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CONSTRUCTION

SEPTEMBER - OCTOBER 2017



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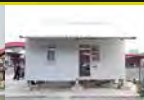
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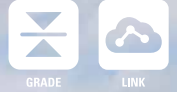


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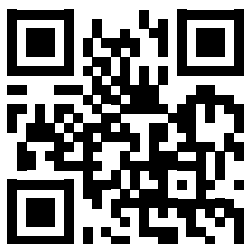
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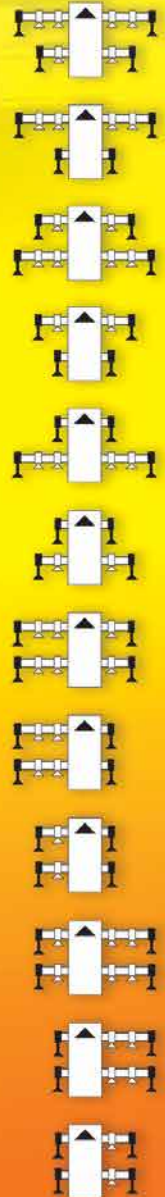
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Hatten Land unveils new mixed development in Melaka

Hatten Land Limited has unveiled its new wellness-themed mixed development to be built in Melaka, Malaysia. Named ‘Satori’, the project has an estimated gross development value of RM300 million and a gross floor area of about 570,400 sq ft. It will consist of 192 serviced suites, an 85,250 sq ft retail mall with an adjoining carpark, a 336-room hotel and more than 50 facilities.

Integrating health, wellness, beauty and leisure all in one premium destination, Satori (which means ‘enlightenment’ in Japanese) also boasts a complete range of sports, spa and pampering facilities alongside alternative treatment centres as well as vast leisure spaces.

“Satori’s proximity to Hatten Land’s iconic Hatten City, and major developments such as the deep sea port, cruise terminal and Kuala Lumpur-Singapore High Speed Rail position this project for future growth in one of the most important cities along peninsular Malaysia’s west coast straddling the Straits of Malacca, one of the world’s busiest sea lanes,” said Dato’ Colin Tan, executive chairman and managing director of Hatten Land.

Hatten Land’s wholly owned subsidiary Prolific Properties Sdn Bhd will develop the project – set on a 2.05-acre land parcel – over three years. Hatten Land is one of the leading property developers in Malaysia specialising in integrated residential, hotel and commercial



An artist’s impression of Satori, a new wellness-themed mixed development to be built in Melaka, Malaysia.

developments and is headquartered in Melaka. It is the property development arm of the conglomerate Hatten Group, whose core businesses in property development, property investment, hospitality, retail and education. ■

SMEC secures infrastructure projects in Asia

SMEC, ACE Consultants (a SMEC subsidiary) and Strategi Consulting Company have signed a contract with the Corps of Engineers of Bangladesh Army to provide construction supervision consultancy services for the Padma Bridge Rail Link project in Bangladesh. The scope of work comprises implementation of the resettlement plan including relocation of various utilities, detail design review, supervision of construction works and preparation of a progress report.

The Government of Bangladesh is undertaking this project in order to connect Dhaka, the capital of Bangladesh with the southwest of the country. The new Padma Bridge, to be completed in 2018, will provide essential rail infrastructure to establish the rail link. The new 215 km rail link will provide a substantially shorter route by reducing travel distance, and is envisioned to become a vital rail corridor, contributing to the country’s economy through increased freight traffic.

ACE Consultants and SMEC were previously involved in the Padma Bridge project during the feasibility study, as part of a joint venture conducted by Canarail and funded by the Asian Development Bank (ADB).

SMEC has also been engaged by Sarawak Energy Berhad to provide construction supervision for the Baleh Hydroelectric Project (HEP) in Sarawak, East Malaysia. The scope of work includes design

review and construction supervision for the two 12 m diameter diversion tunnels, 190 m high concrete-faced rockfill dam and the 20,000 cu m/s capacity radial gated spillway.

Scheduled for completion in 2024, Baleh HEP will generate 1,285 MW of renewable energy. Prior to securing this contract, SMEC had successfully completed in 2015 the tender design and evaluation of tenders for Baleh HEP.

Furthermore, SMEC has won a contract to provide the conceptual design for an approach road to the Gote Hteik Bridge in Myanmar’s northern Shan State. The project is jointly invested by Myanmar’s Oriental Highway Company Ltd and China Harbour Engineering Company Ltd.

The 20 km road is located along the Myanmar National Highway No. 3, between Lashio and Mandalay, which is a section of the China-Myanmar Highway. The approach road will provide an important trade link between Mandalay and Lashio and contribute to greater road safety in the mountainous region. It will also help create a key transport node between northern and southern Myanmar.

SMEC’s scope of work in this project includes: road survey works; geotechnical investigation works; concept designs: geometrical design, subgrade and pavement design, drainage design, road intersection design and road furniture design; as well as preliminary quantities and cost estimation. ■

Manitou acquires LiftRite Hire & Sales

The Manitou group has finalised its acquisition of a majority stake (55 percent) in the Australian company LiftRite Hire & Sales, based in Perth. The group expects to hold a 96 percent share by 2020. A family-owned company founded in 1983 by George Hogg, Mark

Manning and Ted Hirschfeld, LiftRite distributes Manitou, Gehl, Kalmar and Kobelco products for the construction and mining markets. In 2016, LiftRite generated €12 million in sales revenue, of which Manitou group products accounted for 65 percent. ■

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New office project in Jakarta



Japanese developer Mori Building has commenced the construction of a 59-floor premium-grade office tower (above) in the Sudirman area of Jakarta, Indonesia. Currently named Jakarta Office Tower, it is the company's first undertaking in Southeast Asia, which is set to open in 2021.

The new development is ideally located in the centre of the Golden Triangle, next to Semanggi Intersection and the New Semanggi Flyover on Sudirman Street, the main thoroughfare in the city's central business district. It will be approximately 266 m high and offer some 190,000 sq m of offices, restaurants and cafes, and parking space. Designed with sustainability in mind, the project is expected to obtain a BCA Green Mark Platinum Award.

Construction of the Jakarta Office Tower is being carried out jointly by Japanese contractor Shimizu Corporation and local contractor Bangun Cipta Kontraktor. It was designed by Kohn Pedersen Fox Associates (KPF), a New York-based architectural firm that also designed Mori Building's Roppongi Hills Mori Tower and Shanghai World Financial Centre.

Mori Building established its Singapore office in May 2016 as an international base for market research and business development focused on urban centres in the Southeast Asia region. ■

XCMG inaugurates new subsidiaries in Indonesia and Kazakhstan

XCMG has established a new subsidiary in Indonesia, marking another milestone for the company to expand its presence in the country and across Asia Pacific. XCMG Indonesia will work closely with local distributors and provide local customers with an improved one-stop service, said XCMG. The opening ceremony of the new subsidiary was recently held in the country's capital Jakarta.

Since entering the Indonesian market, XCMG has been involved in various engineering and infrastructure projects in the country, including highways, railways, power facilities, airports and other commercial developments. According to XCMG, Indonesia is an important overseas market for the company's global expansion efforts. As the largest economy in Southeast Asia and one of the founding members of ASEAN, Indonesia is considered a key location in China's Belt and Road Initiative (BRI). XCMG said its export volume to Indonesia has increased by more than 100 percent in both 2015 and 2016, and by the end of 2016 the company has ranked top in terms of market shares for loaders, cranes, rotary drill rigs, tower cranes and tunnelling machines in Indonesia.

Furthermore, XCMG has also established a new subsidiary in Kazakhstan, XCMG XuGong Kazakhstan. The company said Kazakhstan is one of its most crucial global markets, as the country plays the role of a bridge that connects Eurasia and is actively participating in the BRI. The new subsidiary will work with local distributors to provide local customers with an enhanced one-stop service, creating a solid foundation that allows the company to increase its presence throughout central Asia. XCMG also said that it ranks top in Kazakhstan, with market share of over 80 percent. ■



Top and above: XCMG is strengthening its commitment to the Indonesian market with the launch of a new subsidiary. The opening ceremony of XCMG Indonesia was recently held in Jakarta.



Above: XCMG has also established a new subsidiary in Kazakhstan to expand its presence in central Asia.



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New art and design district for Hong Kong waterfront

New World Development plans to develop 'Victoria Dockside,' a US\$2.6 billion, 3 mil sq ft art and design district on the promenade of Hong Kong's Tsim Sha Tsui waterfront. Set to fully open in 2019, the mixed-use development will offer Grade A office space, an ultra-luxury Rosewood Hotel, Rosewood Residences, and premier art, design and leisure experiences with views of Victoria Harbour and Hong Kong Island.

"We are committed to pushing new frontiers with Victoria Dockside," said Adrian Cheng, K11 founder, executive vice chairman and general manager of New World Development. "Our vision is to make waves at this world-class destination by providing a blank canvas for artists, designers and businesses to maximise their creativity and help build one of the most exciting new neighbourhoods of tomorrow."

The Victoria Dockside masterplan was created by architectural firm Kohn Pedersen Fox (KPF), landscape architect James Corner Field Operations (JCFO) in collaboration with Mr Cheng and over 100 designers and consultants across the globe.

The development will be built on the site formerly known as Holt's Wharf - a godown terminal next to the Kowloon and Canton Railway in Tsim Sha Tsui. Dating back to 1910, Holt's Wharf served as a global freight and logistics hub, connecting the city to the world.



An artist's impression of Victoria Dockside in Tsim Sha Tsui.

The site helped establish Hong Kong's reputation as the gateway to the Far East and played a major role in the city becoming the busiest port in the world. ■

Crown opens new facility in South Korea

To continue to meet growing demand for its lift trucks and fleet management technology, Crown Equipment has moved to a larger facility in South Korea. Located in Icheon, Gyeonggi-do, this new branch supports Crown Korea's experienced, factory-trained team of material handling specialists including the sales and service technicians and support staff who assist customers countrywide. It also features larger sales and rental forklift fleets, better stock capacity and improved inventory management for faster parts turnaround.

The Icheon facility is the third major demand-driven expansion in Asia for Crown in the last 12 months, following recently completed facilities in Johor, Malaysia and Rayong in Thailand. Crown Equipment's managing director for Asia Pacific, Steven Hill, said the new facility was required due to steadily increasing customer numbers and geographical spread of demand for Crown's innovative products and services.

"The new branch is another example of Crown's commitment to our growing number of South Korean customers in manufacturing, industrial, warehousing and logistics," said Mr Hill. "It also demonstrates Crown's ability to improve the customer experience through ongoing infrastructure development in the Asian market, which is bringing global technology to local business in Asia whilst



Crown Equipment's new facility in South Korea is located in Icheon, Gyeonggi-do.

expanding the customer support network."

He added, "Since we began operating in South Korea, Crown has delivered genuine cost savings, operational improvements and operator safety improvements to its customers, as well as growing employment opportunities. The new facility also enables Crown to extend its already strong environmental credentials, which is in harmony with the sustainability focus of the Icheon area." ■

Meinhardt signs agreement with Xi'An Trade Investment & Exhibition Company

Meinhardt has signed a Memorandum of Understanding (MoU) with Xi'An Trade Investment & Exhibition Company, a subsidiary of China Council for the Promotion of International Trade (CCPIT) as part of its Belt & Road initiative. The agreement allows Meinhardt to work with Chinese companies on projects endorsed by CCPIT. Historically Xi'an had built up its connection with Central Asia, Middle East and

Europe continent via the Silk Road since 1st Century BC and was the centre of the mainland Belt and Road trade.

Meinhardt plans to capitalise on the Belt & Road Initiative (BRI) for growth as it has operations in most of the countries along the BRI. The signed agreement is expected to further elevate and strengthen the bilateral trade and economic relationship between the two countries. ■



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Kobelco Machinery Philippines starts operation

Kobe Steel has established a company in the Philippines to dispatch supervisors and provide engineering services for its non-standard compressor business. The new Kobelco Machinery Philippines (KMP) is headquartered in Makati City, Metro Manila and employs 21 people. It is a wholly owned subsidiary of Kobelco Machinery Asia Pte Ltd in Singapore, which in turn is 100 percent held by Kobe Steel.

KMP provides an optimal framework for supervisor dispatch services and engineering work for Kobe Steel's non-standard compressor business in the region. Supervisors are in charge of the installation, commissioning and after-sales service of non-standard compressors, or custom-engineered compressors.

Through KMP, Kobe Steel expects to further grow its non-standard compressor business and strengthen its supervisor dispatch services. Kobe Steel has increased the number of supervisors in Japan (Takasago Works), the US (California) and China (Wuxi). The Philippines is now the fourth country where Kobe Steel has local supervisors. By increasing staff and improving its mobility, Kobe Steel aims to increase orders for compressors and after-sales service in the region.

In addition, KMP enables Kobe Steel to optimise its engineering work. Kobe Steel can transfer work currently undertaken at Takasago Works in Japan to KMP and also divide some of the work between the two locations. This framework enables Kobe Steel to choose the best location to carry out engineering work and meet the requirements



Miyoshi Sagesaka, president of KMP (back row, second from right) with the company's team members.

of its customers. Engineering work covers the design of OEM parts and arrangements for their procurement.

Under its medium-term management plan launched last year, Kobe Steel is expanding its compressor business as a growth strategy of its machinery-related businesses. In fiscal 2020, Kobe Steel aims to achieve compressor sales of 130 billion yen, an increase of more than 40 percent compared with fiscal 2016. To achieve this goal, Kobe Steel plans to make further inroads in the estimated 1-trillion-yen world market for non-standard compressors. ■

Kobe Steel establishes regional HQ in Thailand

Kobe Steel is set to open its regional headquarters in Bangkok, Thailand in August 2017. This new subsidiary, Kobelco South East Asia Ltd (KSEA), will oversee operations in Southeast Asia and South Asia.

Along with regional headquarters in the US and China, KSEA will serve as the central base to strengthen corporate governance, compliance and other aspects of business management. KSEA will also centralise financial management and further promote coordination within the Kobe Steel Group companies in Southeast Asia and South Asia.

Since the 1960s, Kobe Steel has been expanding its operations in the two regions. The group currently has 30 companies mainly in its materials and machinery businesses covering six countries. Recently, the group has been accelerating business development in the area. In February 2016, its Iron & Steel Business established a joint venture in Thailand to produce and sell steel wire rods.

According to Kobe Steel, since risks associated with business activities have become more complex and numerous, in addition to diverse languages, business practices and laws, a regional headquarters is required to effectively deal with these conditions and coordinate operations in the two regions. The group established KSEA in Thailand as regional headquarters for Southeast Asia and South Asia, where the largest number of its subsidiaries in the regions are located. ■

Prince Lift adds new Skyjack units



Steve Paik, Skyjack sales manager for Korea (left) and Wooteak Lim, president of Prince Lift.

Korean rental company Prince Lift is adding new and refreshed Skyjack mobile elevating work platforms (MEWPs) to its rental fleet in Yongin, following a trial purchase at the end of 2016.

“Refreshing our existing fleet serves greatly to manage our capital investment without compromising the quality and condition of the products we offer to our customers,” said Wooteak Lim, president of Prince Lift. “The trial experience produced very positive results, which increase the rental value of our fleet. At the same time, we are pleased to make further investments in new Skyjack machines.” Prince Lift is expected to deploy its fleet of Skyjack equipment to help with the major investment in construction of semiconductor factories in Korea.

The Refresh programme, provided by Skyjack Manufacturing Southwest in Glendale, Arizona, is an alternative option for rental companies to update their fleet while minimising their investment. Through the programme, Skyjack updates and paints the MEWPs to ensure they not only look new but also work well. It includes replacing machine components such as tyres, control box case, batteries, as well as resetting systems and pressures to original factory specifications. The refreshed units also come with a six-month parts and labour warranty. Models eligible for the programme include: SJIII 3215/19, SJIII 3220/26 and SJIII4620/26/32 electric scissor lifts. ■

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Porter Group to distribute Terex Trucks ADTs in Oceania

Terex Trucks has enlisted Porter Group to support and supply its Generation 10 TA400 and TA300 articulated dump trucks (ADTs) in Australia and New Zealand. With new headquarters in Hamilton, New Zealand, Porter Group is expanding its operations with an enlarged fleet of machines to maintain its position as the largest dealer of rental and sales equipment for construction and associated industries in the country. The deal, which enables Terex Trucks to strengthen its footprint in the region, will focus on Porter Group's sales arm, Porter Equipment.

Founded in 1945, Porter Group now has almost 40 branches in Oceania and distributes a range of ADTs, excavators, wheel and skid steer loaders, compactors, rock crushers, screens, harvester heads, conveyors, stackers, stock-pilers, shredders and feller bunchers. In addition to providing the sale and rental of equipment, Porter Group has subsidiary divisions for the supply of spare parts, servicing and repairs, transport haulage, hire of cranes and access equipment, and financing options. The company serves clients in a variety of industries including construction, quarrying and mining, forestry, recycling and landfill, roadbuilding and agriculture.

Porter Group's new headquarters is a significant investment that includes workshops and a spare parts depot. The company also has bases in Australia, Papua New Guinea and California in the US.

In its articulated hauler range, Terex Trucks makes three models with payloads from 25 to 38 t, and engine power outputs from 311 to 444 hp. The off-highway units are robust, reliable and offer flexible



Above: Terex Trucks Gen10 TA400 articulated dump truck.

Left: Simon Porter (on the left), business manager of Porter Group, with Paul Douglas, managing director of Terex Trucks.

transportation of materials for a variety of applications across the harshest of environments.

Of the ADT units to be distributed by Porter Group, the highest specification model is the Gen10 TA400, which was launched in 2016 and the first of a new era of haulers from Terex Trucks. ■

Tallest Genie boom lift now available in Thailand

Faster Enterprise Co Ltd, a Genie distributor in Thailand, has acquired a Genie SX-180 telescopic boom lift. This high reaching, self-propelled boom can extend up to 56.86 m - about 14 stories high.

Faster Enterprise was founded in Thailand in 1993 as an importer of machinery and equipment. In 2003, the company expanded and became a distributor of mobile elevating work platforms (MEWPs). "We have been receiving a lot of enquiries for booms that can go beyond 50 m for the past year. That motivated us to purchase the Genie SX-180 lift," said Worapat Bunluepanyadee, director of Faster Enterprise.

The Genie SX-180 boom has a lift capacity of 340 kg and a hydraulic platform with a 160° rotation. It comes with the new Genie XChassis design that extends and retracts to provide both stability on the job and a narrow profile for transport. It does not need over width or over heights permits when transported on a truck. ■



Staff from Faster Enterprise with its new Genie SX-180 boom lift.

Persada JCB has new HQ in Indonesia

Persada JCB has opened a new headquarters in Indonesia. Based in Palembang, Sumatera, the company's new US\$1 million facility provides businesses with access to JCB's entire family of machines - as well as specialist support and maintenance services. In 2015, JCB entrusted Persada to be its exclusive authorised distributor in the Sumatera region.

"We want our customers to understand for themselves how we can better support their businesses through this new facility. It means our technicians can take care of our customer's JCB machines, whatever their condition. By ensuring they achieve maximum uptime through parts availability or on-demand technical support, we are making good JCB's aim to make their lives easy in a hard world," said Anthony Azis, marketing director of Persada JCB.

The new facility is set over a 2,400 sq-m site. It also delivers other services such as on-site assistance, local spare-part services and the telematics-based machine monitoring system - LiveLink - which enables customers and Persada to track and maintain their machines. The full range of JCB machines is available at the new facility, comprising popular models like the 3CX and 3DX backhoe loaders, the JS205 and JS305 tracked excavators, and a range of telescopic handlers. The product offering is also expected to include the new JCB116 soil compactor, which delivers up to 15 percent fuel savings and vastly improved compaction performance against the outgoing model.

Persada has plans to open similar facilities in all of Sumatera's provinces including Jambi, Bengkulu, Aceh, Bangka & Belitung and Batam, by 2020. ■

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Leighton Asia wins projects in Hong Kong

Leighton Asia has been selected by Castle Peak Power Company Limited to deliver the civil works for the Black Point Power Station Combined Cycle Gas Turbine project in Hong Kong. Construction of the project is expected to be completed by mid-2019.

Works include excavation and lateral supports, deep shafts and pipe jacking for the delivery of a new cooling water intake and discharge facility including a new pumping station, underground cooling water pipelines, a maintenance shaft and the construction of a turbine hall that will be used to house the power generation equipment and associated facilities.

Located in the New Territories region of Hong Kong, Black Point Power Station is believed to be one of the world's largest gas-fired combined cycle power stations. It is owned by Castle Peak Power Company Limited, a joint venture between CLP Power Hong Kong Limited (70 percent) and China Southern Power Grid International (HK) Co Limited (30 percent).

In addition, Leighton Asia has been selected by the Government of Hong Kong to construct the East Kowloon Cultural Centre. Works include construction of a three-storey building, three studios with the capacity of between 120 and 250 seats, a 1,200-capacity auditorium, 550-seat theatre and under stage area, semi-basement areas for plant rooms, and other ancillary facilities. The project will also house a large rehearsal room, two connectable rehearsal rooms, a restaurant, box office, cloak room and enquiry counter. Construction was scheduled to start in May 2017 and is due to be completed in 2020. ■

One Bukit Senyum



One Bukit Senyum (above) is a new upcoming administrative and commercial hub in Johor, Malaysia, developed by Astaka Holdings Limited. Spanning 11.85 acres, the entire project has an estimated gross development value of RM5.4 billion with an allowable gross floor area of 6.3 mil sq ft. It is targeted to be completed by 2021.

The project comprises twin towers of service apartments (The Astaka @ One Bukit Senyum), as well as phase two of One Bukit Senyum, which includes a shopping mall, grade A office tower, five-star hotel, Johor Bahru City Council's headquarters, serviced apartments and residences.

Astaka Holdings is developing One Bukit Senyum through its 99.99 percent-owned subsidiary, Astaka Padu Sdn Bhd. The project is said to play a key role in Johor's transformation into a burgeoning metropolis of Malaysia. ■

600th machine for Want Access

Haulotte recently delivered an HT23 RTJ Pro 23 m telescopic boom lift to the Australian company Want Access. This unit is the 600th machine in Want Access' fleet, allowing the three year old access rental company to expand its offering and provide larger equipment to its customers.

The HT23 RTJ Pro features a lifting speed of just 56 seconds, rigid boom with fully proportional and simultaneous movements, single control for both steering axles, and Haulotte's ActivShield Bar for added safety. The boom lift is designed for high productivity, optimised maintenance time through easy access to all components as well as simple boom maintenance. The unit also has an exclusive modular basket, which is easy and quick to repair and ActivScreen onboard coloured monitor screen and diagnostic system. ■

Right: Haulotte machines on display at Want Access' facility.



Chris Ryan, Want Access' branch manager (left) with Paul Sultana, Haulotte's area manager for NSW/ACT.



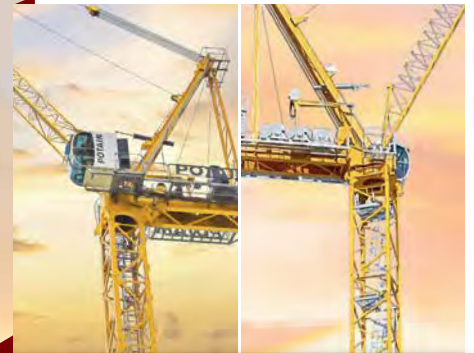
Gomaco appoints new sales representative for India



Sandeep Nirmal (left) has joined Gomaco as a new sales representative for India. With more than 23 years of sales and marketing experience in the

construction equipment industry, Mr Nirmal has gained experience with Gomaco's complete line of concrete paving equipment through his previous position as head of corporate sales with a Gomaco distributor.

