly analyse its quality and properties using samples in triaxial and splitting tensile strength tests. The quality of the foamed bitumen can also be precisely defined in the materials laboratory prior to starting the rehabilitation project.

Cold recycling, particularly with foamed bitumen, is gaining popularity with road authorities and construction companies, said Wirtgen. With this method, the foamed bitumen is processed in-place with the existing building material. The newly produced bituminous mix is known as BSM (bitumen-stabilised material). After final compaction, it shows a long-term and extremely high load-bearing capacity.

Viewed from a long-term perspective, BSM has another advantage, added Wirtgen. The foamed bitumen mixed in leads to selective adhesion within the cold recycling layer and thus prevents cracking. The permanent layers prepared in this way form the perfect foundation for the final asphalt layer with considerably reduced thickness.

Continued overleaf...

Cost-effective design 'with less binders'

The significant potential for energy savings during material processing is also a highlight of the cold recycling process. The raw materials do not have to be dried or heated, so 10-12 l of fuel can be saved per ton in comparison to conventional rehabilitation methods, explained Wirtgen. By almost completely reusing the surface course, the need to transport building materials can be reduced by up to 90%. At the same time, companies can cut resource consumption by 90% and completely eliminate the need to dispose of materials. This results in substantially reduced fuel consumption and lower CO_2 emissions.

Most importantly, the cold recycling design minimises the use of binders by up to 50% – the area with the greatest potential savings, since binders are still the biggest cost factor in road rehabilitation, revealed Wirtgen. Thanks to the special properties of BSM, the cold recycling technology allows for very low costs over the entire life of the roads.

As the RAP is immediately recycled and the associated logistics are extremely lean, in-place cold recycling means that projects can be completed much quicker than with conventional rehabilitation methods.

According to Wirtgen, the entire series of machines required for the rehabilitation process can fit in the width of just one lane. On two-lane roads, for example, the work can be performed across the width of a single lane, while traffic can be routed along the other side of the roadway past the construction site in one lane. Beyond normal working hours, the entire road width is usually available, as the freshly recycled pavement can temporarily be used immediately after compaction has been completed.

In addition to the W 380 CRi (775 kW; EU Stage 5 / US Tier 4f) and W 380 CR (708 kW; EU not regulated / US Tier 2) models, the new generation of Wirtgen recyclers includes the W 240 CRi (775 KW; EU Stage 5 / US Tier 4f) and W 240 CR (708 KW; EU not regulated / US Tier 2).

TOP: **The Wirtgen cold recyclers can also be used as efficient, high-performance milling machines employing the up-cut process.**

ABOVE: **The W 380 CRi and W 240 CRi cold recyclers feature ease of operation with new automatic functions, main control panels that can be positioned as required, and an on-board diagnostic system.**

The W 240 CRi and W 240 CR cold recyclers can be equipped with integrated Vögele AB 375 T variable screeds and have a maximum working width of 2,350 mm.

The four cold recyclers can also be used as efficient, high-performance milling machines employing the traditional up-cut process. Thanks to powerful engines and an impressive conveyor belt capacity, they achieve high removal rates at a maximum milling depth of up to 350 mm – for instance, when removing complete asphalt packages or for large-scale rehabilitation measures such as on motorways or airport runways. ■

Website: www.wirtgen-group.com/singapore

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The newly completed Clement Canopy residential project in Singapore is considered the highest concrete PPVC tower in the world, which was built by Dragages Singapore. *Southeast Asia Construction* recently visited the contractor's 'smart' factory at Jurong Port to find out more about PPVC technology and its benefits, and how it plays an important role in transforming the construction industry in Singapore and potentially across Asia.

Building it

The Clement Canopy residential project during construction.

like Lego

'Highest concrete PPVC building'

In April 2016, United Venture Development - a joint venture between UOL Venture Investments and Singland Homes - commissioned Dragages Singapore to build a new high-end residential development in the west of the country.

To implement the job successfully, Dragages provided its comprehensive services - from the design phase through to the project delivery. The company adopted the PPVC (prefabricated prefinished volumetric construction) method - also known as modular construction - for 65% of the building's superstructure.

The Clement Canopy was completed in early 2019, featuring two 40-storey towers that comprise 505 units, on a gross floor area of 46,000 sq m. At 140 m high, it is currently regarded as the highest concrete PPVC building in the world, incorporating a total of 1,899 PPVC modules.