"Sandeep has the knowledge and experience to start immediately with the growing demand for Gomaco products in India," said Kent Godbersen, Gomaco's vice president of worldwide sales and marketing. "This appointment is a welcomed addition to serving our customers and distributors in this important market." ■



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Case strengthens presence in Southeast Asian market

Case Construction Equipment, a brand of CNH Industrial, has reinforced its commitment to the Southeast Asian market with new facility expansions by its distributors and launch of new technologies.

The brand's distributor in Myanmar, Myanmar Synergy Co Ltd, recently opened a new facility in Yangon. The two-storey building on a 5.4-acre site is located in the Anawartha Industrial Zone in Hlaing Thar Yar Township, in western Yangon. With a total floor area of 43,200 sq ft, it features an extensive office area, a workshop with service and training facilities, a warehouse and a showroom.

In Thailand, Case has strengthened its presence through its local distributor, Watkinson Construction Equipment Co, which opened a new HQ in Rayong in February 2016 and serves its customers through various locations across the country. In mid-2016, Case selected Sunway as its full-line dealer in Malaysia, followed by Singapore in late 2016. And in March this year, Case appointed Tin Quang as its official importer for Cambodia, in addition to its existing dealer Cambodia Equipment Co Ltd.

Case products are available across Southeast Asia and the brand's regional distributors are managed through its regional head office in Bangkok, Thailand. "We have been very active in the region for more than 25 years, and we hold market leading positions with our award-winning backhoe loaders and skid steer loaders. Over the years we have developed a strong reputation, and have become a leading player for these particular product ranges. More recently, we have realigned ourselves with the Case global strategy to position ourselves as a full liner, and we started the process of introducing new products and services into the market, and the necessary network changes and expansion to realise this vision," explained Alvin Lim, Case's business director for construction in SE Asia, Pakistan and Japan.

"Indonesia and Malaysia are currently our biggest markets for backhoe loaders, while Thailand and the Philippines are growing fast, especially the demand for graders, compactors and excavators," added Mr Lim. "Throughout Asia, South Korea and Taiwan are also important as they our biggest markets for skid steer loaders."

Celebrating its 175th anniversary this year, Case has also launched innovative technologies for the Southeast Asian market, such as the SiteControl machine control solutions and SiteWatch telematics system. They were introduced at the Intermat ASEAN 2017 exhibition in Thailand, which took place earlier in June.

"We find that the Southeast Asian market is changing. Jobsite requirements are becoming increasingly demanding, projects' deadlines tighter and penalties for late completion increasingly incumbent, so more and more customers are shifting their focus from the initial investment of purchase to considering the machine's total cost of ownership," said Mr Lim.

He noted that due to such changes, users are now willing to explore advanced technologies, including Case SiteControl precision construction technology and SiteWatch telematics system. "The suite of SiteControl machine control solutions for excavators and motorgraders consists of Leica Geosystem's iCON software and the iXE2 2D machine guidance system. It provides smart, customisable machine positioning for road construction and civil engineering projects. As a result, customers can reduce time and costs on site while increasing accuracy and flexibility," explained Mr Lim.

"The Case SiteWatch telematics system enables fleet managers to monitor their equipment remotely, boosting productivity and reducing downtime. The system provides operating data that helps managers optimise their fleet utilisation, ensuring maximum productivity and



Alvin Lim (right), Case's business director for construction in SE Asia, Pakistan and Japan, together with Danilo Catalucci (left), Case's head of marketing in SE Asia, and Mark Brinn (centre), CNH Industrial's managing director for SE Asia, Pakistan and Japan.



The Case SiteWatch telematics system enables fleet managers to monitor their equipment remotely, boosting productivity and reducing downtime.



Above left: The Case SiteControl technology provides smart, customisable machine positioning for road construction and civil engineering projects.

Above right: Case machines at the Intermat ASEAN 2017.

efficiency across multiple projects."

Despite the rising challenges in Southeast Asia, Mr Lim remains positive about the prospects in the region. "There are millions of people that need to be housed, fed and transported, and the various industries that need to grow to support this, so there is plenty to be built. We have already seen some markets bottoming out, while others continuing their growth. In the medium-long term, Southeast Asia is set to continue growing." ■

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Aurecon plays role in Doha Metro project

Aurecon is involved in the Doha Metro project as design verification engineer for the Red Line South Underground – one of the six sections that make up the new metro system. The company is working directly for the joint venture handling the construction of the Red Line, RLS-JV, which includes Qatari Diar, Vinci Construction, GS Engineering and Construction, and Al Darwish Engineering. Aurecon's engineering consultancy includes a number of elements: bored tunnels, geotechnical, structural and architectural work. The company is also reviewing all MEP work, as well as fire and life safety elements of the design.

“The Metro is the biggest infrastructure project ever undertaken in Qatar, so it's attracting a lot of attention, and the scale of the project plus the tight schedule and number of firms involved all add to the challenge,” said David Moore, Aurecon's project leader for the Doha Metro Red Line South Underground. “It's also a unique development in terms of its appearance, particularly its interior. Once complete, the Metro will be one of the most visually stunning transport developments in the world, which will undoubtedly make it a tourist attraction in itself.”

The geotechnical work, in particular, has called for special attention. All concrete elements in the construction have to conform to strict local standards, with durability requirements typically above those of other regions. For instance, Doha's high salt levels in its air and water means that construction materials have to be assessed for their detrimental effect.

Coordination is vital too. With such a large-scale system being constructed simultaneously, a variety of project management companies, engineering consultants and contractors have to collaborate closely to ensure work proceeds to schedule. Qatar Rail is also driving consistency across the design. This means work must be regularly reviewed and realigned to meet the latest requirements. To ensure it satisfies client needs, Aurecon holds regular workshops to discuss any changes and maintain the professional integrity of the development.



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Aurecon has been appointed as design verification engineer for the Doha Metro Red Line South Underground project.

The branding architecture on the project is also very specific and of a high standard. Architecturally, the stations will reflect the heritage of the country, with a ‘vaulted spaces’ design inspired by traditional Bedouin tents, giving the rail network its striking finished appearance.

The Red Line South Underground section that Aurecon is working on covers 16 km of twin-bored tunnels, with multiple cross passages, five underground stations, and the same number of switchboxes and emergency exit shafts. It will link with other lines in the network, including the Red Line North, Green Line and Gold Line.

The Doha Metro is scheduled to open in 2020 and will be a vital transportation network when Qatar welcomes the world's football fans for the World Cup 2022. It will link all of the city's major hubs as well as providing a fast link to the airport. Its creation will also facilitate the development of several new hubs or districts planned for the city. With about 100 stations and over 219 km of rail line, the Doha Metro is also one of the world's largest metro systems currently under construction. ■

Major Terex tower crane order from Crane World Asia

Singapore-based tower crane rental, sales and service specialist Crane World Asia (CWA) is expanding its fleet with the addition of 13 new Terex CTL 260-18 luffing jib tower cranes. This order follows the company's recent purchases of one CTL 650F-45 luffing jib tower crane in May and 17 CTL 260-18 tower cranes in the first quarter of 2017. In total, CWA has bought more than 60 units new luffing jib tower cranes in a span of two years.

“The CTL 260-18 is the most popular model we sell and rent, it has been a very reliable machine and our customers are very satisfied with it,” said Roger Poon, director at Crane World Asia. “It's widely used in South Korea and in other countries we provide equipment to, including Singapore, Taiwan and Hong Kong.” The CTL 260-18 tower cranes have a 3.1-t lift capacity at maximum jib length of 55 m.

CWA specialises in sales and rental of brand new and used tower cranes. For operational fields, the company provides related services in erecting, dismantling, commissioning, servicing, maintaining, jacking up/down and transporting tower cranes. CWA also supplies spare parts for Terex tower cranes. All its used tower cranes are fully reconditioned, inspected and in good working condition. ■



Crane World Asia is expanding its fleet with the addition of 13 new Terex CTL 260-18 luffing jib tower cranes.



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SNC-Lavalin completes acquisition of Atkins

Canada-based SNC-Lavalin has completed its acquisition of Atkins, creating a global fully integrated professional services and project management company – including capital investment, consulting, design, engineering, construction, sustaining capital and operations and maintenance. Together, both companies will have over 50,000 employees and annual revenues of approximately C\$12 billion.

The acquisition increases SNC-Lavalin's customer base, geographic reach and scale, making it a global player with more balanced revenue coverage worldwide, while strengthening its position globally to develop and capitalise on the infrastructure, rail and transit, nuclear and renewables markets.

Atkins is one of global consultancies in design, engineering and project management, with a leadership position across the infrastructure, transportation and energy sectors. Headquartered in the UK, Atkins has approximately 18,000 employees in the US, Middle East and Asia, together with a leading position in the UK and Scandinavia.

“SNC-Lavalin is continuing to deliver on its strategy of

establishing itself in the top three in our industry globally. By combining our two highly complementary businesses, we are solidifying SNC-Lavalin's position as one of the largest fully integrated professional services firms in the world, while improving our margins and balancing our business portfolio,” said Neil Bruce, SNC-Lavalin's president & CEO.

Heath Drewett, group finance director and executive director of Atkins, now becomes president of Atkins - SNC-Lavalin's fifth business sector - and a member of SNC-Lavalin's executive committee, reporting directly to Mr Bruce.

“Joining SNC-Lavalin will provide us with the ability to offer our clients and employees the enhanced scale, capabilities, expertise and other benefits that come with being part of a larger and stronger global company,” said Mr Drewett. “At the same time, we look forward to bringing our own unique project management, design, consulting and engineering capabilities to SNC-Lavalin's clients. The result will be a more agile and responsive company that better meets client needs and creates cross-selling opportunities.” ■

Volvo CE appoints new president



Melker Jernberg (left) has been named president of Volvo Construction Equipment (Volvo CE) and member of the Volvo Group executive board.

Mr Jernberg is currently president and CEO of Sweden-based powder metallurgy company Höganäs AB. Prior to this, he held the position of executive VP and head of

business area EMEA at Swedish-based steel manufacturer SSAB. Mr Jernberg will assume his new position on 1 January 2018.

Mr Jernberg replaces Martin Weissburg, who due to family reasons has decided to move back to the US and will take up a position as senior advisor to Volvo's president and CEO Martin Lundstedt. Mr Weissburg will be stationed in Greensboro, USA.

“Martin Weissburg has through his strong leadership been key to considerably improve the performance of Volvo Construction Equipment and he will continue to have senior positions within the Volvo Group. Martin Weissburg will remain in his position until year end 2017 and will take up his new position as senior advisor to me during the course of Q1 2018,” said Mr Lundstedt. ■

Vinci Construction awarded contract for Grand Paris Express rail network

The joint venture of Vinci Construction (lead company) and Spie Batignolles has been awarded a civil engineering contract by the Société du Grand Paris for the Grand Paris Express project. It will cover the construction of Noisy-Champs station, a carriage storage area, and a road bridge over the RER A regional express line tracks. The new station will eventually connect Line 16, Line 11 and the RER A regional express line. The contract includes the metal frame, glazed facades and various metal-frame pedestrian walkways (stairs, footbridges, etc).

Due to its heavy traffic and key role in regional development, the new Noisy Champs station is said to be one of the nine ‘iconic’ Grand Paris Express stations. Vinci highlighted a large number of challenges for the project: the joint venture must enable the existing station to continue to operate throughout the project, and it will have to contend with particularly complex logistics in a restricted urban environment while meeting a demanding schedule.

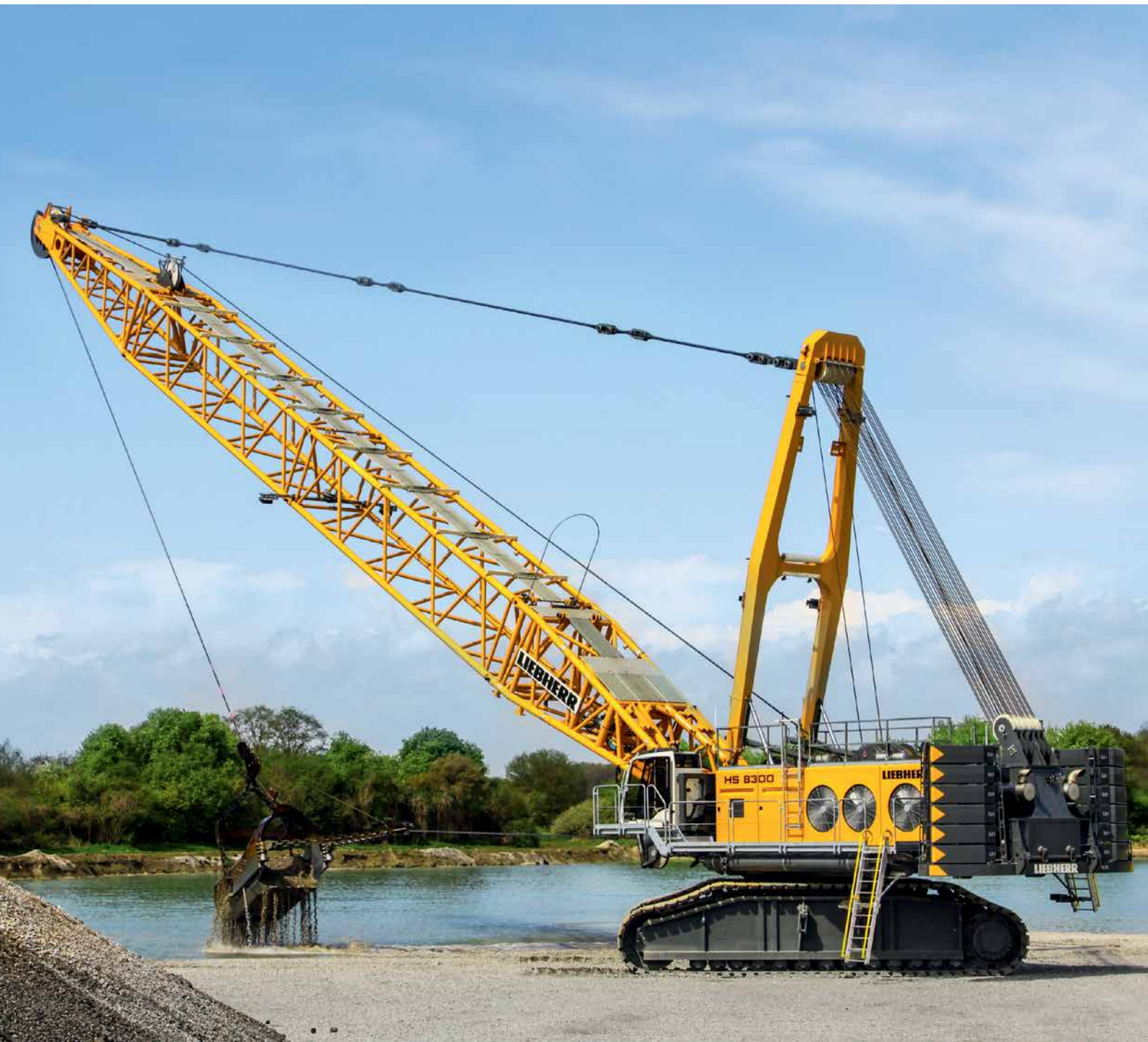
The building's distinctive architecture by Jean-Marie Duthilleul includes a helical dome. The dome and the metal walkways will require 1,650 t of steel, the weight of the first level of the Eiffel Tower. And to help protect the environment, a storm water basin



The joint venture of Vinci Construction and Spie Batignolles has won a contract for the Grand Paris Express project, covering the construction of Noisy-Champs station, a carriage storage area, and a road bridge over the RER A regional express line tracks.

will be built at the site and all recovered water will be recycled to supply the concrete and mud plants for the worksite. The project is also expected to represent more than 680,000 man-hours of work overall, said Vinci. ■

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20 to 23 Sept 2017	BICES 2017 New Beijing International Exhibition Center Beijing China	CCMA, CNCMC & CCPIT-MS C Tel: +86 10 52220946, Fax: +86 10 51183612 Email: info@e-bices.org Website: www.e-bices.org
24 to 26 Oct 2017	Singapore Construction Productivity Week (in conjunction with BuildTech Asia 2017) Singapore Expo Singapore	Building and Construction Authority/Sphere Exhibits Tel: +65 6319 4037, Fax: +65 6319 6140 Email: bca_scpw@bca.gov.sg/buildtechasia@sph.com.sg Website: www.scpw.sg/www.buildtechasia.com
31 Oct to 3 Nov 2017	APEX Asia 2017 Shanghai New International Expo Centre Shanghai China	KHL Group Tel: +44 1505 850 043 Email: murray.pollok@khl.com Website: www.apexasiashow.com
2 to 4 Nov 2017	OneBuild 2017 Kuala Lumpur Convention Centre Kuala Lumpur Malaysia	One International Exhibition Sdn Bhd Tel: +603 8943 7488, Fax: +603 8943 7599 Email: enquiry@oneinternational.com.my Website: www.oneinternational.com.my
8 to 10 Nov 2017	Big 5 Construct Indonesia 2017 Jakarta Convention Centre Jakarta Indonesia	dmg events Tel: +971 4 44380355 Email: info@konstruksiindonesiabig5.com Website: www.konstruksiindonesiabig5.com
30 Nov to 2 Dec 2017	Myanbuild 2017 MEP Mindama Yangon Myanmar	AMB Tarsus Events Group Tel: +603 2692 6888 Email: ei@ambtarsus.com Website: www.myanbuild.net
4 to 6 Dec 2017	World of Concrete Asia Shanghai New International Expo Centre Shanghai China	Informa Exhibitions Tel: +86 21 2326 3669 Email: info@wocasias.com Website: www.wocasias.com
6 to 9 Jan 2018	Philconstruct SMX Convention Centre Manila World Trade Centre Metro Manila The Philippines	Global-Link Exhibitions Specialist Tel: +63 2 893 7973, Fax: +63 2 550 1148 Email: philconstruct@globalinkmp.com Website: www.philconstructevents.com
15 to 18 Mar 2018	Megabuild 2018 Jakarta Convention Centre Jakarta Indonesia	PT. Reed Panorama Exhibitions Tel: +62 2556 5000 Email: steven.chwee@reedpanorama.com Website: www.megabuild.co.id
27 to 30 Nov 2018	Bauma China 2018 Shanghai New International Expo Centre Shanghai China	Messe München GmbH Tel: +49 89 949 20251, Fax: +49 89 949 20259 Email: info@bauma-china.com Website: www.bauma-china.com
Date	Events outside Asia	Organiser & Contact
26 to 29 Nov 2017	The Big 5 2017 Dubai World Trade Centre Dubai UAE	dmg Events Tel: +971 4 438 0355 Email: info@thebig5.ae Website: www.thebig5.ae
23 to 26 Jan 2018	World of Concrete 2018 Las Vegas Convention Centre Las Vegas, Nevada USA	Informa Exhibitions Tel: +1 972 536 6379 Email: info@worldofconcrete.com Website: www.worldofconcrete.com

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First Intermat ASEAN ends on positive note

The first edition of Intermat ASEAN, which took place from 8 to 10 June 2017 at the Impact Exhibition and Convention Centre in Bangkok, Thailand, attracted 4,680 visitors from 43 countries, as well as more than 300 exhibiting brands and companies from 17 countries.

About 20 percent of the visitors came from countries outside Thailand, such as China, Cambodia, India, Japan, Korea, Malaysia, Myanmar, Singapore and Vietnam, among others. “We came to Intermat ASEAN to explore more sources and suppliers to serve to our market in Hong Kong; and here is the best opportunity for us to receive updated information and network with the suppliers at the show,” said Lucien Au, director of Global Engineering Supply Company Ltd.

In addition to an indoor exhibition area, the show featured an outdoor exhibition and demonstration area showcasing machines and equipment from both local and international exhibitors. The live demonstrations were conducted by Case and JCB, which offered visitors with an opportunity to test-drive and experience the power and efficiency of their machines in real-life worksite conditions.

Intermat ASEAN 2017 also hosted several closed-door sessions, including seminars and meetings for the China-ASEAN Business Council and The Association of Thai Concrete Product Industry.

“This new exhibition delivered the possibility for us to demonstrate our wide range of machines, as well as to show customers



Top and above: The inaugural Intermat ASEAN held in June 2017 in Bangkok, Thailand, drew 4,680 visitors from 43 countries including China, Cambodia, India, Japan, Korea, Malaysia, Myanmar, Singapore and Vietnam, to name a few.



Above and below: Beside an indoor exhibition area, the show also featured an outdoor exhibition and demonstration area.



our latest innovative operating technologies, across many industry sectors. Case is delighted to have played such a central role in establishing this important new exhibition, as the leading sponsor of the event,” commented Alvin Lim, business director for Southeast Asia, Pakistan and Japan at Case Construction Equipment.

Intermat ASEAN is jointly organised by Comexposium and Impact Exhibition Management. The show is also supported by several industry associations from across the region, including: the Department of Highways (DOH); Department of Public Works and Town & Country Planning (DPT); Expressway Authority of Thailand (EXAT); Royal Irrigation Department (RID); Thai Contractors Association under H.M. the King’s Patronage (TCA); ASEAN Construction Federation (ACF); Thailand Convention and Exhibition Bureau (TCEB); Construction Institute of Thailand, Department of Rural Roads; International Facilities Management Association; Philippines Contractors Association; Penang Master Builders & Building Materials Dealers Association; Thai Machinery Association; The Malaysia Heavy Construction Equipment Owners’ Association; The National Metal and Materials Technology Centre; The Singapore Institute of Building Limited; Vietnam Association for Building Materials; and Vietnam Concrete Association. ■

Website: asean.intermatconstruction.com

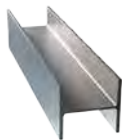
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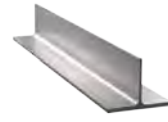
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Bentley to hold Year in Infrastructure 2017 in Asia

Bentley Systems will hold its next Year in Infrastructure Conference in Asia for the first time. Taking place from 10 to 12 October 2017 at the Sands Expo and Convention Centre (Marina Bay Sands) in Singapore, the event will see a global gathering of leading figures in the world of infrastructure design, construction and operations. It features a series of presentations and interactive workshops that explore the intersection of technology and business drivers and how they are shaping the future of infrastructure delivery and asset performance.

The event serves as a great opportunity to learn about best practices in advancing collaboration and technological innovation among the engineering, architectural, construction and operations disciplines, and benefit from networking opportunities with industry peers and thought leaders from around the world.

The Be Inspired Awards programme is set to be the highlight of the event. It will celebrate nominees in 17 BIM Advancement categories, recognising the juries and projects at the annual Be Inspired Awards ceremony that closes the event.

The conference will also include a new Alliance Partner Pavilion, with live application and technology presentations from Microsoft, Siemens, Topcon and Bureau Veritas. Attendees can meet with Bentley's Alliance Partners to learn how they provide advanced solutions together – whether it is leveraging reality modelling to converge engineering and inspection, connecting workflows for construction engineering, offering a best-in-class cloud strategy that encompasses private and public clouds and on-premises deployments, or enabling the digital enterprise by supporting open access to the IoT.

Bentley Systems has contributed to the advancement of infrastructure in Southeast Asia over the years through many projects. Most recently, the Singapore Land Authority (SLA) used Bentley software to create and maintain a high-resolution 3D model of the entire country as part of its Smart Nation initiative.

"I have long admired Singapore for its innovative use of technology in the delivery and operation of infrastructure, and now it is leading the world with its BIM advancements," said Greg Bentley, CEO of Bentley Systems. "In 2015, Singapore was designated the most 'Tech-Ready Nation' by The World Economic Forum's Global Information Technology Report. Adding to Marina Bay Sands' unrivaled conferencing facilities and luxurious accommodations is its spectacular structural design and engineering. We are proud to note that this extraordinary building was structurally engineered using Bentley Systems software." The structural design of the Marina Bay Sands was done by Arup and was the 2010 Be Inspired Award winner for Innovation in Structural Engineering.

Founded in 1984, Bentley Systems is a global leader in providing engineers, architects, geospatial professionals, constructors and owner-operators with comprehensive software solutions for advancing the design, construction and operations of infrastructure. Since 2009, the company has invested more than US\$1 billion in research, development and acquisitions.

Bentley users leverage information mobility across disciplines and throughout the infrastructure lifecycle to deliver better-performing projects and assets. Bentley solutions encompass MicroStation applications for information modelling, ProjectWise collaboration services to deliver integrated projects, and AssetWise operations services to achieve intelligent infrastructure – complemented by worldwide professional services and comprehensive managed services. ■

Website: www.bentley.com/en/yji/home



Above, left and below: Bentley's Year in Infrastructure 2017 will take place from 10 to 12 October at the Sands Expo and Convention Centre (Marina Bay Sands) in Singapore.



The Be Inspired Awards programme will be the highlight of the event. It will celebrate nominees in 17 BIM Advancement categories, recognising the juries and projects at the annual Be Inspired Awards ceremony that closes the event.

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GII Summit explores future of construction industry

The fourth Global Infrastructure Initiative (GII) Summit took place from 24 to 26 May 2017 at in Singapore, marking the first time the event was held in Asia since it started in 2012. Previous summits include Istanbul, Turkey in 2012; Rio de Janeiro, Brazil in 2014; and San Francisco, USA in 2015.

Organised by McKinsey & Company, the GII Summit is an invite-only event for CEO- and ministerial-level leaders to explore new solutions for global infrastructure, inspired by innovative approaches globally. This year, participants comprised more than 200 world leaders from various countries.

Belt and Road 'will benefit global construction industry'

One of the highlights of the Summit was a presentation by Liew Mun Leong, chairman of Surbana Jurong and Changi Airport Group, on the importance of China's Belt and Road Initiative (BRI).

As the Trans-Pacific Partnership (TPP) is unlikely to come into force, "we are now left with only one stimulus to serve as the engine of global economic growth, that is BRI," said Mr Liew. BRI is arguably the most ambitious plan of the century - in terms of its size, economy and geographical spread - which aims to connect 65 countries covering about 65 percent of the world's population and one third of global GDP.

Although some have doubts whether China can deliver the plan, Mr Liew said that China's significant improvements throughout 35 years are a testament to the country's ability, and is currently the world's second largest economy. "Over the past decades, China has convincingly demonstrated its capability to deliver large-scale projects successfully. I have seen too many of China's dreams and works and how they have become a reality in an incredibly short time, and therefore learned not to underestimate China."

Mr Liew continued, "It may be that BRI will increase China's dominance and influence. Any country that invests or trades heavily with another country is bound to have some degree of political or even cultural impact on the host country. It's inevitable."

However, Mr Liew believes that the potential benefits (direct or indirect) for other BRI host countries will likely outweigh any concern of China's global dominance. "The implementation of BRI itself has the potential to create growth, demands and jobs and therefore helps to dampen protectionist sentiments. For developing countries, growth is even more crucial," he said.

Mr Liew further stressed that, from an economic point of view, BRI will bring benefits to all parties – including China, developing countries as well as developed countries. "Big players in the construction industry will have huge opportunities in BRI projects."

3D printing: game changer for construction industry

In addition, Ma Yihe, chairman and founder of Shanghai-based Winsun 3D Printing, explained why 3D printing technology has the potential to revolutionise the traditional construction method.

Winsun is considered a pioneer in construction 3D printing. Among the company's projects were a 3D-printed low-rise 1,100 sq m building in China as well as a five-storey tall building – the latter is believed to be the tallest 3D-printed structure in the world, with a total installation time of just 15 days.

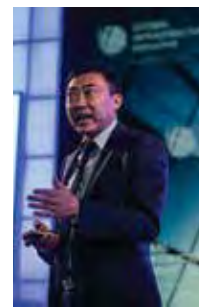
Mr Ma admitted that 3D printing technology is still in its initial stages and can be difficult to apply to projects located in remote areas since the printing of the components has to be carried out off-site. However, there are a lot of long-term benefits gained from the



The fourth GII Summit took place from 24 to 26 May 2017 in Singapore, marking the first time the event was held in Asia.



All images © McKinsey & Company



Above: Singapore's Finance Minister Heng Swee Keat also joined the event.

Far left: Liew Mun Leong, chairman of Surbana Jurong and Changi Airport Group.

Left: Ma Yihe, chairman and founder of Winsun 3D Printing.

technology compared to the traditional construction method, he said. These include shortening construction duration by 50 to 70 percent, saving manpower by 50 to 80 percent, saving construction materials by 30 to 60 percent and saving overall construction cost by at least 50 percent, as well as reducing dust and noise levels. Mr Ma added that 3D printing technology also allows the creation of complex facades and designs that are not possible with the traditional method. Plus, it produces high quality results; for example, a 3D-printed wall can withstand up to 28 t of pressure.

Lastly, Mr Ma advised that in order to drive the adoption of 3D printing technology, there are several things that the industry can do, such as working with governments and statutory bodies to modernise regulatory framework; convincing architects and engineers to use 3D printing technology for more than just architectural applications; working with contractors to break skepticism and encourage pilots and test beds; focusing R&D investments on portable printers to enable printing on-site and access projects away from robust road links; and fighting desertification by using sand in construction 3D printing. ■

Website: www.globalinfrastructureinitiative.com/summit

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Raising safety awareness in HK aerial platform industry

In its efforts to support the safe and effective use of powered access equipment in Hong Kong, Shing Fung Engineering & Equipment recently partnered with Crown Motors and Tadano to organise a truck-mounted aerial platform open day. The event took place at the Shing Fung Film Studio in Sai Kung in July 2017, showcasing a range of Tadano aerial platforms and Hino special purpose vehicles.

Shing Fung, an official distributor of Tadano in Hong Kong, presented three models of the AT-series including the AT-255CG, AT-195CG and AT-157CG, with their upper structure mounted on the chassis of Hino vehicles. These models are equipped with safety features such as automatic working area limiter (AMC) and boom profile monitor system. They have a maximum working height of 27.5 m, 21.5 m and 17.7 m respectively.

The International Powered Access Federation (IPAF) joined the event, represented by Raymond Wat, regional general manager of IPAF South East Asia, to demonstrate a pre-inspection on truck-mounted aerial platforms. Ringtone Chai, Shing Fung's IPAF certified demonstrator, also performed a quality safety check based on the IPAF standard and guidance of Hong Kong Occupational Safety and Health Branch Labour Department.

"By having a pre-inspection demonstration



Left and below left: Shing Fung recently held a truck-mounted aerial platform open day to promote the safe and effective use of powered access equipment in Hong Kong.

Below: IPAF joined the event to demonstrate a pre-inspection on truck-mounted aerial platforms.



at our open day, we enhanced the safety awareness on powered access aerial platforms for Hong Kong users," said Masanori Mitani, general manager of Tadano.

"By the end of 2017, we will be launching

AT-300CG, with a maximum working height of 32 m," added Kindwind Wu, CEO of Shing Fung. "We will continue our role to promote the safe and effective use of truck-mounted aerial platforms to Hong Kong users." ■

MEWP fatalities decline as global rental market grows

The fatal injury rate (FIR) for mobile elevating work platforms (MEWPs) declined in 2016, despite the fact that the total MEWP rental fleet and the number of rental days worldwide increased significantly over the same period, according to IPAF.

The data indicate that in 2016 there were 66 reported fatalities involving MEWPs worldwide, compared to 68 deaths reported in 2015. During the same period, the size of the global MEWP rental fleet rose from an estimated 1.17 million units at the end of 2015 to 1.25 million units estimated at the end of 2016.

In 2015, the number of on-hire rental days was 192.2 million and the number of reported fatalities was 68, giving a FIR of 0.035 per 100,000 operating days. In 2016, the number on-hire rental days rose to 206.1 million and the number of reported deaths was 66, giving an effective fatal injury rate of 0.032 per 100,000 operating days. This

is equivalent to one fatal incident every 3.2 million operating days.

Of the 66 reported MEWP fatalities in 2016, the main causes were falls from height, electrocution, entrapment and overturn of machinery.

Chris Wraith, IPAF's safety & technical executive, commented, "It is disappointing to see the same main causes of fatalities being repeated year on year, which suggests that the industry as a whole is not learning the lessons from previous incidents – in 2016 falls from height accounted for 38 percent of the reported fatalities and electrocution 23 percent. There were fewer fatal overturns (12 percent of total fatal incidents, as opposed to 27 percent in 2015), but entrapments accounted for a higher proportion of the reported deaths (18 percent) than the year before. In 2015 electrocution and entrapment both accounted for around 15 percent of the total reported fatalities."

He continued, "Investigations show that accidents are most often due to management failings or operator error, which can in almost all cases be anticipated and avoided, or at least mitigated. This is why in 2017 IPAF is pursuing its 'back to basics' safety agenda, reminding operators and managers of the need for good risk assessment, choosing the right equipment for the job, proper training for users and supervisors, sound technical and safety guidance and a robust incident reporting regime under which lessons are learned and shared across the business and the wider industry."

Tim Whiteman, CEO of IPAF, added, "It is worth pointing out that MEWPs are still by far the safest way to work at height, and overall it is encouraging that the fatal injury rate declined last year even as the global MEWP rental market increased in terms of size and total operating hours." ■

Website: www.ipaf.org/accident

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Rockmore introduces new tubeless DTH hammer

Rockmore International has introduced the latest addition to its T-series DTH hammer line, the ROK 550T. The company's T-series DTH hammers are 'tubeless' and utilise drill bits with industry standard shank connections without the embedded plastic blow tube/foot valve.

The first T-series DTH model launched by Rockmore was the ROK 600T, a 6-in class model that uses a tubeless QL6/QL60 bit shank. Last year the company released its ROK 60T-360T hammers that utilise the IR 360 bit shank without the blow tube/foot valve. Rockmore is now extending the T-series with the new ROK 550T, a 5-in class hammer model that uses the industry standard QL5/QL50 bit shank, but with the blow tube/foot valve removed. With high performance drilling characteristics rated for drilling 140 to 152 mm diameter holes, the ROK 550T is suitable for blast-hole applications in the construction and mining sectors and for deep hole drilling in the water-well and geothermal sectors.

The new ROK 550T also features Rockmore's SonicFlow technology, which optimises airflow by simplifying and streamlining the air paths to minimise back flow and turbulence, thus delivering



more energy to the piston. Field testing of the SonicFlow design was determined to result in faster penetration rates and greater overall DTH hammer efficiency. ■

more energy to the piston. Field testing of the SonicFlow design was determined to result in faster penetration rates and greater overall DTH hammer efficiency. ■

Website: www.rockmore-intl.com

Hella lighting solutions for construction industry

The new Ultra Beam LED Gen II from Hella has a light output of 4,000 lumens. It offers low power consumption and high durability, no maintenance and a light colour close to daylight, which prevents fatigue and allows switching the low-beam lights on and off under various lighting conditions and in specific situations such as in tunnels.

This work light can be used for close-range as well as long-range illumination and is also available with ZeroGlare light distribution. The ZeroGlare system specifically aims light from the LEDs towards the ground in front of the vehicle, creating a clear-cut boundary between light and dark. This means that drivers of oncoming vehicles are not distracted, which increases the safety and comfort.

There is also a Mining version, called RokLUME series. It is suited to tough conditions in a mining environment. Quality materials like the impact resistant hard-coated polycarbonate lens and the premium anti-corrosion aluminium housing ensure a long lifetime and maintenance-free lighting product. The heavy-duty stainless steel bracket and the rubber dampening system keep everything in check from vibration.

In addition, the new RotaLED Compact is an LED successor to Hella's existing halogen beacon series comprising Rotafix, Rotaflex and Rota Compact. Thanks to its compact



Hella's Ultra Beam LED Gen II (left) and RotaLED Compact (above).

design, the beacon series is especially suitable for construction and agricultural machines as well as communal vehicles.

The new RotaLED Compact beacon also provides the benefits of LED technology, such as maintenance-free and excellent durability. According to Hella, Halogen beacons have a service life of approximately 1,000 to 2,000 hours, while LED lights exceed that many times.

RotaLED Compact can be mounted at the identical positions to the existing halogen beacons. Rotafix, Rotaflex and Rota Compact can therefore be easily exchanged with RotaLED Compact. Overall, the RotaLED Compact product family offers three different assembly options: apart from magnetic and

fixed mounting, it can also be attached using flexible pipe sockets. The flexible base absorbs impacts and shocks, e.g. by branches and twigs. This will cause the beacon to bend before it returns to the original position, thus reducing the damage risk during usage.

A special protection mechanism helps as well: the rubber base's interlocking is released during extreme inclinations of more than 30 degrees. Afterwards, the beacon can be put back in its original place by releasing three pipe socket screws. What's more, RotaLED Compact's smooth, impact-resistant light dome from polycarbonate is resilient against dust, dirt and impact, making it ideal for use on construction sites. ■

Website: www.hella.com

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Innovative piling and drilling rig from Liebherr

Liebherr's new LRB 16 is an all-round piling and drilling rig for diverse applications within the deep foundation sector. It features a compact design with an operating weight of barely 48 t, resulting in low ground pressure. The robust undercarriage offers excellent stability, which can be further increased with optional rear supports.

Innovative hydraulic concepts play a decisive role and, despite reduced engine power, the machine achieves high performance but at the same time keeps fuel consumption low, said Liebherr. The new piling and drilling rig is powered by a Liebherr diesel engine. It has a mere 390 kW and meets with the currently valid emission regulations. In comparison to earlier models, the LRB 16 has a reduced engine speed of about 1,700 rpm.

The parallel kinematics, which have been installed in many piling and drilling rigs from Liebherr, have a large working area and enable the leader to be folded back. The rigid leader of approximately 12.5 m absorbs high torque and is fitted with a rope crowd system for high pull forces of up to 200 kN. Furthermore, the quick connection system allows for the rapid fitting or exchange of working tools.

The LRB 16 can be easily transported in one piece, including mounted counterweight, and has a transport weight of only 43.5 t.

This ensures quick set-up on site as well as flexibility in transferring the machine between different jobsites. As an option the complete loading and set-up processes can be carried out via remote control, which means only one person is required.

The new LRB 16 is also equipped with advanced control and assistance systems. Attachment recognition offers time recording for the respective attachment, among other things. The performance figures are also transmitted with the help of LiDAT, Liebherr's own data transmission system. An improvement for slurry wall application is the obstacle recognition, which enables the timely recognition of obstacles in the soil. This protects both the attachment and the basic machine. Furthermore, cruise control is available for automatic drilling processes and allows for values such as pulldown speed and rotational speed to be programmed in advance.

One of the most frequent types of application for the LRB 16 is the installation of slurry walls with the aid of Liebherr LV 20 vibrator. The machine is also suitable for other common foundation works including drilling with continuous flight auger, double rotary head or Kelly bar, soil mixing, and piling work with a hydraulic hammer. ■

Website: www.liebherr.com



Left: Rendering of an LRB 16 with vibrator installing a slurry wall.

Above: An LRB 16 drilling with double rotary head on a jobsite in Luzern, Switzerland.

Himoinsa has four new 600 kVA generator models

Himoinsa has added four new 600 kVA models that can operate in any market to its series of generator sets with FPT engines. For the 50 Hz market, the HFW-600 T5 and its rental version, the HRFW-600 T5, supply 600 kVA in PRP and 659 kVA in stand-by. For 60 Hz markets, the series includes the HFW-550 T6 and HRFW-550 T6 models, with power of 625 kVA in PRP and 690 kVA in stand-by.

The four models incorporate the new CR16TE1W engine from FPT. Their specific consumption is 191 g/kWh, i.e. 115 l/h at 100 percent power, up to 17 percent lower than other generator sets of similar power, according to Himoinsa.

Another notable feature is their service intervals, which is especially important for machinery rental companies. They last up to 200 hours longer than other generators, said Himoinsa. In addition, with an oil tank of just 32 l, they can operate continuously for 600 hours without needing an oil change. Their engine is more compact and allows for a smaller canopy to be used, which is easier to transport, thus fulfilling another requirement of the rental sector.

With this addition, Himoinsa's HFW series now ranges from 30 to 600 kVA. Following an update of FPT's C13TE7 engine, the company recently changed the name of the HFW-490 T5 and of the



Himoinsa has added four new 600 kVA models to its series of generator sets with FPT engines. One of them is the HRFW-600 T5 for the 50 Hz market (above).

HRFW-490 T5. Both generators now offer increased power of 501 kVA in PRP, instead of 489 kVA. From now on they will be called HFW-500 and HRFW-500, respectively. ■

Website: www.himoinsa.com

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New Bomag BW 211 DH-5 vibratory roller

Bomag's new BW 211 DH-5 single drum vibratory roller boasts a dual pump drive system, allowing the machine to climb grades as steep as 60 percent. It is suitable for heavy earthworks compaction projects such as landfill cell construction, roadwork and dams. The efficient drive system dedicates one travel pump for drum drive and a separate pump for the rear axle, which includes no-spin differential lock, so the machine delivers enhanced gradeability in both forward and reverse travel directions.

Built for high-production compaction of mixed soils, gravel and rock fill at depths reaching 701 mm, the BW 211 DH-5 roller features a balanced front-to-rear-frame weight distribution and high compaction forces. Its dual frequency, dual amplitude vibratory system matches compaction output to site needs. Setting the drum to 30 Hz with amplitude of 1.9 mm efficiently compacts high lift thickness. For increased productivity when compacting thinner lifts, the operator can set the vibration system to 34 Hz and a 1.0-mm amplitude.

By matching engine speed to the task at hand, standard Ecomode speed control lowers fuel consumption by up to 30 percent versus operating at continuous high idle and reduces noise levels for more comfortable operation. Contractors can lower fuel consumption even more and reduce engine wear by equipping the machine with the optional Bomag Ecostop function, which automatically shuts down the engine after a defined idle period.

The new machine design concept for the BW 211 DH-5 roller is focused on lowering total cost of ownership. In addition to the fuel-saving engine technology, contractors achieve savings through longer

machine service intervals and maintenance-free component designs. The roller's simple, operator-friendly concept features a control panel similar to that of other Bomag compactors, reducing the time and cost for training new operators. Additionally, available compaction measuring technology, such as the optional Bomag Economizer and Terrameter, let the operator know when optimum soil stiffness is achieved, eliminating unnecessary fuel- and time-consuming passes and the potential for over compaction and costly material replacement.

The BW 211 DH-5's maintenance-free, 35-degree articulation joint requires no lubrication to improve machine uptime and features up to 12 degrees of oscillation to keep the drum and wheels in constant contact with the ground when encountering irregular terrain, improving compaction performance. The roller's wide-opening, hinged hood grants unobstructed access to the engine and components for fast servicing, while all cables are protected against damage to improve machine reliability. Reached from ground level, oil dipsticks, filters and machine fill points are quickly accessed to shorten the daily maintenance routine.

The roller's spacious cab offers excellent all-around visibility of the work area to improve compaction efficiency and operating safety. A fully adjustable seat and adjustable steering wheel column provide a custom fit to each operator, and operating controls feature logical gauge positioning for self-explanatory operation, boosting comfort and productivity. Mounted on rubber buffers, the operator's platform isolates machine vibration from transferring to the operator for fatigue-free operation, even during long shifts. ■

Website: www.bomag.com



Left and right: The new Bomag BW 211 DH-5 single drum vibratory roller boasts a dual pump drive system, allowing the machine to climb grades as steep as 60 percent.

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10Kg*

IP6K9K

200G*

18/52V

240W



Comansa CM adds new model to CML luffer range

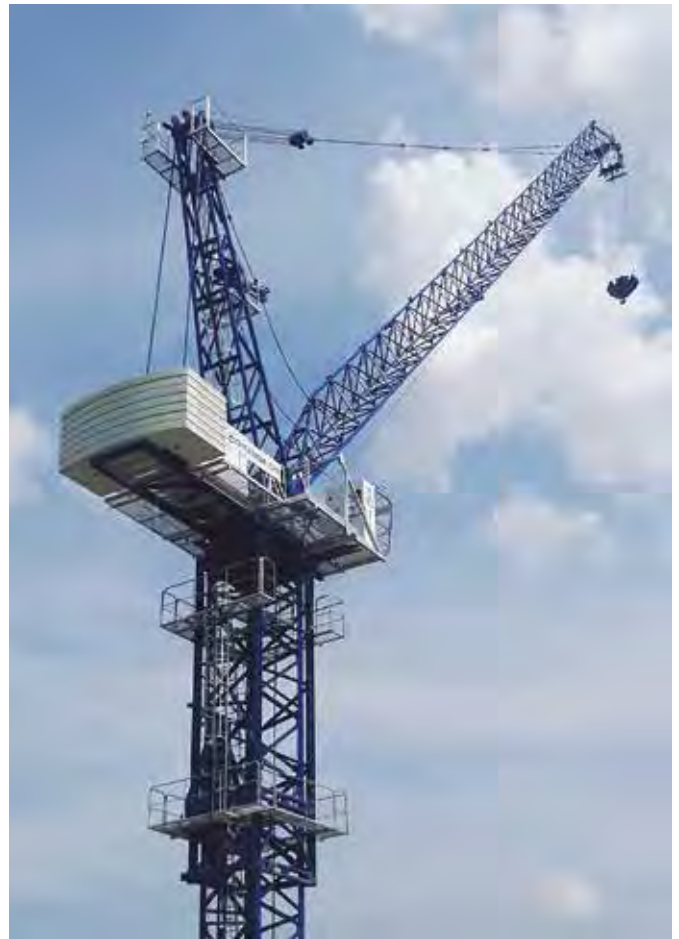
Comansa CM has unveiled its new CML165 luffing-jib crane, featuring a maximum capacity of 12 t and reach of 50 m. This new model is the company's first addition to the CML-series, which was developed in late 2016 with the launch of the CML190 crane.

The CML165 has a 45 kW standard hoist mechanism that achieves a maximum speed of up to 94 m/min and a drum with capacity for 545 m of rope, allowing the crane to work in projects of up to 270 m in height. With the optional 65 kW winch that features a larger wire rope drum, this new model can build towers of almost 400 m in height, working with a hoist speed of up to 131 m/min.

The CML165 is also designed with a short counterjib - only 6.5 m long - and an out of service radius of 19 to 22 m (depending on the jib length). These two features make the CML165 ideal for use in narrow sites or projects with space restrictions due to buildings and other cranes or due to regulations (e.g. where overflying train tracks or roads is forbidden).