"We've carried out PPVC projects in other countries and we've never seen any PPVC structure as tall as Clement Canopy," said Julien Esch, managing director of Dragages Singapore.

"Using the PPVC method, construction work on the Clement Canopy could be reduced by six months, resulting in significant cost savings (by 20-25%) compared with the conventional construction method."

TOP, ABOVE, ABOVE LEFT AND LEFT: **The Clement Canopy features two 40-storey towers, comprising 505 apartment units. At 140 m high, the project is currently deemed the highest concrete PPVC building in the world.**

A subsidiary of Bouygues Bâtiment International - part of Bouygues Construction - Dragages has been active in Singapore for 35 years building various projects across the country. The Clement Canopy is the company's third PPVC project in Singapore, after the Crowne Plaza Changi Airport hotel extension (steel PPVC) – it is said to be the first PPVC project in Singapore's private sector - and the Woodlands Care Home (steel and concrete PPVC).

At present, Dragages is undertaking four other PPVC projects in Singapore - residential developments in Perumal, Serangoon and Woodleigh, and the BCA Academy. All of them feature concrete PPVC.

Why PPVC?

For the past few years, the Singapore government has encouraged the adoption of PPVC, as part of the DfMA (Design for

ABOVE, TOP LEFT, LEFT AND BELOW: **Lifting and installation of PPVC modules at the Clement Canopy project. These modules had been assembled offsite before they were transported to the jobsite. Dragages adopted the PPVC method for 65% of the building's superstructure.**

Manufacturing and Assembly) approach to raise construction productivity and quality.

The PPVC method involves the construction of buildings in a Lego-like manner. The building modules are manufactured in an offsite factory - and completed with internal finishes, fixtures and fittings - before they are sent to the jobsite for installation.

On the jobsite, the modules are assembled and stacked on top of each other to form the building structure. "It usually takes approximately 15 minutes for the lifting and installation of one module, which weighs between 26 and 31 t. About 10 to 12 modules per day per tower crane can be achieved," said Mr Esch.

With such heavy loads, logistics management could pose a problem, pointed out Mr Esch. He said Dragages is now able to deliver the modules via both sea and land. The installation of these modules on the jobsite might also become an issue, he added, with heavier capacity of cranes being required (up to 48 t).

Nevertheless, for an urbanised and highly populated country like Singapore, the main benefits of PPVC technology could well outweigh the challenges. "For one, the construction work can be done faster. By building offsite around 50% of a project, it removes any loss of time on site due to poor environmental or weather conditions," explained Mr Esch. The offsite and onsite works can run concurrently.

"It is also more sustainable. Because fabrication works are conducted offsite, onsite waste can be cut down by 70%. Traffic and disruption to local residents are minimised as well, due to less deliveries, less noise and less dust. Additionally, offsite construction means factory-like assembly and standardisation of modules, leading to better quality of products."

Mr Esch continued, "Another main benefit of PPVC method is greater safety and health. The offsite factory provides a more protected working environment, reducing occupational health risks and risks from working at height.

"Lastly, the whole process is more cost effective. Increased productivity and design optimisation from the beginning can reduce the need for large teams on site. Plus, a shorter construction time allows developers to hand over their units ahead of schedule, thus generating revenues quicker and lowering financial costs."

The PPVC method is not uncommon in developed markets like Europe, the UK, the US and Australia. But in Asia, presently Singapore is the only country that has embraced it, revealed Mr Esch.

"This technology is still in the early stage in Singapore, so if you look at the total cost savings for our PPVC projects here, they would not be as much as those in the more mature markets. In the long-term I believe it will improve," said Pierre-Eric Saint André, deputy CEO of Bouygues Bâtiment International in charge of Asia Pacific.

Most projects can be built using the PPVC method and there is huge potential for it to be applied across Asia, shared Mr Esch. "We will use Singapore as the platform to expand our technology in the region."

Dragages and Bouygues also have presence in Hong Kong, Vietnam, Thailand, Myanmar, Indonesia, Malaysia, the Philippines and Australia.

The 'smart' factory

To meet the increasing demand for PPVC projects in Singapore, Dragages offers a complete solution ranging from technical feasibility studies through to the project delivery.

During feasibility studies, Dragages analyses the technical and financial viability of the project, as well as the logistics management and also advises on the best layout and structure of the modules.