Comansa CM expects the new CML165 to be successful in Asia and the Middle East due to the increasing construction demand in large cities, including high-rise buildings which are becoming more prevalent in both regions. The company said that so far the model has already received a positive response from its customers across Asia, such as Thailand, Malaysia, Philippines, Vietnam and India, among others.

The CML165 is scheduled to be available from September 2017 in Asia, the Middle East and South America. With this new model, the current CML-series now consists of: the 12 t CML165 with a 50 m maximum reach, 2,300 kg jib-end load and 56.6 m freestanding height; 12 t CML190 with a 60 m maximum reach, 1,550 kg jib-end load and 64.4 m freestanding height; and 18 t CML190 with a 60 m maximum reach, 1,550 kg jib-end load and 64.4 m freestanding height.



According to Comansa CM, another luffing-jib tower crane is planned to be launched before the end of the year. Comansa CM's parent company, Linden Comansa, offers a wide range of luffing-jib cranes to its customers worldwide, comprising 14 models with maximum capacities from 8 to 64 t. ■

Website: www.comansa.com

Top: The new CML165 luffing jib crane features a maximum lifting capacity of 12 t. This new model has a short counterjib, which is a great advantage when operating on narrow jobsites.

Left: The CML165 is expected to be available from September 2017 in Asia, the Middle East and South America.

Haulotte HA26 boom lift with enhanced safety features

The new Haulotte HA26 articulating boom lift was built based on the success of HA16 and HA20 models. It delivers a working height of 26.4 m, up-and-over clearance of 9.3 m and horizontal outreach of 17.5 m. The machine also offers a 250 kg/350 kg dual capacity as an option. In 350 kg mode, it can accommodate an extra 40 percent of equipment by weight.

To increase user safety, Haulotte has developed an innovative and ultra-high performance lighting system, the ACTIV'Lighting System-Safe Load. Located at several points around the machine, this lighting system illuminates controls and the area around the boom.

To prevent risks of accidents, particularly crushing accidents, and protect operators, the new HA26 is fitted with the Haulotte ACTIV'Shield Bar 2.0. The system is now fully incorporated into the upper control protection cover to guarantee better ergonomics and enhanced robustness. Thanks to the push forward principle bar, which provides a 'safety gap', workers are protected from any risk of crushing without compromising productivity.

For greater visibility, the jib can be raised to a vertical position even when the machine is moving at full speed, said Haulotte. The HA26 has also been designed with high boom rigidity; perfectly regulated boom kinematics thanks to the built-in computer; and automatic damping of ramp motion when approaching full extension.

The HA26 is suitable for operations on all terrains. The machine has an oscillating axle for excellent ground adhesion; hydraulic differential wheel lock that effectively distributes power to the wheels; high ground clearance to get over obstacles; smaller turning radius and well dimensioned frame to manoeuvre in confined spaces; and gradeability of up to 45 percent.

Another highlight is the STOP Emission System that automatically stops and restarts the engine. According to Haulotte, the system reduces the use of engine and peripheral components by up to 20 percent, thereby extending the life of the engine and assuring higher residual value. By decreasing fuel consumption, operating costs can be lowered and overall noise level reduced, thus allowing operators to work in sensitive areas (such as hospitals, schools and office buildings.).

In addition, the HA26 features the ACTIV'Screen onboard diagnostic system,



a comprehensive tool that provides access to: details and complete malfunction resolution procedure; machine settings; maintenance alerts and service intervals; and modifications of general settings such as interface language and units of measurement. The ACTIV'Screen system acts as a veritable assistant, supporting users daily in carrying out maintenance operations.

For fleet management, the HA26 is equipped with a universal telematics connector as standard. As it adapts to various types of telematics systems, it enables users to quickly connect their own telematics devices to the Haulotte machines. ■

Website: www.haulotte.com



Top, middle and above: The new Haulotte HA26 articulating boom lift has a working height of 26.4 m, up-and-over clearance of 9.3 m and horizontal outreach of 17.5 m.

New and updated Demag all terrain cranes

The new six-axle, 300-t class AC 300-6 all-terrain crane has an 80 m main boom and is the first crane of its size in the Demag range equipped with a luffing jib. The 80 m main boom can perform jobs at heights up to 78 m or 74 m radius without rigging a jib.

The Demag AC 300-6 is ideal for tower crane erection, featuring a lifting capacity of 15 t on fully telescoped 80 m main boom. Also, it is the smallest in the Demag range that can be outfitted with a luffing jib for superior reach and fly-over capabilities, bringing the maximum system length to 118 m. The luffing jib rigging system is the same as on the AC 350-6 and AC 1000-9 cranes and provides safe and quick rigging.

Equipped with the IC-1 Plus control system and a single engine concept with an intelligent motor management system, the Demag AC 300-6 enhances productivity to help reduce operating costs. The IC-1 Plus control system provides real time calculation of the lifting capacities and supports operators in safe crane operation. It also allows asymmetric outrigger positioning and enables the crane to perform jobs usually reserved for larger machines. The AC 300-6 is fitted with a single engine, with start and stop function to reduce idle times and total engine hours contributing to the reduction of fuel costs and preserving the crane's residual value.

The Demag AC 300-6 helps maintain a lower stock of spare parts because it uses a high number of interchangeable parts with the Demag five-axle family all terrain cranes. The 21 m double folding main boom extension of the five-axle Demag cranes is also compatible with the AC 300-6.

With a carrier length of 15.3 m and a width of 3 m, the AC 300-6 features a compact design. It is easy to position on the jobsite, thanks to its active all-wheel steering that allows excellent manoeuvrability in tight spaces.

On the road, the Demag AC 300-6 meets axle load limits from below 12 t up to 16 t and can travel up to 85 km/h. It also has 800 kg of extra payload capacity for carrying extra lifting accessories. It includes an axle load monitor, displayed on the dashboard, to help customers drive within the road legal weight. This model, like all Demag cranes in this product family, can be configured to comply with the variable axle weight limits in most states of North America and many other countries by connecting different types of boom dollies or removing the boom.

In addition, Terex Cranes has updated its 100-t class AC 100-4L all terrain crane with a new design that improves lifting performance, especially when working at steep main boom positions. Boosting crane capacity as well, the updated model includes the Demag IC-1 Plus control system. This system is designed to provide the crane's maximum allowable lifting capacity, based on the slewing angle, for every crane configuration.

The new control system no longer limits the maximum lifting capacity to a pre-calculated 360° load chart which was based on the most unstable position of the crane. Instantaneous capacity calculations allow customers to take full advantage of the maximum lifting capacity available at any given slewing position for any crane configuration. This advantage is particularly useful when working with reduced outrigger settings and reduced counterweight. In fact, it enables the Demag AC 100-4L to perform jobs where higher capacity cranes are typically needed, said Terex Cranes. This also comes with an added benefit: for many applications, the IC-1 Plus control system not only uses the full potential of the crane's lifting capacity, but also creates the opportunity to use less counterweight as compared to the 360° lifting capacities. This results in reduced transport costs.



The new Demag AC 300-6 (above) and the updated AC 100-4L (below) all-terrain cranes.



Another benefit of the four-axle AC 100-4L is that it incorporates many of the same design concepts as the Demag five-axle crane family. From the drive train and the assembly for drive components to the boom head and main boom extension designs, customers will find more parts and component commonality between the AC 100-4L and other Demag all terrain cranes to reduce spare parts inventory costs and storage.

According to Terex Cranes, the Demag AC 100-4L remains the only crane in the 100-t class to offer a narrow standard truck width of only 2.55 m, even when equipped with large 445/95R25 tyres, allowing it to easily navigate in congested urban areas. With its 59.4-m main boom length and 69.5-m total system length, the AC 100-4L offers one of the longest system lengths that can travel on four axles while adhering to 12-t axle load limits.

The AC 100-4L crane offers both Euromot 4/Tier 4 Final and Euromot 3a/Tier 3 engine options to meet market needs. ■

Website: www.terex.com/cranes

JCB offers 30 t excavator for non-emission markets

JCB has introduced its new 30 t JS305 crawler excavator for extreme environments and high-productivity applications in Southeast Asia, the Middle East, Africa, Russia and the CIS region. The machine is powered by a JCB Dieselmix 672 six-cylinder engine producing 221 hp. According to JCB, in tests against leading competitors in the 30-t class, the JS305 proved 13 percent more fuel efficient while delivering a 7 percent improvement in tonnes moved.

The JS305 has an air filter with a scavenge pre-cleaner as standard. This two-stage filter uses elements that are three times more efficient than a traditional pleated air element, said JCB. The dust holding capacity of the filter is increased by 175 percent over a standard filter, eliminating the need for an aftermarket pre-cleaner. Engine oil and filter changes are set at 500 hours, while hydraulic and outer air filter service intervals occur at 1,000 hours. The air filter's internal element can be changed at 2,000 hours intervals, with hydraulic oil changes set at 5,000 hours, for minimal downtime and reduced operating costs.

The twin Kawasaki variable displacement hydraulic pump ensures maximum productivity in all operating conditions. The operator can choose between an Eco operating mode, which delivers the optimum balance between productivity and machine efficiency, or a Power mode for high performance and bulk excavating duties. The operator can also access a Power+ mode, which optimises engine



JCB has unveiled its new 30 t crawler excavator, the JS305.

speed and hydraulic output for maximum productivity.

In addition, the JS305 comes with JCB's LiveLink telematic machine monitoring system, as well as the JCB 2 Go hydraulic isolation system that requires the operator to activate a secondary hydraulic cut-out before the machine hydraulics will function, boosting safety. ■

Website: www.jcb.com

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Vermeer pedestrian trenchers and R250C reclaimer

Vermeer's RTX130 and RTX200 pedestrian trenchers are fitted with 61 to 91.4 cm cutting booms and 15.2 cm cutting widths to help landscape contractors install irrigation systems, drainage tile and outdoor electrical lines more efficiently. The machines are available with track or rubber tyre options.

The RTX130 has a 13-hp Honda gas engine and is typically paired with a 61 to 76.2 cm trenching boom to optimise efficiency. The more powerful RTX200 offers a 20-hp Kohler gas engine and can be paired with a larger 76.2 to 91.4 cm trenching boom.

Vermeer also manufactures different boom chain configurations to accommodate a variety of soil conditions. For example, a full cup-type chain can be used to move light material when working in loose, sandy soils, while individuals working in more difficult ground conditions can select a combination chain with both cups and shark teeth.

Both the RTX130 and RTX200 feature the Vermeer VZ steering system and operator presence system. The intuitive VZ steering system enables operators to steer the machine using only the handlebars and provides additional leverage when operating the pedestrian trencher in difficult terrain. For added protection, the operator presence system stops the trencher chain and ground drive if the operator lets go of the handle.

In addition, Vermeer has expanded its fluid management product lineup with the introduction of the R250C reclaimer - a modular mud reclaimer that can be paired with a variety of directional drills, trailers, pit pumps and gensets on a jobsite.

The design of the R250C reclaimer helps to reduce the costs to conduct horizontal directional drill (HDD) projects. It is equipped with an innovative 45-degree manifold, a balanced elliptical shaker motion and scaled shaker deck, as well as several serviceability features to help increase overall productivity.

The 45-degree outlet manifold on the Vermeer R250C reclaimer, combined with the use of the suction breakers, separates sand and coarse silt efficiently. The cones deliver a consistent performance of reducing solids. This new reclaimer is equipped with industry-leading pumps to also help aid the process.

The Vermeer R250C reclaimer's balanced elliptical shaker motion delivers the same motion every time with the centre of gravity balanced on the motors to carry lower gravity solids, such as clay, over the shaker screens. This motion produces slightly drier cuttings and reduces the mesh size to help



increase overall screen life and flow. Clay swelling is also diminished as a result, and the recycling process is more consistent.

The two-deck shaker design of the R250C reclaimer provides a first-cut shaker bed area of 3 sq m and a second cut area of 1.7 sq m. The scaled shaker deck features a proportioned double-deck shaker that gives access and visibility to the bottom deck without sacrificing overall screen square footage. The 360-degree working deck gives the operator access to all sides of the shaker for easy washing and screen changes. Also, all pumps, electrical motors and pressure washer are located on one side of the machine for ease in accessing and servicing components.

With a processing rate of 1,968.4 l/min and a recommended consumption rate of 946.4 l/min, the Vermeer R250C reclaimer is best paired with drills in the 45,359.2 kg class. ■

Website: www.vermeer.com



Top and above: Vermeer RTX200 pedestrian trencher can operate with a 76.2 to 91.4 cm trenching boom.



Vermeer R250C modular mud reclaimer can be paired with a variety of directional drills, trailers, pit pumps and gensets on a jobsite.

Potain MCR 295 luffer ideal for tight jobsites

The Potain MCR 295 is the largest luffing jib crane from Manitowoc's manufacturing facility in Zhangjiagang, China, targeted at the Asia Pacific, Middle Eastern, African and Latin American markets. The model was launched in November 2016 at the bauma China exhibition in Shanghai. It is available in three variations, each with its own rated capacity and load chart. The MCR 295 H16 has a 16 t maximum capacity; the MCR 295 H20 has a 20 t maximum capacity; and the MCR 295 H25 has a 25 t maximum capacity. All three include a 60 m maximum jib.

The luffing jib crane is ideal for jobsites with tight working quarters, featuring a compact 2 m x 2 m footprint and the optional Top Tracing II anti-collision system. There is a variety of winch options, all with Potain's variable frequency drive technology that offers smoother acceleration and closer control. Winch options for the MCR 295 include: the 75 LVF 40 Optima or the 100 LVF 40 Optima on the 16 t version;



the 100 LVF Optima 50 or the 150 LVF 50 GH Optima/180 LVF 50 GH Optima (depending on power supply) on the 20 t version; and the 100 LVF 63 Optima or the

150 LVF 63 GH Optima/180 LVF 63 GH Optima (depending on power supply) for the 25 t version. ■

Website: www.manitowoc.com



Top and above: The Potain MCR 295 luffing jib crane features a compact 2 m x 2 m footprint and the optional Top Tracing II anti-collision system.

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Genie updates ZX-135/70 articulating boom lift

The Genie ZX-135/70 articulating boom lift has been updated to offer the latest advancements in engineering design and technology. Designed with transportability in mind, the lift now features the new Genie mini XChassis axle design, which extends and retracts the axles to and from the stowed position with a more compact footprint — 2.49 m x 4.11 m retracted or 3.94 m x 4.11 m extended — to provide both stability on the job and a narrow profile for transport. Similar in design to full-size X-Chassis expanding axle on the previous generations of this machine, the mini XChassis system boasts two-thirds the footprint of the full-size version for excellent manoeuvrability on and around confined jobsites without distributing people or traffic.

This boom has also been engineered to meet the overload restriction guidelines in the proposed ANSI A92 and CSA B354 industry standards in North America, as well as the current European EN280 and Australian AS 1418.10 standards. To comply, all new Genie ZX-135/70 booms come standard with new low-maintenance load sense cell technology - which monitors the weight in the platform and disables drive, steer and certain boom functions if the load exceeds the platform load limit.

The updated Genie ZX-135/70 can be customised to meet customers' jobsite needs with one of three hydraulically driven generator options: A 12 kW welder-ready package, 7.5 kW welder-ready package or 3 kW AC generator for general needs. In addition, the Genie ZX-135/70 boom is updated to reflect the latest Genie design language of an all-black chassis and an updated blue and grey colour scheme.

Replacing the previous generation's six-point process, the 4.11 software on these newly redesigned Genie ZX-135/70 envelope-controlled machines now only need two calibration points: 1) When the boom is lowered to the stowed position, and 2) when the boom is fully raised, without the use of an inclinometer. Calibrations can now be done in as little as 15 minutes, saving customers up to an hour or more of set-up time each time they are ready to use this articulating boom.

Here's an example of how it's done: With the secondary boom fully lowered to the stowed position, the operator will input 'secondary boom fully lowered' into the software. Then, the operator will fully raise the secondary boom until it stops at the end of the cylinder stroke, at approximately 76°, and input into the software 'secondary boom fully raised.' Pressing and holding the engine start button for approximately five seconds will shut off the engine and save the calibration settings.

To achieve a two-point calibration process, the 4.11 software works with the boom's angle sensors to ensure that the boom is fully elevated. The machine's angle sensors provide input to the control system, and the control system determines the appropriate boom angle for safe operation.

The Genie ZX-135/70 lift still features a maximum platform height of 41 m, 21.3 m of horizontal outreach and a 23 m of up-and-over clearance - all accessible with a 272 kg platform capacity. The Telescoping Jib-Extend jib on this boom continues to be distinctive, providing exceptional access by extending from a retracted length of 3.7 m to an extended length of 6.1 m. This design includes 360° continuous rotation turntable, 160° platform rotation for fast, easy positioning and 110° vertical range of motion. This design still provides access to 'up, over, and in' applications inaccessible by a traditional jib.



The new generation of Genie ZX-135/70 articulating boom lift includes the new Genie mini XChassis axle design, a platform load sensing system and a simple two-point calibration process to set up the primary boom, secondary boom and jib bell crank in as little as 15 minutes.

The updated Genie ZX-135/70 boom is engineered with four-wheel drive with full-time positive traction to handle rough ground conditions to enhance the smoothness of the ride. Four-wheel steer with front-wheel, rear-wheel, crab- and coordinated- steer options available to provide additional manoeuvrability.

This unit's intuitive control system provides menu-based adjustments for machine and component calibration, as well as on-screen multi-language system diagnostics. Platform controls feature toggle switches and a tactile membrane surface, as well as proportional Hall-effect joysticks for all major functions. Operators will find the control layouts on this model to be consistent and intuitive, making operation of the boom easy and straightforward.

Moreover, the revamped Genie ZX-135/70 boom shares commonality in design, parts and accessories, as well as serviceability benefits, including easy access to crucial service points, with other Genie products. ■

Website: www.genielift.com

Allu attachments help 'transform' jobsites

The Allu Transformer D-series consists of excavator-/loader-/tractor-mounted attachments that screen, crush, aerate, blend, mix, separate, feed and load materials. They can be used with 12 t loaders as well as 8 t tractors and backhoe loaders, and are ideal for various screening and crushing projects. The D-series is also versatile and shares the DL-series' use of fine-screening TS drum construction with standard blades. Main applications for the D-series attachments include: waste material handling; composting; pipeline backfilling/padding; stabilising clay; crushing asphalt and minerals; and cabling backfill.

At the heart of the Transformer D-series is the innovative top screen of its bucket. This is where the screening blades spin between the top screen combs with the end material size being defined by the space between the combs. Effectively these screening combs carry most of the material weight to ensure the drums and bearings take on less impact and load. This construction is clog-free and maintains good capacity even with wet materials, said Allu.

The Transformer D-series can also be used to handle excavated soil and rubble, with processed material not needing to be transported away and replaced with fresh soil. Not only does this result in substantial savings in material and transport costs, but also no time is lost when waiting for replacement material. Additionally, binders can be mixed if the job undertaken requires stabilisation. ■

Website: www.allu.net



The Allu Transformer D-series attachments can screen, crush, aerate, blend, mix, separate, feed and load materials. Here, one of them is working on a project together with an excavator.

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Link-Belt expands crawler crane line with 228 HSL

The Link-Belt 228 HSL crawler crane (117.2 t) has been developed based on the company's Hylab lattice boom crawler line-up. It can move under 54,431 kg as an assembled machine, with tracks on, or users can remove the side frames and easily achieve a transport weight under 36,287 kg.

Matching main and auxiliary 'power-up and power-down' winches come standard equipped with the selectable freefall system. Main hoist drums are grooved for 26 mm wire rope. These winches provide maximum line pull of 19,600 kg and feature Link-Belt's wet brake design, giving the operator superior control of the load on hook during freefall operation.

Link-Belt's 'Eco Winch' is an additional fuel saving feature that, when activated, allows for maximum line speeds when hoisting light loads at idle engine speeds, resulting in greater fuel efficiency, lower operating cost, less engine RPM's under load and fewer emissions. The crane features a 730 ft-lb peak torque @ 1,500 rpm. The telematics system is also in place to give real time data to better forecast maintenance and service needs of the crane.

The operator is assisted by on-board high-resolution winch-view, rear-view and blind-side swing-view cameras to enhance jobsite visibility from within the cab. The cab is highly functional and comfortable, incorporating a full LED system monitor, AM/FM digital clock radio and adjustable armchair-mounted controls. The ergonomic design offers the operator greater visibility, more room and a six-way adjustable seat. An audio/visual travel alarm system alerts crew members on the ground. The intuitive RCL monitoring system provides the operator with all lift information, and allows the operator to set swing and other control parameters creating virtual walls with audio, visual alarms and function kick out.

The 228 HSL offers maximum boom lengths with two different styles of boom: tubular boom, up to 71.6 m and angle boom, up to 47.2 m. Link-Belt's open throat designed top section features quick Reeve capabilities and will incorporate a fold-down three-sheave-idler assembly. According to Link-Belt, the newly designed idler will allow three working lines to run independently up and down the boom, and make for more gradual radius rope travel over the head sheaves. The idler can be easily stored for transport by rotating down and riding inside the boom. A fixed jib, common to the 218 HSL, with lengths of 9.1 to 22.8 m in 4.5 m sections is available.

The robust lower car body is designed and built to withstand all jobsite conditions and capacity loadings. Standard features include hydraulically extendable side frames, hydraulic car body jacks, swing out axle extenders and centralised grease points. Side frames feature completely sealed under carriage components, hydraulic track tensioning system and self-cleaning full contact track shoes. The 4.4 m track gauge in the extended position provides a sturdy base for operations. Two 6,010-kg 'hook and pin' style car body counterweights fit neatly between retracted side frames.

Once on a transport trailer, the 228 HSL has a retracted track width of 3.6 m. A nine-piece modular counterweight configuration makes it easy to move the crane, and depending on geography it can transport with full counterweight in four or five loads.

The 228 HSL is powered by a 270 hp Cummins QSB 6.7L Tier 4 final diesel engine. An operator selectable 'auto-idle' engine shutdown feature allows for maximum fuel economy during extended idle periods, and engine RPM's resume immediately when the throttle is activated. ■

Website: www.linkbelt.com



Top and above: The Link-Belt 228 HSL crawler crane offers maximum boom lengths with two different styles of boom: tubular boom, up to 71.6 m and angle boom, up to 47.2 m. The model is also fitted with the 'Eco Winch' fuel saving feature.



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Cat RM500B rotary mixers play key role in SE Asia

Indonesian equipment and construction company PT Lancaraya Mandiri Abadi (LMA) and its joint venture company PT Road Technology Indonesia (RTI) are utilising two Cat RM500B rotary mixers on a 110 km coal hauling road project in Maura Enim, South Sumatra. The haul road is owned by Servo Lintas Raya (SLR) - a joint venture operation between local mining company Titan and international energy company Trafigura. The machines were supplied by local Cat dealer PT Trakindo Utama.

LMA-RTI has the contracts for the cut to fill earthworks for the more difficult 30 km of the haul road to the river (1.5 mil cu m of fill work) and some other construction zones and jetty works. The two associated companies also have contracts for the stabilisation of the intermediate layers and final layers of the 0-30 km road sections and for the crushing/stabilisation of the remaining 30-110 km of the hauling road.

RTI is using other equipment for stabilising the 30 cm deep intermediate and final layers of the new fill on section 0-30 km. The two new Cat rotary mixers are deployed for the stabilisation of the harder crushed rock sub-base (to a depth of 350 mm) on the 30-110 km section of the haul road.

The section of the coal hauling road where the Cat machines are working incorporates large quantities of riverbed rock that was placed over many years. To work with this hard material, the contractors first turn the variable size round rock into a usable aggregate using special towed rock crushing machines. The crushed aggregate (sized below 50 mm) is then stabilised by the addition of cement utilising cement spreader machines.

Depending on the work zone and the requirement (intermediate layer versus final top layer), the RM500Bs are used to mix-stabilise the soils or aggregate soils between 250 and 350 mm using 3-6 percent cement. The resulting road has an improved sub-base with a CBR (California bearing ratio) of between 45 and 80 percent depending on the zone and construction specification.

The RM500Bs are both fitted with a Universal rotor that provides a mixing width of 2,438 mm. Using durable cutting bits, the machines are able to efficiently process 3,500 to 4,000 cu m of material per hour. The RM500B is powered by a Cat C15 Acert engine rated at 403 kW to provide a maximum travel speed of 10 km/h. It has a hydrostatic transmission and features all wheel drive and four steering modes to provide good traction and manoeuvrability.

In order to increase operational flexibility, one of the two 28-t RM500Bs is equipped with both water and emulsion spray systems for the incorporation of water and additives. This machine also has a torque limiter to protect the rotor drive system and an extra counterweight to enhance performance in really tough reclamation and mining applications.

In addition, Kok Kiat Machinery Pte Ltd, one of the several subcontractors awarded the three-runway system construction project at Singapore Changi Airport, is also using a Cat RM500B rotary mixer to carry out its work. The machine was supplied by Tractors Singapore Limited, Caterpillar's dealer for Singapore, Maldives and Christmas Island-Indian Ocean.

It is vital for the ground to be stabilised before the airport facilities can be built. The initial ground was clayey. As such, Kok Kiat deploys the rotary mixer to efficiently mix sand into clay across the hectares of land. Water is injected into the mixing chamber to allow precise metering of water into the sand and clay mixture to achieve the appropriate moisture content required.



Two Cat RM500B rotary mixers are used for stabilisation of a major coal hauling road in Indonesia.



Above and left: A Cat RM500B rotary mixer has also been involved in the construction of a third runway at Singapore Changi Airport.

On the area where the third runway and supporting taxiways will be built, multiple layers of subgrade are required before any cement treated bases and surface course can be applied. For this requirement, the ready-mixed soil will be used to pave a layer of subgrade of depth 200 mm. A Cat CS79B soil compactor then evens out the surface while its vibratory drum compacts the soil. This process repeats until the required thickness is achieved. The CS79B soil compactor is equipped with machine drive power (MDP) technology, an innovative measurement technology that informs the operator when the compacted soil meets their load bearing specification, reducing the risk of over-compaction. ■

Website: www.cat.com

Volvo supports eco-town construction in Malaysia

In Selangor, Malaysia, a mixed residential and commercial township is currently under construction. An eco-masterplan - which outlines green initiatives for the use of energy and water; design; landscaping; and construction - guides the creation of the development. The township is one of 18 similarly-themed projects spread across three key economic regions in Malaysia.

The main subcontractor of the township, Advancecon Infra Sdn Bhd, has deployed 40 of its Volvo CE machines for the earthworks. These comprise excavators, articulated haulers and motor graders. The company is targeting completion of the project in November 2017.

The EC700C is the largest of the excavators on the project, with an operating weight of 69,300 to 71,700 kg. Its gross power is 346 kW, while bucket capacity can extend up to 6.6 cu m. The EC480D is the next biggest, and one of Asia's most popular excavators in the 40-t plus category, said Volvo. It has an operating weight of 47,300 to 53,100 kg and gross power of 265 kW, while its bucket capacity can be up to 3.8 cu m. Other excavators being used by Advancecon include the EC330BLC and EC140BLC. ■

Website: www.volvoce.com



Right: Advancecon has deployed 40 of its Volvo CE machines to complete earthworks for a new township development in Selangor.

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Ammann meets challenges in Singapore and Bhutan

Ammann rollers and asphalt plant are helping United E & P to carry out works on Singapore's airport expansion project. The construction of Changi Airport Terminal 4 is scheduled for completion this year, which also includes adding a third runway.

Providing the mix for the terminal is an Ammann ABA 300 UniBatch asphalt-mixing plant. United E & P said it is supplying 850,000 t of pre-mix for the project. The plant delivers a good productivity with its capacity of 300 t/h. It has a small footprint, which is suitable for the location, and also features a low height, making it ideal to operate near an airport. In addition, the plant is simple to operate, fitted with the as1 control system, and easy to maintain.

For the runway, the base course consisted of 1.6 mil t of cold mix; this amount is expected to increase before completion, according to United E & P. The plant will also produce binding materials of 650,000 t and 850,000 t for the surface lift.

Ammann AV 110X articulated tandem rollers handled the compaction of the runway. The roller has two frames connected by

a double joint that enable crab steering on each side. This steering provides increased compaction output and responsiveness.

In Bhutan, Construction Development Corporation Limited (CDCL) has been constructing roads, bridges and other infrastructure developments. The company recently completed several large-scale projects, including resurfacing 200 km between Phuentsholing and Punakha. It also handled a large-scale resurfacing project in the city of Thimphu.

These projects required high quantities of mix, and occurred on hilly terrains and narrow roads. To perform its tasks efficiently, CDCL opted for Apollo WM 6 HES mechanical paver finishers from Ammann Apollo India. Soon, CDCL also turned to Apollo for an asphalt-mixing plant and the company finally purchased a DrumMix 60 fully automated plant. This purchase also included a bitumen barrel decanter unit, which will eliminate the need for manual feeding. ■

Website: ammann-group.com



Ammann's ABA 300 UniBatch asphalt-mixing plant (above left) and AV 110X articulated tandem rollers (above right) help United E & P to carry out works on Singapore's airport expansion project.



CDCL has selected Apollo WM 6 HES mechanical paver finishers (above left) and Apollo asphalt-mixing plant (above right) to complete its projects in Bhutan.

Liebherr LTR 1220 telescopic crane goes to India

NCC Ltd has taken delivery of a Liebherr LTR 1220 telescopic crawler crane, which is equipped with polyamide pads for operation on metro site. The crane is currently working on the Nagpur Metro project in Maharashtra, India. It is being used to lift girders for the two new metro lines that have a total length of 38 km.

The LTR 1220 comes with double grouser crawler pads, which are useful in off-road operation. For operation inside a hall or on the road, polyamide plates can be installed on the double grouser crawler pads to protect the surface of the floor.

Liebherr LTR crawler cranes feature short set-up times and high flexibility in use. Fitted with a telescopic boom, they do not need space to assemble and erect the boom. They can be fast relocated on the jobsite and are then immediately again ready for operation. Another benefit is that they can march with full load, giving a distinct advantage over mobile cranes, said Liebherr.



Liebherr LTR 1220 lifts girders on the Nagpur Metro project.

In addition, the LTR cranes' pick and carry capacity makes them ideal for girder placements. According to Liebherr, this is

the first time that such a crane is being used in India. ■

Website: www.liebherr.com



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Tour around Asia with XCMG

XCMG's XR550 rotary drilling rigs have been involved in the construction of Xi Jiang railway bridge in Guangzhou, China. They were used by local construction company Xuteng to carry out the foundation work on the project.

The new double-line railway bridge extends across eight waterways in different provinces. It is located in complex geological areas, with a combination of silt, silty clay, saturated silt, medium sand and gravel, as well as slightly weathered clay, sandstone and slightly weathered calcareous sandstone. The uniaxial compressive strength of bedrock is as high as 70 Mpa.

The two main piers of the bridge were located in the water and on the land respectively, and both had a pile foundation with 3 m in diameter. The constructed concrete earthwork volume of a single pier was 9,870 cu m. It was estimated that there were 30 main piers in the water, requiring an average drilling depth of 108 m and rock depth of 55 m, and also 30 piers on the shore, which required a drilling depth of 98 m and rock depth of 45 m. Other challenges in the project included a large bridge span, high tower and tight schedule, to name a few.

To overcome such difficult environments, Xuteng looked for drilling rigs with a drilling diameter of 3 m and drilling depth of 110 m. The company finally decided to use five XR550D rotary drilling rigs from XCMG as the main equipment for the project.

The XR550D was launched in 2016, with a maximum drilling diameter of 3.5 m and maximum drilling depth of 132 m. It is designed by XCMG specifically for large bridge piles, high-speed railways, highways and other large-scale projects. The power head of the XR550D consist of two modes: general and rock-entering, with functions of the automatic rotary featuring seamless switching, which makes it suitable for construction in hard layers.

In addition, XCMG has supplied its machines and equipment for use in a wide range of projects throughout Asia, including construction of roads in Myanmar, Sino-Laos railway project, Cambodia Highway 51 reconstruction, Philippines Cebu Airport expansion project and Nepal power station, among others. The company's machines and equipment also work in quarries and other developments in rural areas. ■

Website: www.xcmg.com



Left: XCMG's XR550 rotary drilling rig at the construction of Xi Jiang railway bridge in Guangzhou, China.

Below left: XCMG excavator on a road project in Myanmar.

Below: XCMG wheel loader at a Vietnam quarry.



XCMG machines have been used widely in other projects across Asia, including the Philippines (above left), Cambodia (above) and India (left).

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Potain cranes deliver building projects in India and Dubai

Kolkata-based Indian real estate company PS Group is using three Potain MCT 85 topless cranes to help construct its residential project, PS Panache.

According to PS Group, the MCT 85 delivers excellent performance in terms of energy consumption and functionality. The crane is built at the Manitowoc plant in Pune, India and is the successor to the MCI 85 A model. 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 1985, PS Group purchased its first Potain cranes back in November 2014. Aside from the PS Panache project, the company also currently has a Potain crane working on residential project, PS Zen, a joint venture between PS Group and Srijan Realty. To date, PS Group has been involved in 78 real estate projects across India.

In addition, a fleet of 10 Potain MR 418 tower cranes is helping to construct a massive new project in Dubai, UAE - the Royal Atlantis Resort and Residences, which is located on the crescent of the Palm Jumeirah island.

Potain business partner, Abu Dhabi-based NFT, supplied the cranes on a rental contract to the joint venture (JV) building the development. The JV is made up of two contractors - the Belgium-based BESIX and South Korea's SsangYong Engineering & Construction - and the project is believed to mark the first time that MR 418 cranes have been used in the UAE.

The Royal Atlantis Resort and Residences will reach 193 m in height when completed. The 43-storey resort will include 795 rooms, 231 of which will be residential units. The project will have 65 outdoor pools in the residential section and a 'sky pool' at a height of 100 m at the hotel. There will also be parking space for 1,500 cars.

The Potain MR 418 has a 24 t maximum capacity, 60 m boom and 5 t capacity at the jib end. Its 270 LVF 120 hoist offers excellent capabilities for work on high-rise projects, including a 254 m per second hoisting speed. The 830 m rope capacity on the winch's drum means that in single-fall configuration a hook path of 830 m is possible.

Further boosting the crane's performance is a 150 VVF 56 luffing winch, which delivers a luffing speed of just 1 minute and 15 seconds to manoeuvre the jib from 15° to 86° - with or without load. The uniquely-mounted luffing mechanism and hoist ensure there is plenty of room for operation on



Left: Potain MCT 85 topless cranes work on the PS Panache residential project in India.

Below: Potain MR 418 tower cranes help build the Royal Atlantis Resort and Residences in Dubai.



tight jobsites, or on projects like the Royal Atlantis Resort and Residences, where 10 units need to work together.

NFT delivered the cranes to the project in October 2016 and the company set them up on the jobsite. The MR 418s were assembled quickly and working soon after.

The MR 418s will be freestanding in the early stages of building work but will be tied to the structure using 16 m-long braces as construction develops. Final working heights for the cranes will range between 104 m and 193 m. The cranes are lifting a variety of materials including steel beams and concrete formwork, to support the construction of the development, with loads weighing up to 16 t.

To ensure crane uptime is maximised on the project, NFT is storing a container full of MR 418 spare parts directly on the jobsite. In the event that a part needs to

be replaced, the company has eliminated any delay, thereby ensuring a high level of aftermarket service.

NFT is one of the world's leading suppliers of tower cranes and a long-time Potain business partner. With more than 1,500 tower cranes in its fleet, the company has its headquarters in Abu Dhabi, and operates offices in Saudi Arabia, Lebanon, Qatar and Kuwait.

The Royal Atlantis Resort and Residences was designed by New York architecture firm Kohn Pedersen Fox Associates and is estimated to cost US\$1.4 billion. The hotel and residential complex will cover 100,000 sq m and will feature one of the tallest towers on the Palm Jumeirah. Contractors expect construction to be completed in the third quarter of 2019. ■

Website: www.manitowoc.com

Hawkins relies on Gomaco GP3 in Omaha paving project

Hawkins Construction Company has chosen a Gomaco GP3 paver and T/C-5600 texture/cure machine to carry out a paving project in the city of Omaha, Nebraska, USA. The company uses two different kinds of stringless guidance systems with its paver, Leica Geosystems and Trimble GPS. G+ Connect seamlessly integrates both systems with the G+ control system. The Trimble system uses a paver-mounted Trimble GPS receiver with Gomaco sonic sensors. They work with the G+ controller and its digital slope system to steer the paver and allow the mould to match the existing pavement. Hawkins uses the 3D solution on its shoulder scab-on projects. The Leica 3D system with total stations is used on its freestanding pours.

The T/C-5600 with the G+ control system has a four-track design with each track having 90 degree turn capabilities for easy width changes and simple transport, while G+ provides electronic-over-hydraulic steering and grade control for tining accuracy.

Both Gomaco machines, featuring tracks with 90 degree turn capabilities, allow Hawkins to quickly and easily move the equipment around in difficult jobsite conditions. The paver and the texture/cure machine can just swing their tracks to the transport mode and drive right onto the trailer for transport.

Hawkins took delivery of the new GP3 paver in June 2016 for paving 7.9 m wide with a 152 mm integral curb on both sides of a new roadway. The GP3 is equipped with a Gomaco 3100 series open-front mould with a telescoping diverter plow instead of an auger out front to move the concrete.

The GP3's first paving project was on Q Street on the west side of the city. Hawkins used the Leica 3D guidance system on this project. The paver was also equipped with a 5400 series bar inserter. The company slipformed a 701 m long portion of Q Street. Hawkins paves with a typical state of Nebraska concrete mix design. Slump averages 51 mm.

The GP3 is easy to transport with its retractable, sliding console that reduces the overall shipping width. It features a transport mode by simply driving the legs around to the transport position. Once the legs are in transport position, G+ travel is switched to 'transport' for complete operator control.

Hawkins ordered its T/C-5600 at 11 m wide, with a 9.1 m wide longitudinal tining attachment. The machine has the ability to finish at 17.1 m wide. It can also run without stringline and is equipped with sonic sensors to control steering, elevation and grade. Easy width changes are accomplished with the T/C-5600's new walking end car with cure tank. Frame sections can be added or removed by turning the machine's four tracks 90 degrees and walking the end car to the required width. ■

Website: www.gomaco.com



Above: Hawkins Construction uses its Gomaco GP3 paver fitted with a telescoping spreader plow on the front of the machine, which is to move the concrete and facilitate quicker width changes.

Bottom: Sonic sensors on the Gomaco T/C-5600, protected by black spray guards, control the machine's elevation and crowning adjustments on this stringless project.



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Doka formwork solutions for new curvy building

The AWO-Föhrenpark is a new retirement home and care centre located in Munich, Germany. Designed by *sorge. architekten GmbH*, this six-storey curvy building offers an approximately 12,000 sq m of floor area and will cater for slightly more than 130 residents. Contractor on the project is Arge Föhrenpark consortium (*Zechbau GmbH* and *Bauunternehmung Glöckle.SF-Bau GmbH*). Construction is scheduled to complete by the end of 2017.

For the project, Doka's Concremote - a digital concrete sensor technology - delivers real-time data on temperature and strength development in fresh concrete. Three Concremote slab sensors are in use, and therefore a three-day cycle can be achieved and maintained.

The sensor is pressed into the fresh concrete as soon as it has been screeded. The sensor's job is to measure temperature at regular intervals, so that strength development can be calculated. The authorised site managers can call up these data through a secure web portal at any time with a notebook, tablet PC or smartphone.

Arge Föhrenpark can start early stripping after only two to three days. The upshot is that the floor-slab formwork is ready for the next cycle sooner. At the same time, the Concremote measurements also help the engineers decide on the ideal time for switching from the summer to the winter formula for the concrete. On the AWO-Föhrenpark project, that meant commissioning quantities could be reduced by 600 sq m of formwork per storey, and with fewer materials, formworking operations were speeded up by six whole weeks, said Doka.

With 54 different radii in all, variations in storey height and abrupt changes in levels on a single storey, Doka had to develop a perfect-fit formwork concept specifically for these requirements. Its formwork solutions will be deployed on an area of around 19,900 sq m.

One of them is a combination of Doka H20 circular formwork with the Framax Xlife framed formwork and KS Xlife column formwork. The preassembled panels of the circular formwork are operated by spindles, so they adapt quickly and easily to whichever radius is needed. This variability is a vital benefit, because there are nine changes in radius on every floor, according to Doka. Special bending templates make the adaptations easier.

The H20 circular formwork also enables Arge Föhrenpark to gain the heights needed for the walls more rapidly. There are five panel heights and only one form tie is needed every 1.5 sq m. So forming the different wall heights on each floor is fast and straightforward. The combination with Framax Xlife framed formwork speeds up the progress even more. The system scores with wide form-tie spacing and big gang-forms. Less crane time is needed for repositioning. With forming and stripping times shorter, the KS Xlife column formwork also contributes to faster concreting operations. This formwork features a special mechanism for easy opening and closing.

The timber-beam Dokaflex 30 tec floor formwork for the floor slabs helps minimise equipment costs and maintain speedy progress on the project. It is made possible by the high-strength I tec 20 composite formwork beam. Used as primary beam, it allows the floor props for Dokaflex 30 tec to be set at this wide spacing. This formwork system also offers easy solutions for downstand beams and closures.

The curvatures and the variety of radii pose challenges for the site crew when it comes to positioning the formwork. On each storey, 1,000 survey points are needed for precision positioning of the formwork panels. Each of these points is triangulated by tachymeter. This procedure and the high quality of the formwork combined make it possible to meet the strict statutory requirements



Above: The new AWO-Föhrenpark development in Munich.

Left: Doka Concremote measures the temperature and strength development of the concrete automatically and in real time.



Doka K folding platform keeps the site crew safe all the time.

for wall smoothness in structures of this kind. Five millimetres is the maximum permissible deviation.

Special solutions are also needed for the scaffolding. The structure is in close proximity to the trees, so there is not enough room for a conventional working scaffold. The Doka K folding platform offers self-supported working areas for speedy and safe progress on the project. With a maximum load bearing capacity of 600 kg/sq m, the scaffold platform enables safe and secure set-up and propping of the wall formwork. ■

Website: www.doka.com

Bauer performs foundation work for Sydney resort hotel

The new upcoming Crown Sydney Hotel Resort is located in the Barangaroo South district, Australia. With 69 floors and a height of 275 m, it will have 350 rooms, suites and luxury apartments, as well as restaurants, bars, luxury boutiques and conference rooms. Bauer and joint venture partner Piling Contractors execute the foundation work, which was commissioned by Crown Sydney Property in August 2016.

Bauer is responsible for the design and the building of the perimeter retaining wall for the basement floor as well as constructing the foundation for the building using diaphragm wall elements, barrettes and bored piles for the building foundations. The 220 m long perimeter retaining wall will be extending several meter into the Sydney sandstone rock formations.

The core areas of the foundation are especially complex, because the diaphragm wall elements will be installed as individual barrettes with various shapes. These barrettes are used as foundation elements but also building the finishing entire sub-ground lift pit structure. The T-shaped and L-shaped barrettes require up to 500 cu m of concrete.

The Barangaroo site had original marine structures and an old industrial gasworks.

The gasworks had contaminated significant large areas of the site. Therefore the majority of the work needs to be performed in special protection suit and mask to protect the workforce. Another big challenge for the project is that the site is located within old marine structures. These partially left in place structures on the re-claimed land requires dealing with obstruction and voids during panel excavations of the foundations elements.

In total, Bauer will construct roughly 8,000 cu m of ground improvement, 7,988 sq m of diaphragm wall up to 1.5 m thick and over 7,800 cu m of barrettes up to 1.5 m thick, as well as 112 bored piles up to 50 m deep and with a 1.8 m maximum diameter. A Bauer MC 96 duty-cycle crane with a trench cutter BC 40 and a Bauer BG 40 will be used. The foundation work is expected to continue until October 2017. ■

Website: www.bauer.com



A Bauer MC 96 duty-cycle crane (above) will be used to carry out the foundation work for the new Crown Sydney Hotel Resort development (left).

Carmix overcomes difficult conditions in Tanzania

A Carmix 5.5XL concrete mobile batching plant has been used at the North Mara gold mine, in the northwest of Tanzania. The machine was working at the Gokona underground site to produce concrete for strengthening the walls of the tunnel portals, thus avoiding the detachment of debris. The difficult terrains on the jobsite, with steep slopes, required the machine to operate under extreme environments. The concrete also had to be of high quality for use in such difficult mining conditions.

The Carmix 5.5XL can produce a large quantity of concrete directly on site. It has an output capacity of 5.5 cu m and its concrete mixer unit has a capacity of 7,600 l. The machine also features a system with a double mixing blade, a drum with hydraulic rotation and a planetary reducer, thus providing a uniform and compact mix. This result can also be achieved due to an automatic loading system, which, with the aid of the front cab, next to the loading shovel, allows maximum visibility for operations.

In addition, the Carmix 5.5 XL is fitted with Joymix, a servo-controlled joystick that controls the hydraulic functions of the loading shovel and allows the concrete to be discharged up to 2 m high. An optional load cell weighing system is available as well, with load cells under the concrete mixer unit, for producing high-quality concrete.