The design phase is accomplished by partnering Bouygues' in-house engineering team and the architect of the project, in order to optimise the modular design

The Dragages team (from left): Khor Yew Chai, director of PPVC at Dragages Singapore; Julien Esch, managing director of Dragages Singapore; Pierre-Eric Saint André, deputy CEO of Bouygues Bâtiment International in charge of Asia Pacific; and Felix Hartanto, business development manager at Dragages Singapore.

ABOVE, BELOW LEFT AND BELOW RIGHT: **PPVC modules for residential projects being stored in Dragages' new facility at Jurong Port, Singapore. The modules will be completed with internal finishes, fixtures and fittings prior to delivery.**

FAR LEFT: **Up to 40 trades are carried out by Dragages at its Jurong Port facility.**

LEFT: **The Parc Colonial is one of the ongoing residential projects in Singapore, also being built by Dragages with the PPVC method.**

(modularisation of floor plans, design adaptation to facilitate offsite manufacturing and collaboration with BIM) and coordination of trades.

The manufacturing operation is divided into two steps. Firstly, the modules are precast and prefabricated at Dragages' Senai facility, Malaysia. Afterwards, they are transferred to the company's Jurong Port facility in Singapore - opened just last year - where technical and architectural works are performed (up to 40 trades) including flooring, painting, plumbing, electricity and waterproofing, to name a few.

"With the location of our facility at the Jurong Port, we are able to ship the modules instead of transporting them by road," said Mr Esch.

At this new facility - dubbed a 'smart' factory - Dragages aims to enhance digitisation (particularly by placing QR codes on the PPVC modules for real-time tracking) and lean manufacturing operation.

Thanks to the QR codes on each module, the company can easily monitor its work progress in real time. "Digitisation also enables better coordination between the factory and the jobsites," added Mr Esch.

To boost efficiency, Dragages utilises robotic equipment - the Effibot automatic tracking cart. It can be pre-programmed to follow a specific route or a worker, and is fitted with a built-in sensor to detect obstacles. The Effibot helps move tools and materials up to 250 kg, with a battery capacity of up to eight hours.

In addition, Dragages employs the 'zero-gravity arms' to decrease the workers' physical burden caused by heavy tools, further increasing health and safety. The system is equipped with exoskeleton and can hold loads up to 16 kg.

"We will keep investing in innovations and R&D in the next years to maintain our position as a top player in modular construction," asserted Mr Esch.

"The PPVC technology is a sustainable game-changer for the construction industry - transforming the way we build buildings today - and is a revolution in the construction methodology. This is the direction that the industry is heading in the future!" ■

For more information:

www.dragages.com.sg
www.bouygues-construction.com

TOP, ABOVE LEFT AND ABOVE: **With digitisation at its new 'smart' Jurong Port factory, Dragages can monitor the work progress in real time through the use of QR codes.**

LEFT AND BELOW: **The QR codes are placed on each PPVC module.**

BELOW LEFT: **The Effibot automatic tracking cart helps to move materials up to 250 kg.**

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Totalling 1,372 m in length, the Eyiste Viaduct will serve as the link between Central Anatolia and Turkey's Mediterranean region. The structure is supported by two abutments and eight piers with varying heights from 31 to 155 m.

EYISTE VIADUCT

The Eyiste Viaduct in Konya, Turkey, spans the Göksu River near Bağbaşı District, featuring 1,372 m in length. It is supported by two abutments and eights piers with varying heights from 31 to 155 m. The bridge will serve as the link between Central Anatolia and Turkey's Mediterranean region, shortening the travel time between the cities of Konya and Alanya.

Nurol Construction and Trading Co Inc is the project developer, while construction work is carried out by ATI Construction and Energy Production, Trading Co Inc. The architect on the project is the General Directorate of Highway.

The superstructure of this balanced cantilever bridge has nine spans, the longest of which is 170 m. The balanced cantilever method was chosen to build the superstructure as it is considered the ideal solution for long spans. It is also believed to be the most preferred method for many bridge construction projects in Turkey.

Work on the Eyiste Viaduct started in March 2017 and it is scheduled to be opened for traffic in June 2020. A total of 130,000 cu m of concrete and 28,000 t of steel (excluding prestressing cables) are expected to be used throughout the project.