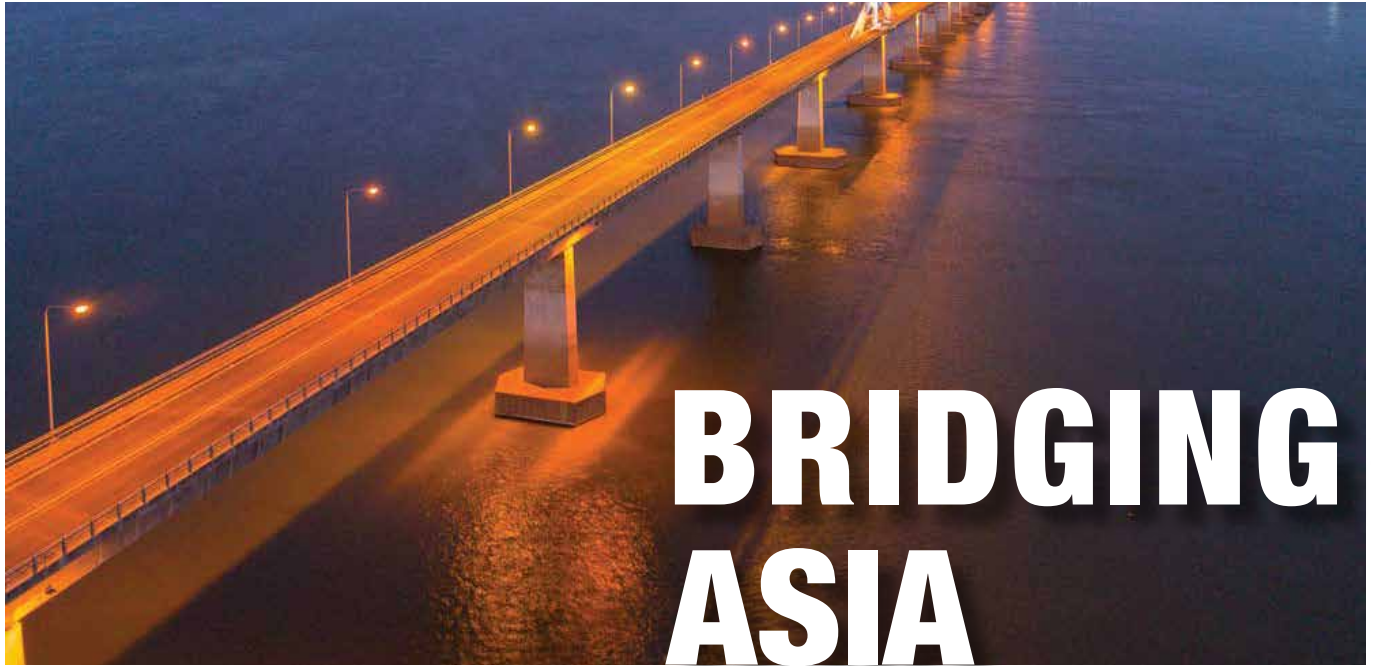
The model also comes with a Perkins 112 kW motor with six water-cooled cylinders and an integrated four-wheel drive system to



The Carmix 5.5XL produces concrete at the North Mara gold mine, successfully tackling the difficult conditions on the jobsite.

ensure the power required to work on difficult jobsites, with gradients of up to 30 percent. ■

Website: www.carmix.com



BRIDGING ASIA

THE DEVELOPMENT OF BRIDGES IN ASIA SERVES AS A USEFUL NARRATIVE TO TRACK THE GROWING PROSPERITY ACROSS THE CONTINENT. MIKE TAPLEY, AURECON'S TECHNICAL DIRECTOR FOR BRIDGES AND CIVIL STRUCTURES IN ASIA, SHARES THE ADVANCEMENTS AND CHALLENGES IN THE REGION, AND WHY HE FINDS IT ONE OF THE MOST EXCITING PLACES TO BE A BRIDGE ENGINEER.

Asia is home to many of the world's longest bridges and has a strong pipeline for future construction, much of it driven by the increasing prosperity and bold infrastructure programmes of the region's developing economies, says Mr Tapley. "The natural environment of the region also presents several unique challenges, and as technology advances and expertise grows, increasingly innovative solutions are being engineered."

Mr Tapley joined Aurecon in March 2011 to establish a bridge team for Asia and support other markets. He possesses a wealth of global experience in design and construction of bridges and civil structures on major infrastructure projects, including Stonecutters Bridge in Hong Kong, a new 120 m cable footbridge in Dubai and a 275 m cable-stayed bridge in Thailand. Leading a team in Hong Kong and Bangkok, Mr Tapley is currently undertaking advanced analysis and long-span bridge and civil infrastructure projects. He is very excited about the prospects for the sector and reveals a big future in Asia.

Long-term benefits

At present, Japan hosts the longest suspension bridge in the world, the 4,015 m Kurushima

Bridge, as well as the bridge with the longest span in the world, the Akashi Kaikyo Suspension Bridge, which has a span of close to 2 km.

However, Mr Tapley is confident that both these record-breaking titles will soon be making their way across the East China Sea, where a flurry of bridge building activity is underway. "China currently hosts four of the 10 longest span bridges in the world, and another two in the top 10 list are also to be found in Asia. But given the pace of infrastructure development worldwide, it's unlikely these records will stay untouched for long."

Mr Tapley points out that the leading role of Japan, China and Hong Kong (which is home to Stonecutters Bridge, one of the most complex cable-stayed bridges in the world) in bridge building is born out of geographical necessity. "For Japan and Hong Kong there is the need to connect their many islands; while in China, the landscape is characterised by long and wide rivers. Crucially, Japan, China and Hong Kong also have the economic muscle to fund the large investment that long-span bridges require."

He notes that developing countries in Asia have also seen the importance of bridge developments for the long run. "Although



Mr Tapley joined Aurecon in 2011 to establish a bridge team for Asia and support other markets. He is currently leading a team in Hong Kong and Bangkok.

bridges are a significant investment, governments understand that their creation can boost a nation's prosperity, providing supply chain routes for goods, services and people. This is why we see developments such as the impressive Padma Bridge in Bangladesh get off the ground. The bridge, which will link Dhaka with the isolated western region of the country, is one of the largest bridges under development worldwide, yet Bangladesh remains one of the poorest countries in Asia.

"A bridge of this scale, with an estimated construction cost of US\$3 billion, would normally be beyond the financial means of Bangladesh. But the government understands



Mr Tapley (at the far back) with some of Aurecon team members on a project site.

the economic benefits its creation will bring, and has concentrated efforts in guaranteeing its construction. The long-term value of the bridge will pay back its cost of construction many, many times over.”

Meanwhile in the Philippines, the upcoming Cebu-Cordova Bridge will be the third bridge to serve the hugely popular tourist island of Cebu. Construction is planned to start in 2017, with completion in 2020.

Cable-stayed vs suspension bridges

Another interesting feature of bridge building in Asia, and other markets, is the advancement in design-and-build methods, says Mr Tapley. “Design-wise, we see a stronger preference for cable-stayed bridges versus suspension bridges, not only in Asia but worldwide. In general terms, there is a cost premium of 20 to 30 percent for a suspension bridge.

“Cable-stayed bridges are also easy to maintain, compared to suspension bridges, which is why this bridge form is preferred in all but the most exceptional cases.”

He mentions that there is also a rapid acceleration in the span sizes for cable-stayed bridges. “Whereas previously there might have been a limit of 300 m or 400 m spans for a cable-stayed bridge, that number is now over 1 km.” According to Mr Tapley, bridges with a main span of over 500 m will typically opt for steel as the preferred choice for deck sections, while those with shorter spans (and the back span sections of bridges), concrete is often an economical deck option.

“With the latter, a key consideration will be whether to opt for precast or cast-

Continued overleaf...

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in-situ sections. Using precast concrete sections is generally a more advanced way of bridge building and its increasing prevalence in this region reflects the rising budgets and engineering skill levels in Asia,” explains Mr Tapley. “The precast segmental construction method requires a higher level of understanding of geometry control and the technical work for erecting the cantilevers is more detailed, but with modern design software these advanced procedures can be simulated more easily with computers.”

Environmental challenges

Mr Tapley further describes one of the more intricate aspects to bridge design work in Asia - that is, accounting for the environmental challenges, particularly earthquakes and typhoons. “In terms of seismic design, our industry has learnt much from recent events in Europe and Japan, which are reflected in the updated international codes of practice. For example, the Akashi Kaikyo Suspension Bridge in Japan moved 1 m during construction in 1995 following an earthquake. It was one of a series of similar disasters that changed the way we design bridges as an industry.

“Our understanding of earthquakes, especially their geotechnics and soil mechanics, gives us much more insight into how it affects bridge structures. Today, we have assembled a team of skilled engineers who can design bridges that will withstand earthquakes, even if surrounding buildings do not. While a bridge might be damaged during an earthquake, the structure is designed to be flexible so even if some elements fail, the overall structure will not. Therefore, in the event of a humanitarian crisis, the bridge will remain to provide much-needed supply access.”

Mr Tapley adds, “The approach to typhoons is similarly changing with our analysis becoming more sophisticated. For example, in many countries where long-span bridges are planned, there is insufficient research on the loadings that will apply in the event of a major typhoon. In these instances, we have to use whatever local data is available and adapt it for use within international design codes. We study the winds in the bridge’s location and also wind test the designs, first on the topography and then on the bridge itself.

“Modern cable-stayed and suspension bridges are now very aerodynamic, and their designs allow air to move more easily over the deck sections, minimising wind forces. With our wind analysis, we are able to model how wind behaves, using computational fluid analysis to see its effects around the structure. We also use wind tunnel testing, which is easier than before, and create physical models of the structures - increasingly using 3D printing. This allows for far more detailed modelling, both for the structure as a whole and for individual elements.”

“ Today, we have assembled a team of skilled engineers who can design bridges that will withstand earthquakes, even if surrounding buildings do not. While a bridge might be damaged during an earthquake, the structure is designed to be flexible so even if some elements fail, the overall structure will not. Therefore, in the event of a humanitarian crisis, the bridge will remain to provide much-needed supply access. ”

Talking technology

As creative architecture advances and demands more complex structures, more advanced analysis is required, highlights Mr Tapley. “But by using BIM technologies and the latest analytical tools, design consultants such as Aurecon are able to handle that analysis. The technology is a major progression, allowing our designers to understand structures better than ever before.”

He continues to explain, “The increasing prevalence and affordability of modern technology can help in other areas of bridge engineering, such as asset management for existing bridge structures. On a recent project, Aurecon conducted a bridge-specific live load assessment, using video to record traffic. We used that video to calculate how the traffic was split by category, timing and more. This allowed us to determine the worst-case load scenario based on actual data, rather than simply applying the design parameters of the code, which are always the most conservative. This is a great example of how modern engineering can combine design codes and real-world data to deliver more accurate and functional results.”

As far as engineering is concerned, Mr Tapley believes that a design-led approach is essential to supporting the ambitious bridge development programme underway in Asia. “Moreover, the challenge of creating long-span bridges here is not only about withstanding extreme events, but also about connecting people and communities!” he sums up. ■

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COMPACTING THE AMMANN WAY

ATR rammers

The new Ammann ATR 30 rammer is the lightest in the company's lineup. Weighing only 29 kg, it has a working width of 80 mm or 130 mm and is powered by a 1.1 kW Honda petrol engine. A new foot and slim design make the ATR 30 ideal for contractors who work in tight spaces or trenches. Applications include placement of cable or small patchwork jobs.

Ammann has also introduced its new ATR 60 and ATR 68 rammers. Offering both Premium and Classic versions, they have a standard working width of 280 mm. Optional feet can provide a width of up to 330 mm and length of up to 340 mm. A reduction foot is also available. Weights of the rammers range from 62 to 68 kg.

Replacing the ACR rammers, these new ATR models consist of the ATR 60 Classic, ATR 60 Premium, ATR 68 Classic and ATR 68 Premium. The ACR 70 D Diesel rammer will remain in the Ammann portfolio.

The Classic versions are the successors to the previous Ammann ACR rammer line. The machines are easy to use, highly robust, durable and equipped with the Honda GX100 petrol engine.

The Premium rammers include new features to meet the strictest restrictions for emissions and operation vibration levels. They utilise a Honda GXR120 engine. Key features of the Premium rammers include: an optimised gas lever, shaped and positioned for easy reach and operation; a handle concept, which limits hand-arm vibrations to protect the operator and meets the strictest regulations; and an additional air filter, which extends the life of the machine.



Ammann ATR 30 rammer is the lightest in the company's lineup, weighing only 29 kg.



Above and left: Ammann's new ATR rammers (above) are the successors of the ACR models (left). Available in both Premium and Classic versions, the new ATR rammers have a standard working width of 280 mm.

APF vibratory plates

Another innovation from Ammann is its new range of technologically advanced APF forward moving vibratory plate compactors. The models include the APF 12/33, APF 15/40, APF 15/50, APF 20/50 Hatz and APF 20/50 Honda. This APF product line is the lightest of all Ammann plate compactors, with weights ranging from 69 to 107 kg and widths of 330 to 500 mm.

The plates fit a broad range of applications, such as gardening, landscaping and patchwork for road repairs. With an optional water sprinkler and vulkollan mat, the machines are also suitable for asphalt applications and laying of paving stones.

The APF line is powered by Honda petrol engines. The largest plate, the APF 20/50, is available with a Honda petrol or Hatz diesel engine. The diesel engine performs well, even in high altitudes, says Ammann, and is a good alternative for owner who prefer diesel powered.

The reduced vibration values (below 2.5 m/sec²) result from the Z-buffer in the handle bar. This system enables precise machine control while protecting the operator from vibration. The low HAV levels allow long work shifts without health risk to the operator or a need for documentation.

The long-lasting cylindrical bearing design and an exciter unit that is generously designed in size deliver power and keep service to an absolute minimum. The exciter unit is completely maintenance-free for the lifetime of the machine, according to Ammann. In addition, the ball bearings significantly reduce friction. The entire bearing unit is sealed, blocking entry of dust or water and eliminating the need for service throughout the life of the machine. The system also provides better forward-movement force and travel speed as well as improved climbing ability to the plates.

The ergonomic frame protects all crucial components while working and during transport. The frame is also easy to grip, helping operators manoeuvre the machine – especially as they work in tight spaces. The bottom wear plate is designed to be durable, with thicker protection added towards the back of the plate where the most wear occurs.

A water tank, available as an option on most of the plates, can be mounted without a single screw. This allows simple adjustment and also eases refilling. The tank with its 10-l capacity is large and the sprinkling system runs efficiently to extend intervals between refilling. Operation is kept simple, a simple turn of the sprinkler bar activates or stops the water flow.

An optional mat can be mounted in a few seconds, preparing the machine for work on paving stones and protecting the stones' edges from cracking. The transport wheels can be dropped with a foot release, allowing a convenient and quick transportation of the machine on site and protects the operator's back by eliminating bending and prevents fingers from being pinched.

ACE^{econ} system

Furthermore, Ammann's proprietary ACE^{econ} compaction measurement system is now available as an option on Ammann APR 4920 and APR 5920 reversible vibratory plates. Both models use a centrifugal clutch for their power transfer from engine to exciter. With the addition of ACE^{econ} compaction system, Ammann extends its range of intelligent vibratory plates with two new machines.

The ACE^{econ} system helps operators monitor compaction progress via an intuitive LED display. The information provided by the system is essential to productivity, as it prevents operators from compacting areas where targets have already been met.

The ACE^{econ} system utilises technology similar to other Ammann



Ammann's new APF forward moving vibratory plate compactors have an optional water sprinkler and vulkollan mat, making them suitable for asphalt applications and laying of paving stones.



Above: The APR 4920 and APR 5920 are now available with the Ammann ACE^{econ} system.

Left: The ACE^{econ} system shows the operator with intuitive LED signals, when the maximum compaction has been achieved.

Compaction Expert (ACE) products developed for larger Ammann machines, including soil and asphalt compactors. Ammann says the ACE^{econ} system is already available on its APH hydrostatic vibratory plates. ■

Website: www.ammann-group.com

FIGHTING THE DUST

CONSTRUCTION DUST CAN BE VERY HARMFUL TO THE HEALTH AND SAFETY OF THE WORKERS. IN RECENT YEARS, MANY COMPANIES HAVE INTRODUCED BETTER AND MORE EFFICIENT SOLUTIONS TO CONTROL DUST ON JOBSITES. AMONG THEM ARE GENERAC DUST FIGHTERS, WHICH HAVE MADE THEIR WAY INTO SINGAPORE.



Generac Dust Fighters are designed to reduce dust in various applications. Among the models targeted at the Asian market include the DF Mini (left), DF Smart (right) and DF 7500 (above).

Entering Asia

The Dust Fighter line of mobile dust suppression units was launched by Generac Mobile Products in 2010. They are suitable for use in various applications and can operate on construction sites, quarries, mines and amongst other industrial applications. The comprehensive range of Dust Fighters also offers smaller, compact models that can be used in indoor areas.

“The concept of dust removal for health and safety is starting to gain acceptance in Asia, especially in countries like Singapore where environmental responsibility is an important topic at the national level,” says Alessandro Carenzio, area sales manager for Asia at Generac Mobile Products. “Our dealer in Singapore, JPN Industrial Trading, has been introducing Dust Fighters to the local market and will be the first company to launch this product line in Asia.”

Cindy Casey Lim, business development director of JPN Industrial Trading, highlights the importance of this new system. “The traditional water-spraying method has an estimated efficiency of less than 10 percent, while trials on Dust Fighters carried out by primary health and environmental firms have showed a decrease in dust particles by at least 50 percent in worse operating conditions.

“The nebulised water particles created from these Dust Fighters have a 40-150 micron diameter, so they can easily bond with dust particles of the same dimensions and drive them to the ground. The average size of a dust particle is 80 micron in diameter, while water particles created from a standard irrigation system have a 1,000 – 1,500 micron diameter and are therefore too big and will go through the dust cloud. The Dust Fighters provide a good alternative in reducing dust onsite.”

Ms Lim adds, “There are other advantages using the Dust Fighters. They are fully automatic and can be easily installed on any transport vehicle, so users can eliminate the costs of hiring extra personnel (who would otherwise be required with the traditional method). The Dust Fighters can also prevent mud problems - so called wet floor problems - by emitting only the required amount of water. The traditional method can consume up to 300 - 350 l/m, but the Dust Fighters only need around 12 to 120 l/m.”

Indoor and outdoor applications

The smaller range includes the DF Mini and DF Smart models, covering an area of up to 8 m and 13 m respectively. The DF Mini is powered by a 0.7 kW engine and the DF Smart 2.2 kW. Both are equipped with wheels and handles for easy transport.



Above: The traditional water-spraying method is considered less efficient. The average size of a dust particle is 80 micron in diameter, while water particles created from a standard irrigation system have a 1,000 – 1,500 micron diameter and are therefore too big and will go through the dust cloud.



Left: Generac Dust Fighters offer a safer and healthier solution. The nebulised water particles created from these units have a 40-150 micron diameter, so they can easily bond with dust particles of the same dimensions and drive them to the ground.



“ IN AN ENCLOSED INDOOR ENVIRONMENT, THE USE OF DUST SUPPRESSION UNITS IS EVEN MORE NECESSARY TO REDUCE INDOOR AIR POLLUTION, OTHERWISE THE WORKERS COULD FACE A GREATER HEALTH RISK. ”



Above and inset: The DF Mini (above) is suitable for indoor use and the DF Smart (inset) is the smallest dust control unit of the Dust Fighter range that can be used for outdoor jobs.

“These smaller models are ideal for indoor use or small-scale jobsites,” says Ms Lim. “In an enclosed indoor environment, the use of dust suppression units is even more necessary to reduce indoor air pollution, otherwise the workers could face a greater health risk.”

The DF Mini has a 70 l water tank, three interchangeable type of nozzles for different coverages, and an integrated booster pump. The DF Smart is very light and portable, weighing only 79 kg and is the smallest dust control unit of the Dust Fighter range that can be used for outdoor jobs. It features a single-phase 16 A inlet, a tilting system and an emergency stop button.

In addition, the medium-sized Dust Fighters targeted at the Asian market currently include the DF 7500, DF 15000 and DF 20000 models. They have a maximum range of up to 40 m, 50 m and 60 m respectively, with a rotation angle of 335°.

Ideal for small- to medium-scale jobsites, these models are fitted with a two-wheel undercarriage and robust tow bar for excellent manoeuvrability. The DF 7500 is suitable for construction and demolition works, while the DF 15000 and DF 20000 are ideal for the mining industry.

The DF 7500 and DF15000 are equipped with a three-phase 32 A inlet, while the DF20000 with 63 A inlet. The DF 7500 has a water consumption of up to 52 l/m, the DF15000 up to 60 l/m and the DF20000 up to 70 l/m. “The DF 7500 is expected to be a popular model in Singapore, which delivers an excellent performance with a highly affordable price,” says Mr Carenzio.

The DF 7500 is powered by a 7.5 kW engine and requires a 22 kVA generator, the DF15000 with a 15 kW engine and a 40 kVA generator, while the DF20000 has a 22 kW engine and a 60 kVA generator. The forklift pockets makes them easy to transport across site and placed into position. The units also have a remote control to switch on/off the fan, pump, electrical rotation (if any) and tilting system.

Other standard features of the medium-sized Dust Fighters consist of: a phase inverter, water peripheral booster pump, flowmeter for pump protection, stainless steel crown with nozzles, and two height adjustable stabilisers. Some optional features include an automatic oscillation system managed from the control panel, and a pump for chemical additives. ■

Note: The Generac Dust Fighters mentioned above are available at JPN Industrial Trading Pte Ltd: cindy@jpn.sg and sales@jpn.sg
More information on the machines can be obtained from the website: <http://towerlight.com/dust-fighters>

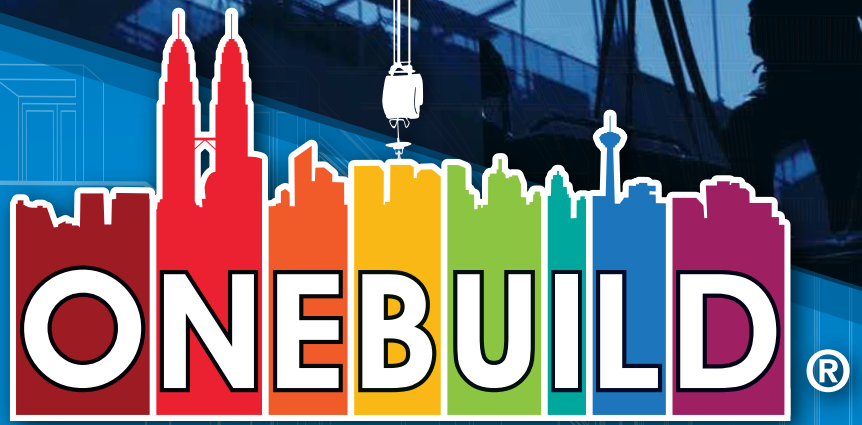


Above: The power supply for the Dust Fighters comes from a generator or electrical mains (left) and the water supply comes from a tank or public water net (right).



Second image from the top and above: The Dust Fighter DF 7500 is ideal for construction and demolition works. This model has a maximum range of 40 m with a rotation angle of 335°.

Left and far left: Dust Fighters use a fan powered by an electric engine (far left) and a robust stainless steel crown with nozzles.



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THE ART OF OSCILLATION

For over 35 years, Hamm has been offering its oscillation rollers covering more than 35 models. They include tandem rollers for asphalt compaction ranging from 2.5 to 15 t, as well as pivot-steered rollers in the DV+ series that are ideal for demanding road construction projects.

The oscillation technology results in fast, cost-effective and high-quality dynamic compaction. In particular, tandem rollers with one oscillation drum and one vibrating drum can achieve at least the same degree of compaction as double vibrating drum rollers, but with fewer passes, says Hamm. The technology also features low vibration emissions and this has made dynamic compaction on bridges, of thin layers and in sensitive areas (such as city centres, rail tracks and industrial plants) possible.

Oscillation principle

In oscillation drums, two unbalance shafts rotate synchronously, driven by a toothed belt, explains Hamm. The unbalances are offset by 180° relative to one another. As a result, the drum performs a rapidly alternating forward/backward rotary movement. This causes the drum to direct the compaction force into the substrate tangentially to the front and rear in the form of shear forces. Here, the compaction force acts continuously on the substrate because the drum is in contact with the ground at all times. This is why oscillation rollers compact dynamically as well as statically with their intrinsic weight the whole time.