3D model under extreme conditions

Differing pier heights and the long deck cause differences in the way external influences affect the structure. The CSiBridge software was used to model the viaduct in 3D, so that the bridge's ability to handle vertical and lateral forces could be assessed and the results incorporated into planning.

The simulations indicated that the shortest pier (31 m) would be most affected by seismic forces. By contrast, the long bridge deck and the tallest pier (155 m) would be more susceptible to creep, shrinkage and temperature effects (CST) and to wind loads.

Based on these results, only the four tallest piers are being cast monolithically with the deck sections. The deck remains supported on longitudinally sliding bearings, providing flexibility and reducing seismic effects.

The balanced cantilevering superstructure sections of the new viaduct are constructed towards each other, from pier head to pier head. The four cantilever forming travellers (CFTs) work in pairs, so that the horizontal forces acting on the bridge piers are always in equilibrium. The travellers can handle various section lengths from 3 to 5 m and concrete weights up to 250 t.

The forming carriages speed up the progress on the project and allow for variations in segment geometry. Slide bearings secure the CFTs against unwanted travelling on longitudinal gradients. Fully enclosed working platforms on all levels and hydraulic test loading of the rear carriage anchorages prior to each pouring operation help ensure safety at work.

Six paired sets of Doka Xclimb 60 automatic climbing formwork are used for forming the bridge piers. The system climbs hydraulically, anchored to the structure at all times by guiding shoes. Because it is always guided on the structure, the system can still be climbed even in windy conditions, said Doka.

Other products supplied by Doka for the project include the Top 50 large-area formwork, d2 load-bearing tower, cantilever forming traveller and supporting construction frame. ■

Website: www.doka.com

All images © Doka

TOP: **The differing pier heights and the long deck cause differences in the way external influences affect the structure. The CSiBridge software was used to model the viaduct in 3D, so that the bridge's ability to handle vertical and lateral forces could be assessed and the results incorporated into planning.**

ABOVE: **Six paired sets of Doka Xclimb 60 automatic climbing formwork are in use for forming the bridge piers. The system climbs hydraulically, anchored to the structure at all times by guiding shoes.**

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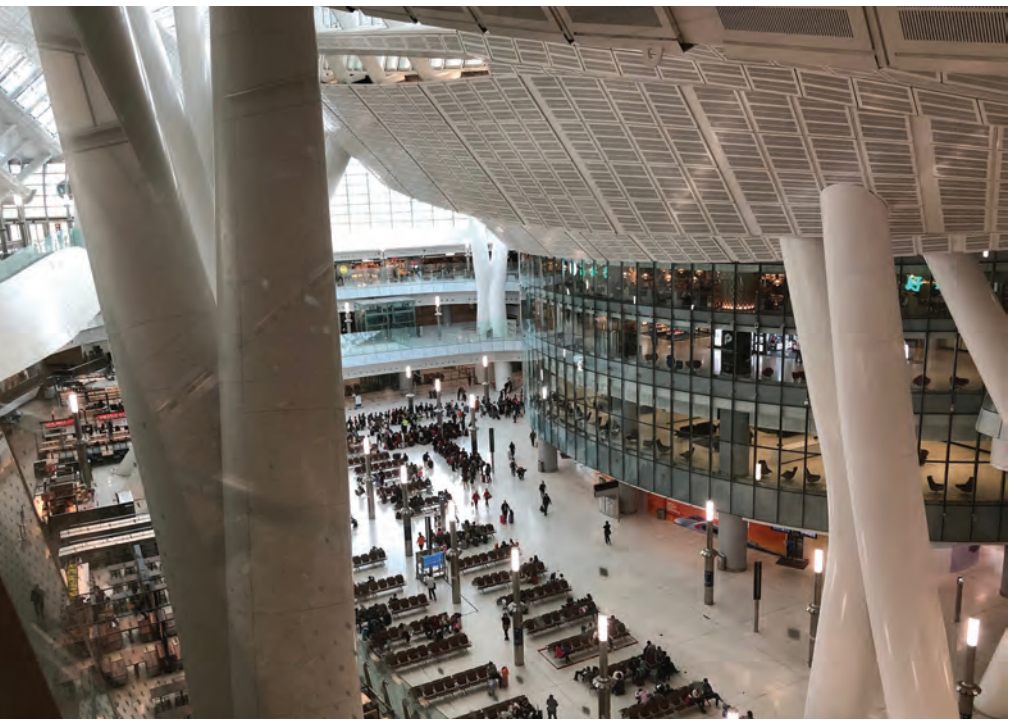

ABOVE AND OPPOSITE: **Below the station's curved roof structure is a four-storey building, and above it is a green plaza with nearly 8, 900 sq m of open space, accessible by the public.**

The recently opened Hong Kong West Kowloon Station is a landmark building on the city's skyline, and is considered one of the world's largest underground cross-border railway stations. It serves as the gateway to Guangzhou province and the mainland.