Suitable for 'all layers'

Oscillation rollers can be used to compact all earthwork and road building layers, says Hamm. They come into their own in earthwork, where re-loosening of the upper layers has to be effectively prevented, such as in garden and landscaping work. Another important application is the compaction of soils in vibration-sensitive areas (e.g. above gas, water and other pipework).

In asphalt construction, base courses, binder courses and surface courses can also be compacted with oscillation rollers.



Top: Hamm offers more than 35 different rollers with oscillation technology – including machines with Tier 3 and Tier 4 engines, machines with working weights ranging from 2.5 to 15 t, and machines for asphalt and earthwork.

Above: The oscillation technology involves two unbalance shafts that rotate synchronously. Their unbalances are offset by 180° relative to one another. This causes the drum to carry out a rapidly alternating forward/backward rotary movement, as a result of which the compaction energy is directed into the substrate tangentially to the front and rear in the form of shear forces.

According to Hamm, the rollers perform especially well in the compaction of generally hard-to-compact asphalts such as SMA (stone mastic asphalt) or in the case of polymer-modified material mixes. This is because the effective direction of the vibrations during oscillation promotes the desired redistribution of long-chain binding agents.

Other applications include work on thin layers (surface courses or thin overlays), in vibration-sensitive areas (bridges, confined urban spaces, buildings or parking decks) and wherever the mix cools quickly (thin layers, windy or cold environments). Also of particular importance is joint compaction where the hot asphalt is to be compacted without damaging the adjoining cold asphalt.

Distinct advantages

Hamm further highlights the distinct benefits of oscillation technology. Among them is the high compaction power, which enables the rollers to compact quickly. The reason for this is the superimposition of dynamic shear forces with the permanent load from the roller's own weight. As a result, considerably fewer passes are needed, especially on large areas.

Oscillation rollers are also easy to operate, simply by pressing a switch. The appropriate amplitude is set automatically according to the rigidity of the material to be compacted. This happens so quickly that compaction is always adjusted perfectly, even with varying substrates.

In addition, oscillation rollers produce surfaces with excellent longitudinal evenness, as the drum remains in contact with the ground at all times. Asphalt compaction with oscillation also provides good initial skid resistance, because the oscillating movement of the drum rubs off the bitumen from the top surface of the carriageway.

Another benefit is that oscillation drums do not lift off the ground while compacting. Only around 15 percent of the vibration is directed into the substrate around the roller, meaning that oscillation rollers can be used without problems for dynamic compaction near vibration-sensitive buildings or installations. And because the rollers are quiet, they help to protect the environment. Such low-vibration compaction also means that it reduces component wear and is perceptibly less tiring for the drivers.

Furthermore, oscillation compaction ensures that aggregate particles are redistributed undamaged. In this way, it avoids detrimental aggregate crushing and over-compaction. What's more, oscillation



Hamm oscillation rollers at work on the Hong Kong-Zhuhai-Macao Bridge project in China. The oscillation technology allows dynamic compaction to be used on bridges without difficulty.



Above: During the construction of the F1 track in Baku, Azerbaijan, Hamm oscillation rollers compacted the asphalt surface efficiently yet with minimal vibration.

Left: Oscillation rollers also produce surfaces with excellent longitudinal evenness, as the drum remains in contact with the ground at all times.

compaction produces watertight, long-lasting joints without damaging the cold asphalt.

Lastly, oscillation widens the temperature window in which compaction is possible because it can be used to

compact without damage, even at lower temperatures. For this reason, oscillation is particularly suited to the compaction of thin layers or on fast-cooling surfaces such as on bridges. ■

Website: www.hamm.eu

MAPEI CONTINUES TO EXPAND ACROSS ASIA PACIFIC

Right from the start, Mapei has been dedicated to improving the quality of life by developing ecologically sustainable products for the construction industry. This year, as the company celebrates its 80th anniversary, Southeast Asia Construction talks to Marcel Smit, Mapei's director for Asia Pacific, about the company's milestones and achievements in the region, and his outlook on the future.

1. Mr Smit, celebrating 80 years is quite an accomplishment, especially in today's business environment. Could you tell us the one thing that makes Mapei unique?

Marcel Smit (MS): I think our focus on environmental responsibility from the very beginning - since our establishment in 1937 - has set us apart. All our product lines are designed according to eco-sustainable principles to make sure they have the lowest possible impact on the environment.

Mapei adheres to the concept of 'green' building by formulating products made from recycled and ultra-lightweight raw materials, resulting in reduced energy consumption and very low emission levels of volatile organic compounds.

Our products have also been developed with improved mechanical performance characteristics and durability which, by allowing construction members and structures to be fabricated with an intrinsically longer service life, leads to a reduction of waste materials and lower consumption of materials and energy for their construction.

Since 2012, we have offset more than 50,000 t of CO₂ emissions associated with the production of Keraflex Maxi S1 zero in Italy (Mapei's headquarters), through the acquisition of certified credits by financing wind energy projects in India.

2. How do you maintain the consistency in your products all these years?

MS: We invest significantly in research & development (R&D) to guarantee that our products continue to be eco-sustainable, yet safe at the same time. We spend approximately 5 percent of our annual turnover in R&D activities at our 20 laboratories around the world, and about 12 percent of our employees are involved in research. The majority of our new employees are also working in this field.

Our laboratories not only concentrate their research on innovations, but also periodically certify that our products meet the requirements specified by current standards and constantly look for ways to improve them. We collaborate with universities as well as scientific and industrial research institutes.



Marcel Smit, Mapei's director for Asia Pacific.



Mapei Far East Pte Ltd in Singapore serves as Mapei's regional office for Asia Pacific. It also hosts an R&D facility.



Mapei places a high priority on R&D. The company spends about 5 percent of its annual turnover on R&D activities, and around 12 percent of its employees are also involved in research.



The Singapore team celebrated Mapei's 80th anniversary in May 2017.

3. We understand that in 2015, Mapei signed up for a €45 million grant from the BEI (Bank European Investment) to help fund R&D activities in Europe. Will you carry out a similar approach in the Asia Pacific region?

MS: This funding was available in 2015 and Mapei was able to qualify for this attractive World Bank loan. No further funds are needed for the moment.

Asia Pacific is an attractive market for Mapei, and we will continue to grow and strive to expand our footprint across the region. In fact, six of our 20 R&D centres are located in Asia Pacific - in China, South Korea, Singapore, Malaysia, India and Australia.

4. Asia Pacific appears to be an important place for Mapei. Since entering the market in 1989, you have expanded tremendously - your regional facility in Singapore has increased from 500 sq m to around 15,000 sq m now, and recently you have also established new subsidiaries in the Philippines and Indonesia. How has growth been for Mapei in the region over the past five years?

MS: Mapei has reported a strong growth in Asia Pacific for the last five years. On average, our net sales in the region have increased by approximately 20 percent per annum. And fortunately, we have not been affected by the slowing Chinese economy; we currently even enjoy a double-digit sales growth in China.

Several countries offer promising opportunities for Mapei in the region, including South Korea, China, India, Malaysia, Singapore and Australia. In these markets, our quality, innovative products and systems as well as our technical services are well appreciated.

5. With many changes happening in the construction industry, have you seen any major new trends in the region lately?

MS: Yes, there has been a rising demand in recent years for environment-friendly systems, ecological solutions and of course 'green' products. But this is not new to Mapei, as you know; the environment has always been our key consideration for the past eight decades.

6. The construction industry in Asia is also getting more and more competitive nowadays. How do you overcome this challenge?

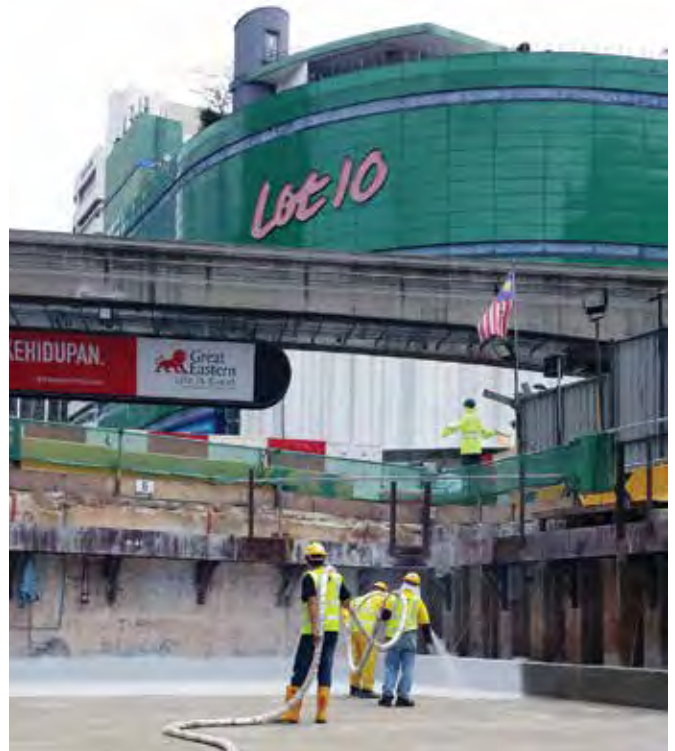
MS: Mapei focuses on the medium-higher segments of the markets. In these segments, we try to offer the best cost-performance solutions combined with excellent technical services. This approach has led us to success.

We always try to improve our performance and services for all our business partners, which include developers and owners, engineers and architects, main contractors, subcontractors and applicators, and distributors/dealers.

7. Moving forward, are you confident that the construction industry will be able to grow as fast as it did before?

MS: The growth development of the construction industry in Asia varies from country to country - in some countries it experiences a strong growth, while in some it is (temporarily) shrinking. However, throughout the years, construction activities in Asia have always increased and I believe this pattern will remain; although the growth rate is likely to be a bit lower than earlier years. ■

Website: www.mapei.com.sg



Mapei waterproofing system being used on Malaysia's new Bukit Bintang Central underground station project, which is part of the new Klang Valley Mass Rapid Transit (KVMRT) network.



Mapei curing compound being applied to protect the concrete slab surface on the Chu Lai International Airport upgrading project in Vietnam.



Above and left: Since its establishment in 1937, Mapei has been focusing on its mission to improve the quality of life by developing eco-sustainable products for the construction industry.

LIANTANG/HEUNG YUEN WAI BOUNDARY CONTROL POINT

The upcoming Liantang/Heung Yuen Wai Boundary Control Point (BCP) is a series of infrastructure projects that will see the construction of the seventh land crossing between Shenzhen in China and Hong Kong. There are currently two existing BCPs on the eastern side of the New Territories between China and Hong Kong. These are located at Man Kam To and Sha Tau Kok, which are mainly used to access eastern Shenzhen and Guangdong. All cross-boundary traffic travelling from these BCPs has to travel through busy local roads in Hong Kong and Shenzhen before joining the major highway systems. This often leads to traffic congestion and hold-ups.

The HK\$25 billion Liantang/Heung Yuen Wai BCP has been designed to alleviate these problems, connecting the expressway systems in Hong Kong and Shenzhen, thereby reducing the travelling time between Hong Kong and eastern Guangdong, as well as southern Fujian and Jiangxi.

The new BCP will help redistribute the cross-boundary vehicular traffic amongst the crossings in the east, helping to alleviate traffic hold ups at the Man Kam To and Sha Tau Kok BCPs. It will also provide room for the expansion of the existing BCPs, so that the overall handling capacity and the quality of service of the BCPs in Hong Kong will be enhanced. In addition, four interchanges along the connecting road at the junctions with Fanling Highway, Sha Tau Kok Road, Ping Yuen Road and Lin Ma Hang Road, will be constructed in order to improve access for local residents with a new road connection being built.

Contract 6

One of the major areas of development for the new BCP will be the construction of a new highway, viaducts and a 700 m road tunnel. The works are scheduled for completion by the end of 2018 with a budgeted cost in the region of HK\$ 6 billion.

Termed 'Contract 6', this part of the BCP will be undertaken by the CRBC-CEC-Kaden joint venture (JV), comprising three companies: China Road and Bridge Corp (CRBC) from mainland China, Continental



Above and left: Contract 6 is one of the major parts of the new Liantang/Heung Yuen Wai BCP project, which includes the construction of a new highway, viaducts and a road tunnel. The works are scheduled for completion by the end of 2018.

Engineering Corp (CEC) from Taiwan and Hong Kong based Kaden Construction Ltd.

When completed, Contract 6 will provide a new 4.6 km long dual two-lane trunk road (with about 0.6 km at grade roads), 3.3 km of viaducts and a new 0.7 km tunnel. These will connect the Sha Tau Kok Road Interchange to the new BCP, and will also see associated environmental mitigation measures, landscaping, as well as new drainage/sewerage, utilities and waterworks.

Contract 6 is seen as a project requiring a multifaceted approach to construction, requiring the use of many different

techniques in order to deliver the project on time, and within the budget. To this end, the JV has turned to Sandvik Mining and Rock Technology for equipment and support.

"We realised that Contract 6 would require some highly specialised equipment that will need to be supported by highly trained and effective people," said KY Chow, construction manager for the JV. "We needed surface drill rigs for open cut of the hills by drill and break. Tunnelling jumbos for the excavation of the tunnel, and then vitally, high-quality mobile crushers to crush the excavated rock."

The first part of Contract 6 required the JV to invest in three Ranger DX800 surface drill rigs. A Ranger DQ500 and Ranger DX700 were also working at this site. The drill rigs were used for the open cut of the hills by drill and break. Drill and blast was not possible as blasting was not permitted on the type of hill cut along the highway.

The Ranger DX800 used has been redesigned to accommodate new features, one of which is the revolving superstructure enabling large drilling coverage from the standard 17.6 sq m to a US standard 26.4 sq m. While able to rotate, the rig's stability is guaranteed thanks to its innovative structure, keeping counterweight at all times on the opposite side of the boom.

In addition to these, the rig features a THC700 drilling control system that automatically adjusts to changing rock formations and sends an optimal amount of power to the rock. This has been designed to ensure smooth rotation, solid rock contact and fast penetration in different rock conditions.

Operating costs significantly reduce due to the rig's low fuel consumption rates that are achieved with a new advanced eco-package and engine RPM adjustment. Another enhancement is improved tramming force, which has increased by over 10 percent.

For the actual excavation of the dual two-lane tunnel Sandvik was again chosen to supply equipment with three Sandvik DT1230i and a Sandvik DT820-SC tunnelling jumbos being selected. These were required as each tunnel is 14 m wide and 11 m high for two lines of traffic on the two main tunnels as well as some small cross passage tunnels.

The Sandvik DT1230i is a computer-controlled three-boom electro-hydraulic drilling jumbo for tunnelling and cavern excavation of 20-211 sq m cross sections, including face drilling, bolt hole drilling and mechanised long-hole drilling. It features the iSURE tunnel management programme, intelligent iDATA control system, newly launched high frequency RD525 drills, robust booms and advanced drill string guides.

Sandvik's role has not been limited to the excavation of the tunnel. Two Sandvik QJ241 tracked jaw crushers have also been put to work crushing the excavated granite in order to provide a base for the road construction in the tunnel. Although granite is a hard and notoriously difficult rock to crush, the Sandvik QJ241 has dealt with the 600 mm feed-size in order to produce a -250 mm product. This is further fed into the



Top, above and left: Contract 6 is seen as a project requiring a multifaceted approach to construction, requiring the use of many different techniques in order to deliver the project on time and within the budget. Here, Sandvik surface drilling rigs, tunnelling jumbos and mobile crushers are being used to help complete the works.

second Sandvik QJ241 in order to produce a -40 mm product for the tunnel refilling.

The Sandvik QJ241 compact tracked jaw crusher is fitted with a hydraulic raise and

lower facility on the main conveyor, making it ideal for hard rock applications such as found on the Contract 6 tunnel rock. ■

Website: www.construction.sandvik.com

LIXIL CHITA SOLAR POWER PLANT

Lixil Corporation, a Japanese company in the living and housings solution industry, has begun creating renewable energy sources by turning unused land as well as factory rooftops into solar power plants. The Lixil Chita solar power plant, located in the city of Chita in Aichi Prefecture, along Japan's eastern coastline, was built in two sections at Lixil's manufacturing facility for bidet toilets.

One section was built on the roof of the first manufacturing building - this is believed to be the first rooftop solar plant in Japan. The second section was constructed on some empty land adjacent to the manufacturing site. Kajima, the main contractor on this project, commissioned Koyanagawa Company Limited to slipform concrete bases for the solar panels to be mounted on.

Koyanagawa carried out the job with its Power Curber 5700-C-Max machine, working nine hours per day, six days per week. The company poured a total of 12.6 km of concrete footings over #4 rebar to reinforce the concrete. The job had to be completed within 22 days.

Nearly 18,000 solar panels were then mounted onto the concrete bases. The solar plant also includes nine photovoltaic (PV) inverters, required to convert and store direct current (DC) solar energy into usable alternating current (AC) power that can be fed into the commercial power grid. The power is being sold through Chubu Electric Power Co Inc.

The newly-opened Chita plant produces 5.2 MW of power, which will create 6,000 MWh of energy annually and meet the power consumption of approximately 1,200 households. The plant covers 52,330 sq m of previously unused space and is expected to offset about 3,000 t of CO₂ emissions each year of operation. The addition of the Chita plant gives Lixil 23.92 MW of total solar power production in Japan. ■

Website: www.powercurbers.com



The new Lixil Chita solar power plant covers an area of 52,330 sq m and is expected to offset about 3,000 t of CO₂ emissions each year of operation.



Koyanagawa was tasked to slipform concrete bases for the solar panels to be mounted on. The work had to be completed within 22 days.

Right and far right: Koyanagawa used its Power Curber 5700-C-Max machine on the project, working nine hours per day, six days per week. The company poured a total of 12.6 km of concrete footings over #4 rebar to reinforce the concrete.





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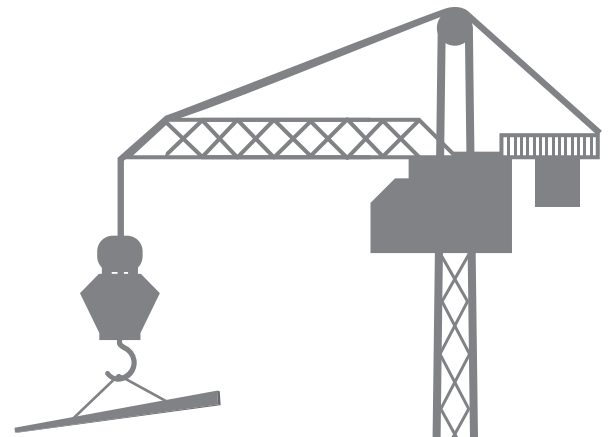
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HK-ZHUHAI-MACAO BRIDGE



Top and above: The Hong Kong – Zhuhai – Macao Bridge is set to be the longest sea-crossing bridge upon completion, spanning 22.9 km with a pavement surface of 700 sq km. The project started on the Zhuhai side (above) in 2009 and its final stages (top) were completed in 2016.

The Hong Kong – Zhuhai – Macao Bridge (HKZMB) is believed to be the world's largest single deck project under construction to date as well as the world's longest sea-crossing bridge upon completion, spanning 22.9 km with a pavement surface of 700 sq km. The main bridge-cum-tunnel segment provides a dual three-lane carriageway and a tunnel of approximately 6.7 km in length. The bridge is designed with a service life of 120 years, and the estimated total value of the project is RMB 110 billion.

Construction of the bridge began in 2009 on the Zhuhai side and the final stages were completed in 2016. It is due to be opened officially to the public at the end of 2017. The bridge is expected to meet the increased demands of land transport for passengers and freights between Hong Kong, Pearl River West of the Mainland, and Macao. By meeting the increased traffic demands and enhanced connectivity, the bridge will

also play an important role in improving the economic and sustainable development of these three regions.

Bridge paving

As the bridge is located in a hot and humid environment with high exposure to seawater, it requires a waterproof and anti-rust deck system. Due to this, Gussasphalt technology is being applied to the project. It features high temperatures of 220-230°C, with high percentage of asphalt and up to 30 percent of added mineral fillers.

Developed by Linnhoff & Henne, Gussasphalt technology is considered one of the best solutions for paving steel deck bridges, industrial flooring, tram track construction, and sealing because of its light weight and durability for heavy traffic use. According to the company, Gussasphalt pavement is thinner and about 55 percent lighter compared to normal hot mix asphalt, making it ideal for use on bridges. The technology has also been used for the construction of the Autobahn (federal highways) in Germany.

After the bridge's steel deck surface is paved with Gussasphalt, it is topped with a layer of stone mastic asphalt (SMA). Both the Gussasphalt and SMA are produced by two Lintec CSM4000 containerised asphalt mixing plants working on site. The project also requires 22 Gussasphalt cookers and two finishers. The cooker is equipped with heating, mixing and transporting functions. It can maintain the temperature and mix the Gussasphalt continuously while being transported to the paving site. The finisher is also needed because Gussasphalt is highly viscous.

Lintec and Linnhoff & Henne are long-time partners of Linnhoff Technologies Pte Ltd, a Singapore-based specialist in road construction. Linnhoff Technologies manufactures asphalt mixing plants with an innovative screen drum technology for Asia Pacific and several African markets. The company also supplies the containerised plant technology from Lintec and Gussasphalt technology from Linnhoff & Henne.

Top right: Gussasphalt technology is being used for road surfacing to ensure the durability of the bridge. Two Lintec CSM4000 asphalt mixing plants are currently working at the Zhuhai site to produce the Gussasphalt as well as stone mastic asphalt.

Above right and right: A total of 22 Gussasphalt cookers (right) and two finishers (above right) are also deployed on the project.





© China Communications Construction Company



Top: On two artificial islands at both exits of the HKZMB tunnel, striking architectural concrete structures are currently being built. On the right of the picture, the exit at the west end of the tunnel can be seen.

Above: The directions of travel for the tunnel are separated by 15.50-m-high reinforced concrete walls, which support a steel structure that also serves as a sun shield.

Tunnel operation buildings

In the area of the approach flight path of the Hong Kong International Airport, Chek Lap Kok, the connection runs through an underwater tunnel. The entrances of the tunnel and the operation buildings on two artificial islands in the southern Chinese Pearl River Delta are currently being built.

At the transition area leading down from the bridge, six lanes with a 3 percent longitudinal gradient disappear into the tunnel whereby two artificial islands were created in order to accommodate these crossover points. For the transition structures, it was necessary to build the up to 15.50-m-high side walls of the entrances with a clearly structured joint and tie arrangement as well as ensuring they are permanently impermeable to water. In addition, enormous wave breakers were put in place around the islands.

With the multi-storey operation buildings, each of them reaches a size of almost 100,000 sq m. In the structure at the west end of the tunnel – which has around 19,000 sq m of usable space – machine rooms, fire fighting equipment and office space will subsequently be accommodated; with one basement level and three above ground floors, this building is almost 20 m high. At the eastern exit of the tunnel, a 23.60 m high, four-storey building has been built to host the service and equipment areas of the tunnel operator and also two storeys of retail space. Furthermore, an exhibition has been planned for the top floor that will feature the development and construction of this mega project.