Working on the project, Aurecon had the challenging role of planning and managing the erection engineering to raise the long-span station roof to sit protectively and elegantly over 400,000 sq m of rail station.

Underneath the three-dimensionally curved roof structure is a four-storey station building, and above it is a green plaza with nearly 8,900 sq m of open space, accessible by the public.

The project maximises civic gestures both internally and externally as it invites passengers to be an integral part of the space, explained Aurecon. The station is sculpted out of the energy of these moves, and strongly defines the design's focus towards Victoria Harbour and the Hong Kong skyline.

The West Kowloon Station in Hong Kong is regarded as one of the world's largest underground cross-border railway stations.

Complex engineering challenges

The West Kowloon Station features a lot of open space - but the project did not come without engineering challenges, revealed Aurecon. These included designing for the strong typhoon wind loads that Hong Kong experiences each year; deep underground construction that is extremely close to Victoria Harbour; irregular and complicated geometry of the curved roof structure; extremely slender mega columns in the atrium, and the inclined mega columns that created temporary instability; as well as concurrent construction of the roof structure with the basement structure in order to meet the tight construction programme.

Another major challenge that Aurecon faced on the project was the complex interface between the temporary works, the permanent roof and the supporting substructures, shared Mike Tapley, Aurecon's technical director.

"Given this complexity, the planning for the station roof construction had to be a collaborative effort between Aurecon

ABOVE AND BELOW: **The West Kowloon Station during construction. Aurecon was involved in the planning and managing the erection engineering to raise the long-span station roof to sit protectively and elegantly over 400 000 sq m of rail station.**

ABOVE: **The station's curved steel roof is about 180 m long and 30 m high, supported by six groups of slender load-bearing structures.**

and five other organisations, including the main contractor and client."

Mr Tapley added, "Analytically demanding engineering tasks were tackled by Aurecon's Sydney, Hong Kong, Bangkok and Brisbane offices, with the use of advanced engineering and technology tools. This ensured the roof was safely erected within the acceptable tolerance and design capacities."

The long-span curved steel roof is approximately 180 m long and 30 m high. This elegantly shaped roof consists of six groups of slender load-bearing structures. The structure was formed from three, geometrically complex, lattice trusses.

"This project is a great example of Aurecon's technical strength and ability to bring together mass transit and building expertise from across the world, to help deliver our client's vision," concluded Mr Tapley. ■

Website: www.aurecongroup.com

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Qualified Person: Er. Kam Mun Wai
C&S Consultant: Meinhardt (Singapore) Pte Ltd
Builder: Hyundai Engineering & Construction Co Ltd
Developer: Frasers Property Singapore
Architectural Consultant: DP Architects Pte Ltd

Challenges:

• Iconic and slender high-rise tower with sloping facade.

• Deep basement construction in highly variable Jurong formation.

• Close proximity to Telok Ayer Chinese Methodist Church (a national monument of Singapore), the Clift and Bangkok Bank building.

• Construction of underground pedestrian walkway to Tanjong Pagar MRT station underpass.

• Congested site and access constraint in a dense city centre.

Solutions and Features:

• Use of Earth Retaining Stabilising Structure (ERSS) system comprising secant pile wall and semi top-down construction method to minimise wall deflection, ground movement and water drawdown. This enabled the three-level basement construction to be carried out safely, without adversely affecting the integrity of adjacent sensitive properties and structures.

• Sustainable raft foundation system with settlement-reducing piles for the high-rise tower and tension piles for the podium. The favourable ground stratum below the basement was strategically considered to provide support for the building structure. Piles were introduced to reduce stress concentration and control settlements. The use of this hybrid foundation system for a high-rise building resulted in substantial time and cost savings, in comparison to a conventional fully-piled foundation system.

• Flat-plate system for basement and podium to facilitate the semi top-down construction and enhance buildability and productivity.

• Highly buildable, repetitive and standardised post-tensioned band beam system for the typical office floors, allowing the application of lightweight table forms for faster construction.

• Well-defined structural load paths and key structural elements design and detailing, taking into consideration the gravity loads, high wind loads and additional horizontal forces as a result of the sloping columns and slenderness of the high-rise tower.

• Safe and practical top-down method for the construction of the underground pedestrian walkway to Tanjong Pagar MRT station underpass, involving temporary traffic diversion of Telok Ayer Street and suspension of underground services.

The Arc

Institutional & Industrial - Excellence

Qualified Person: Er. Aaron Foong Kit Kuen
C&S Consultant: KTP Consultants Pte Ltd
Builder: Lian Ho Lee Construction (Private) Limited
Developer: Nanyang Technological University
Architectural Consultant: DCA Architects Pte Ltd /KIRK

Challenges:

• Curvilinear building geometry within a 16-m-high sloping site, which is surrounded by existing buildings on all sides.

• Presence of multiple critical live underground services corridor overlapping directly with the building footprint.

Solutions and Features:

• Building Information Modelling (BIM) with Virtual Design and Construction (VDC) technology were seamlessly implemented from design to construction, thus achieving a safe and buildable structure-foundation outcome.

• Elimination of intrusive services diversion by creatively engineering the co-location of building structures and services corridor by way of self-stabilising micropile groups foundation.

• Design of a strutless excavation system with contiguous bored pile wall and removable ground anchor system to achieve safe and productive construction works within the high unbalanced slope.

Source: BCA

SEAB

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National Centre for Infectious Diseases and Centre for Healthcare Innovation

Institutional & Industrial – Excellence

Qualified Person: Er. Kam Mun Wai
C&S Consultant: Meinhardt (Singapore) Pte Ltd
Builder: Kajima Overseas Asia (Singapore) Pte Ltd
Developer: Ministry of Health
Architectural Consultant: CPG Consultants Pte Ltd

Challenges:

• Deep basement construction (up to 24 m) in highly variable Jurong formation.

• Unbalanced excavation due to undulating ground terrain 15 m across site.

• Construction of three deep underpasses below Jalan Tan Tock Seng.

• Erection of three bridges to provide inter-building connectivity to Tan Tock Seng Hospital and Lee Kong Chian (LKC) School of Medicine.

• Close proximity to existing hospitals, LKC conservation building and surrounding residential developments.

• A fast track programme.

Solutions and Features:

• Use of Earth Retaining Stabilising Structure (ERSS) system comprising contiguous bored pile wall and top-down construction method to minimise wall deflection, ground movement and water drawdown. This allowed the four-level basement construction to be carried out safely, without adversely affecting the integrity of adjacent sensitive properties and structures.

• With the top-down method, the excavation and superstructure construction could run concurrently to speed up the work, given it was a fast track programme.

• Hybrid piled-raft foundation system maximising the favourable ground condition resulted in time and cost savings.

• Flat-slab system for basements to facilitate the top-down construction and enhance buildability and productivity.

• Highly buildable, repetitive and standardised semi-precast system with band beams and hollow core slabs for the superstructure, designed for future proofing.

• The ERSS system for the construction of the three underpasses, involving multi-staged road diversion of Jalan Tan Tock Seng.

• Lightweight composite steel trusses with segmental and sequential erection enabled safe construction of the bridges over the busy Jalan Tock Seng Seng road.

My First Skool Large Childcare Centre at Punggol Dr

Institutional & Industrial – Excellence

Qualified Person: Er. Lauw Su Wee
C&S Consultant: LSW Consulting Engineers Pte Ltd
Builder: Kwan Yong Construction Pte Ltd
Developer: NTUC First Campus Co-Operative Limited
Architectural Consultant: LAUD Architects Pte Ltd

Challenges:

• A fast track project aiming to deliver the building in one year.

• The building is of irregular shape, like two 'seashell' pivoting around the centre point.

• It also features a 12-m-high curved glass facade supported by steel framing, at the back of each 'seashell.'

• The client wanted a more open space and lesser columns for flexibility and re-partitioning of the rooms in the near future.

Solutions and Features:

• Use of precast floor system with precast pre-tensioned rib beams and powerdek as left in formwork, so that the basic structure of the two-storey building with roof terrace could be completed within three months.

• Long span (up to 18 m) post-tensioned curve main beams were chosen, in order to give more column free space within the building.

• DfMA solution for the 12-m-high curve facade, with standardised and repetitive vertical and horizontal trusses, fabricated in the factory and assembled on site.

Source: BCA

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Contract 1688 - Construction of Station EW30 and Viaduct for Tuas West Extension

Civil Engineering – Merit

Qualified Person: Er. Rengasamy Selvaraju
C&S Consultant: AECOM Singapore Pte Ltd
Builder: Shanghai Tunnel Engineering Co (Singapore) Pte Ltd
Developer: Land Transport Authority (LTA)
Architectural Consultant: Aedas Pte Ltd

Challenges:

• A four-level interchange station above live six-lane roadway (two carriageways).

• Continuous long, five spans (53m-75m-75m-75m-53m) with curved alignment at the crossing of Pan-Island Expressway (PIE) along Tuas Road, where the rail viaduct would be constructed over live traffic.

• Construction of the rail viaduct that crosses over an existing road viaduct at Ayer Rajah Expressway (AYE) at a height of 21 m over busy live traffic.

•Limestone cavity encountered during construction of piling.

Source: BCA

Solutions and Features:

• Main RC frames cast-in-situ every 25 m to piled foundations and PSPC girders as main floor elements between frames. PC planks / metal decking between PSPC beams were used. The roof is a steel diagrid modular truss system erected on site. Many stages of traffic diversions were conducted to build foundations and lifting equipment was used where necessary.

• Use of balance cantilever method over the live PIE with the segmental post-tensioned precast beams across. This method adjusts for changes in pier distances and is suitable for curved spans. Also, the system minimises construction and footprint over live traffic and work can be staged to suit ongoing traffic conditions.

• The span-by-span technique was applied to build the rail viaduct over an existing road viaduct at AYE. The beams were launched at 21 m above ground at 36-m-long span, while maintaining a safe working environment at height with no impact on the AYE.

• Additional probing was carried out at every pile proposed at the cavity prone location to ensure the cavity depth from ground level, and the pile design was revised accordingly. Permeant casing was provided from ground level and terminated below 500 mm from the bottom of cavity.

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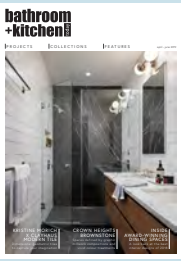

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Assisi Hospice

Institutional & Industrial – Merit

Qualified Person: Er. Tan Wai Houng
C&S Consultant: Meinhardt (Singapore) Pte Ltd
Builder: Soil-Build (Pte) Ltd
Developer: Assisi Hospice
Architectural Consultant: New Space Architects Pte Ltd

Challenges:

• The site has surrounding constraints with existing MRT Circle Line tunnels, Marymount Flyover, MacRitchie Viaduct, Thomson Road, future MRT Thomson Line, and future North-South Expressway tunnels.

• Unbalanced excavation due to undulating ground terrain with 10 m difference next to existing Assisi Hospice.

• A long-span link bridge connecting the north and south of the building, at the fourth storey.

Source: BCA

Solutions and Features:

• Use of Earth Retaining Stabilising Structure (ERSS) system comprising sheetpiles with partial excavation on two sides and secant bored piles on two sides, strutted to central basement structure / island. Analysis carried out incorporated movement limits by LTA. Detailed 2D and 3D finite element modelling was performed systematically to analyse and design the SBP system.

• The ERSS system minimised the impact of ground movement to neighbouring properties, including sensitive structures such as MRT Circle Line tunnels, flyover viaduct structure and existing Mount Alvernia hospitals and Assisi Hospice structures. The SBP system, instead of the conventional cut-and-cover method, mitigated the impact of ground movements, vibrations, existing structure movements, etc.

• Repetitive flat-plate structural system designed for typical ward levels, minimising floor-to-floor height and construction time, and also enhancing site productivity and construction safety.

• Extensive coordination on routing of M&E services with ceiling spaces and provision of penetration through slabs and beams using BIM, and extensive collaboration between consultants, builder and client throughout the design and construction stages to meet the client's requirements.

• Composite steel floor system for the link bridge to enhance buildability, productivity and safety in construction.

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