The contractor, China Communications Construction Company (CCCC), has chosen Peri formwork systems to build various elements of the project. The fabrication of the up to 15.50-m-high reinforced concrete walls, which separate the two lanes in the area of the tunnel entrances, is carried out with mobile Peri portal formwork carriages. This movable solution includes a project specific Vario GT 24 girder wall formwork, which enabled the construction team to create the required, clearly structured joint and tie arrangement for the walls. Moreover, the use of Peri SK tie technology provided a high degree of water tightness required throughout. Also for the massive breakwater, the construction team used a mobile Peri wall formwork solution.

For the large sized columns, slabs, cantilevered balconies and parapets, Peri developed formwork and scaffolding solutions based on standard components of its various systems. The company also planned, produced and supplied project specific solutions with timber formers and a range of cut-to-size plywood panels for the more complex shaped areas and components. All system components and panel cuts were delivered to the construction site just in time and assembled on site according to the construction progress.

According to Peri, the contractor was able to reduce the construction time by around six months compared to its initial planning. Completion of the structures on the islands is slated for October 2017. ■

Top right: China Communications Construction Company has chosen Peri formwork systems to build various elements of the project, including the circumferential wave breakers and the multi-storey operation buildings on the artificial islands.

Above right: Peri formwork solution for the slabs, cantilevered balconies and parapets is largely based on standard components taken from its various systems. The company also planned, produced and delivered countless timber formers and other cut-to-size plywood panels for the circular-shaped areas.

Right: The cut-to-size plywood formlining for the project-specific formwork of the large-sized columns was planned and produced in Germany.



All images © Peri (unless stated otherwise)

For information on the Gussasphalt technology during bridge paving work (pages 84-85): www.linnhoff.com.sg
 For information on the formwork technology during construction of the tunnel portals and operation buildings (pages 86-87): www.peri.com

REINVENTING CONSTRUCTION THROUGH HIGHER PRODUCTIVITY

BY: Jan Mischke, McKinsey Global Institute (MGI), and Mukund Sridhar, McKinsey & Company

GLOBAL CONSTRUCTION PRODUCTIVITY HAS AVERAGED ONLY 1 PERCENT PER YEAR OVER THE PAST TWO DECADES. WE IDENTIFY SEVEN WAYS THAT CAN BOOST THE VALUE ADDED OF THE INDUSTRY BY US\$1.6 TRILLION A YEAR, AND EXPLORE A NEW MANUFACTURING-STYLE SYSTEM THAT COULD BOOST PRODUCTIVITY BY FIVE TO 10 TIMES.

Global construction has a productivity problem

Today, around US\$10 trillion a year is being spent on the buildings, infrastructure, and industrial installations that are the backbone of the global economy, and demand is rising. By 2025, that amount is projected to total US\$14 trillion. However, the industry could produce more for this investment if productivity were higher, leading to a fundamental improvement in the world's infrastructure and the quality of life of citizens.

Globally, labour-productivity growth in construction has averaged only 1 percent a year over the past two decades, compared with growth of 2.8 percent for the total world economy and 3.6 percent in the case of manufacturing. In a sample of countries analysed, over the past 10 years less than one-quarter of construction firms have matched the productivity growth achieved in the overall economies in which they work, and there is a long tail of usually smaller players with very poor productivity. Many construction projects suffer from overruns in cost and time.

The labour-productivity performance of construction sectors around the world is not uniform. There are large regional differences as well as visible pockets of excellence. In the United States, for instance, the sector's labour productivity is lower today than it was in 1968. Indeed, the US construction sector accounts for one-third of the opportunity to boost global productivity identified in this research. Europe's productivity is largely treading water. China and South Africa are increasing their productivity rapidly, albeit from a low base, while countries such as Brazil and Saudi Arabia are falling further behind. A few smaller countries - notably Australia, Belgium, and Israel - are managing to combine high measured

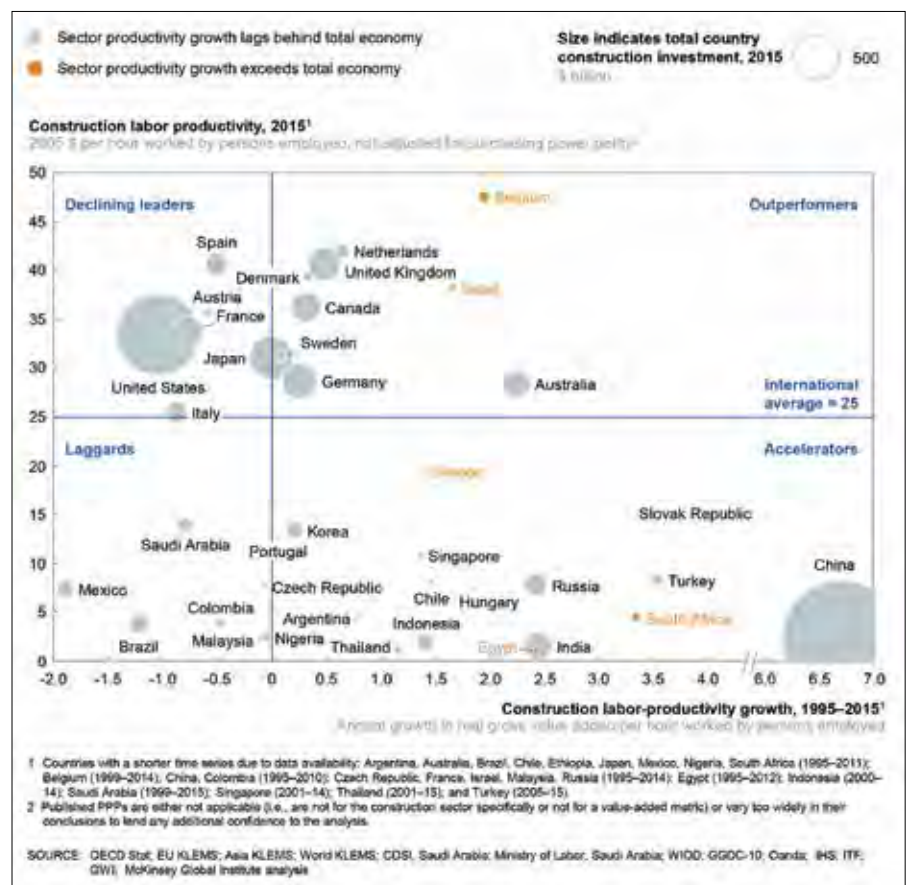


Figure 1: A small number of countries have achieved healthy productivity levels and growth rates.

productivity levels with comparatively fast growth (Figure 1).

The low labour productivity of the construction industry is an important issue. If construction sector productivity were to catch up with that of the total economy - and we will show that it can - this would boost the sector's value added by an estimated US\$1.6 trillion, adding about 2 percent to the global economy a year. This would correspond to an increase in construction value added using the same resources of almost 50 percent.

Market failures and industry dynamics

The construction sector is not homogeneous. It splits more or less in half between large-scale players engaged in heavy construction such as civil and industrial work and large-scale housing, and a large number of fragmented specialised trades such as mechanical, electrical, and plumbing that act as subcontractors or work on small projects

such as single family housing or, increasingly, particularly in Europe and the United States, refurbishment and repair work. The first group tends to have much higher productivity than the second.

In the first group, contractors involved in industrial infrastructure have, on average, the highest productivity at 124 percent of the figure for the industry as a whole, followed by civil construction players at 119 percent and large-scale building contractors at 104 percent. Trades subcontractors, which are responsible for a large share of value in small real estate and refurbishment projects, are typically relatively small; their productivity is about 20 percent lower than the sector average. The higher-productivity large-scale half of the industry is not immune to the low productivity of the other half. Large-scale players routinely subcontract to smaller specialised players, and, in the United States, the productivity in civil, industrial, and buildings including trades subcontractors drops by 12, 26, and 28 percent, respectively. Therefore, any action to boost sector productivity needs to apply

to the entire supply chain and to both parts of the market - each of which lags behind manufacturing in its productivity (Figure 2).

We identified 10 causes of low productivity and market failures in the construction industry (Figure 3).

At the macro level, projects and sites are becoming increasingly complex and brownfield-, refurbishment-, or repairs-oriented, and are challenged by geographic dispersion and fragmented land markets. In addition, the construction industry faces extensive regulation and dependency on public-sector demand. Informality, and sometimes outright corruption, distorts the market. Compounding these issues are industry dynamics that contribute to low productivity - construction is among the most fragmented industries in the world, the contracting structures governing projects are rife with mismatched risk allocation, and owners and buyers, who are often inexperienced, must navigate a challenging and opaque marketplace. The results are operational failures within firms, including inefficient design with limited standardisation; insufficient time spent on

planning and implementing the latest thinking on project management and execution; and a low-skilled workforce. In addition, the construction industry is highly volatile and has bottom-quartile profit margins compared with other sectors, constraining investment in the technology and digitisation that would help raise productivity.

The most important market failures and dynamics vary between the two groups. For heavy contractors, suboptimal procurement criteria by public and private owners (focused on reducing initially offered prices and offloading risk) combined with, in some cases, corruption or inexperience among buyers - particularly in the public and residential sectors - have nurtured an environment of misaligned contractual and incentive structures. This has led to hostility and change orders rather than productive and trusted collaboration. The results of a new MGI Construction Productivity Survey confirm this picture of lack of alignment across the industry. For example, contractors and suppliers identified misaligned contracts as the most important root cause of low productivity, while the top root cause cited by owners was inefficient on-site execution.

Key issues for smaller specialised trade contractors and subcontractors include information asymmetries that reflect the fragmentation of this part of the construction sector, and the geographic dispersion of projects that compromise the cost transparency of projects for owners and make it more difficult for contractors to benefit from scale. Furthermore, small and specialised trade contractors offering higher-productivity solutions are held back by competition from contractors using less productive but cheaper informal labour and by regulation such as heterogeneous zoning and building codes. Many players in the industry benefit from today's market failures, earning a substantial share of revenue and profits from change orders and claims, and reducing exposure to competition in an opaque market.

Seven ways to improve the productivity of construction

It doesn't have to be this way. We have identified seven ways innovative companies and regions are addressing current market failures and improving productivity - as well as cost and schedule reliability - in the construction industry. With action and widespread adoption of all seven, the sector's productivity could be 50 to 60 percent higher (Figure 4).

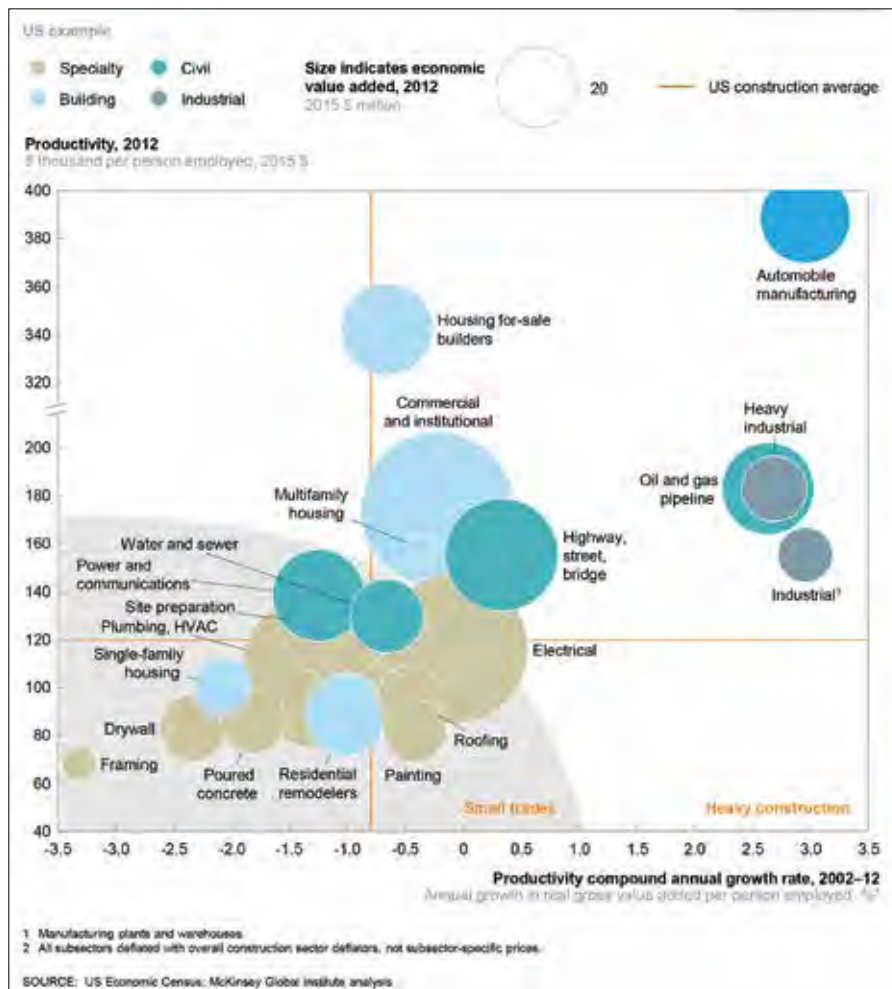


Figure 2: Smaller trades trail on productivity levels and growth (not exhaustive).

Many of the aspects of these seven levers for higher productivity are not surprising, but the industry has not universally applied basic approaches and, even when it has, there is an opportunity to push for best practices:

1. Reshape regulation and raise transparency

Actions include streamlining permitting and approvals processes, as Australia has done; reducing informality and corruption; and encouraging transparency on cost and performance, as the International Construction Measurement Standards project does. Many governments allocate grants for innovation and training. Germany’s Federal Ministry of Transport and Digital Infrastructure (formerly the Federal Ministry of Transport, Building, and Urban Development), for instance, supports R&D through studies in building materials.

Best practice regulation would include moving toward outcome based, more standardised building codes and consolidating land to promote scale. Examples include Singapore’s move to allow cross-laminated timber (CLT) for high-rise structures and Japan’s promotion of scale through land pooling.

2. Rewire the contractual framework

There is a need to move away from the hostile contracting environment that characterises many construction projects to a system focused on collaboration and problem solving. To achieve this, tendering processes can be based on best value and past performance rather than cost alone, and public processes streamlined. Establishing a ‘single source of truth’ on projects for monitoring progress early, potentially supported by collaborative technology, helps to minimise misalignments and enable joint corrective action. The data already exist to fundamentally improve the accuracy of cost and schedule estimates.

Where players continue to use traditional contracts, they should introduce incentives that significantly improve performance and alignment not at a trade or package level, but at the project-outcome level. To move toward best practices, appropriate alternative contracting models such as integrated project delivery (IPD) help build long-term collaborative relationships. Relational contracts will need to become more prevalent than transactional contracts.



Figure 3: Ten root causes for low construction productivity.

Sufficient investments in up-front planning incorporating all parties’ input have been shown to raise productivity substantially.

3. Rethink design and engineering processes

Institutionalising value engineering into the design process with a greater focus on constructability, and pushing for repeatable design elements in those projects that do not require bespoke solutions would make a contribution to boosting productivity. The biggest impact on productivity would come from moving toward thinking about construction as a production system, where possible encouraging off-site manufacture, minimising on-site construction through the extensive use of precast technology, assembling panels in factories and then finishing units onsite.

To indicate the scale of the opportunity, only 50 percent of respondents to the MGI Construction Productivity Survey said that their firms had a standard design library. In asset classes for which standardisation might not be the panacea, the opportunity for parameter specification rather than individual company specifications is significant. Our analysis of sectors such as deepwater oil and gas underscores what a highly significant and largely uncaptured opportunity this is. The automobile and aerospace industries provide insight into how tighter integration with contractors might evolve.

4. Improve procurement and supply-chain management

A combination of best practices seen in other industries and innovative, digitally enabled approaches can deliver substantial change. Improved planning and increased transparency among contractors and suppliers would reduce delays significantly. Properly skilled central procurement teams can drive economies of scale for certain products across those sites. Best practice in areas such as digitising procurement and supply-chain workflows will enable more sophisticated logistics management and just-in-time delivery.

5. Improve on-site execution

There are four key approaches that are well known in the industry but have not been universally adopted. First is the introduction of a rigorous planning process - the Last Planner System (LPS) is a useful tool - to ensure that key activities are achieved on time and on budget. The use of integrated planning tools on a large-scale oil and gas project, for instance, achieved a 70 percent increase in the project’s productivity. Second is reshaping the relationship and interactions between owners and contractors, and key performance indicators (KPIs) being agreed on and used at regular performance meetings at which on-site issues are resolved. Complementing commonly used KPIs with additional forward-looking plan conformance metrics to identify, and subsequently reduce, variance is critical.

Third is improving the mobilisation for new projects by ensuring that all pre-work (for instance, obtaining approvals and developing project milestones) has been completed prior to starting onsite.



Figure 4: Construction can catch up with total economy productivity by taking action in seven areas.

IF CONSTRUCTION WERE TO DEPART FROM ENTIRELY PROJECT-BASED APPROACHES TO MORE CONSISTENTLY EMPLOY A MANUFACTURING-LIKE SYSTEM OF MASS PRODUCTION WITH MUCH MORE STANDARDISATION AND MANUFACTURING OF MODULES AND PARTS IN FACTORIES OFFSITE, THE PRODUCTIVITY BOOST COULD BE AN ORDER OF MAGNITUDE GREATER.

Finally, there is a need for careful planning and coordination of different disciplines on-site along with the application of lean principles to reduce waste and variability. At the heart of this issue is a need to move from systems that rely primarily on process and command-and-control toward a more holistic operating system. The sheer complexity and variability of today's mega projects require a project-operating approach that integrates technical and management systems and fully harnesses workers' capabilities.

In the future, new forms of digital collaboration, notably the Internet of Things and advanced analysis, will combine to enable tracking of equipment and materials and therefore greater transparency.

6. Infuse digital technology, new materials, and advanced automation

Companies can start by making 3D building information modelling (BIM) universal within the company alongside use of digital collaboration tools, drones, and unmanned aerial vehicles for scanning, monitoring, and mapping. They can put themselves at the cutting edge by using platforms such as 5D BIM to establish transparency in design, costing, and progress visualisation; advanced analytics enabled by the Internet of Things to improve on-site monitoring of materials, labour, and equipment productivity; and digital collaboration and mobility tools (such as construction management apps loaded on mobile devices) to better track progress and collaborate in real time.

On-site productivity can be increased by as much as 50 percent by implementing a cloud-based control tower that rapidly assembles accurate data in near real time

that is both backward looking and predictive (for example, using plan conformance and other variability and inventory metrics). Importantly, owners need to ensure that the right data flow through the various owner, contractor, and subcontractor systems. Big data also has a significant role to play. Techniques and data that are readily available today can produce large improvements in the accuracy of cost and schedule estimates as well as engineering productivity.

Developing new lightweight materials and construction methodologies such as prefabricated prefinished volumetric construction can further facilitate off-site fabrication. Advanced automated equipment and tools such as bricklaying and tiling robots can accelerate on-site execution. The introduction of predictive analytics and pattern recognition has enabled far more sophisticated monitoring of construction projects; one example is the network of sensors installed to track the impact of tunnelling works for London's Crossrail project. MGI's productivity survey indicated that the biggest barriers to innovation by construction companies are underinvestment in IT and technology more broadly, and a lack of R&D processes. Establishing innovation officers can make a difference for technology adoption.

7. Reskill the workforce

Change in the construction sector cannot be achieved without investment in retooling a workforce that is aging and changing its makeup through migration. Construction firms and workers need to continuously reskill and train to use the latest equipment

and digital tools. In the mix should be apprenticeship programmes such as the one run by Siemens in the United Kingdom, training frontline workers in core skills that are currently underdeveloped; and increasing stability in the workforce by breaking seasonality and cyclicity.

A production system could boost productivity by up to tenfold

The seven areas that need to be addressed can boost productivity on projects by some 50 to 60 percent. However, if construction were to depart from entirely project-based approaches to more consistently employ a manufacturing-like system of mass production with much more standardisation and manufacturing of modules and parts in factories offsite, the productivity boost could be an order of magnitude greater.

Examples of firms that are moving to a production system suggest that a productivity boost of five to 10 times could be possible. For instance, Barcelona Housing Systems, which builds replicable four-storey multifamily buildings, aims to have a full production system in place in 2018 that can build five to 10 times more units than traditional construction with the same amount of labour. Finnish industrial company Outotec has stated that its mobile flotation plant for small mines requires 20 percent less capital investment and 30 percent less labour, and is 30 percent faster to install than alternatives. Broad Sustainable Buildings of China, which has erected a 30-storey hotel in just 15 days, estimates that its buildings cost 10 to 30 percent less than structures erected in the traditional way. Dramatic time and cost savings reported - or aspired to - by these firms add up to much higher productivity. A broader shift to a production system would negate the majority of market failures that we identify in Chapter 2, simplifying and streamlining the construction ecosystem and making it more efficient.

The shift to a production system will not be possible for the entire sector. For some parts of the industry, the answer is a more effective and efficient project based system, but many players could embrace a much more radical approach. Construction projects cover a broad spectrum in size and complexity, and change of different forms is possible along the breadth of that spectrum. ■

Note: The information and images in this article are taken from the report titled 'Reinventing Construction: A Route to Higher Productivity', published by McKinsey Global Institute (MGI), the business and economics research arm of McKinsey & Company. The full report is available for download at: www.mckinsey.com/MGI/construction

CELEBRATING CONSTRUCTION PRODUCTIVITY

Singapore's Building and Construction Authority (BCA) has given out a record number of awards to recognise built environment firms for their efforts in driving construction productivity. The awards ceremony took place on 13 June 2017 at the Resorts World Sentosa.

City Developments Limited (CDL), Dragages Singapore Pte Ltd and Teambuild Engineering & Construction Pte Ltd received the highest Platinum accolades under the Advocates category of the BCA Construction Productivity Award. These companies were among the first few in the industry to adopt the game-changing prefabricated prefinished volumetric construction (PPVC) method in Singapore, where building modules complete with finishes, fixtures and fittings are manufactured off-site in factories, and then transported to the site for installation in a 'Lego-like' manner.

In the Project category, 11 project teams were recognised for their use of productive technologies. The top awards went to the HAUS@Serangoon Garden, HDB's Rivervale Delta, Crowne Plaza Hotel extension, Oasis Primary School, Yishun Community Hospital and the design and construction of the station at Bukit Panjang and tunnels for Downtown Line stage 2. The other five Gold award winners included HDB's Fernvale Lea, Sea Esta Condominium, Timbre+, ASM Technology Park Building 2 and Jubilee Bridge.

"It is encouraging to see more firms changing the way we build, by shifting most construction work off-site for efficient assembly on site, and making use of info-communication technologies to improve work processes. This not only significantly improves construction productivity but also causes less dis-amenities to the surroundings and improves safety on site," said Ang Lian Aik, BCA's group director of construction productivity and quality. "Ultimately, changing the way we build and pressing on with our industry transformation efforts will raise the competitiveness of our firms and create better jobs for Singaporeans in the built environment sector."

Government to 'review public sector procurement processes'

During the event, Singapore's Minister for National Development and Second Minister for Finance, Lawrence Wong, delivered his speech



The 2017 BCA Awards ceremony took place on 13 June at the Resorts World Sentosa.

and reiterated the government's plans to support the built environment sector. "In this year's Budget, we have announced an additional S\$700 million in construction projects and this is on top of the significant pipeline of public sector projects that are already in place. Of the S\$700 million in projects that we have decided to bring forward, about S\$160 million are already in the design stage, and the tenders will be called by the second half of the year. For the remaining amount, we will try to put out as soon as possible by next year because the intent is to benefit our contractors. For the whole of 2017, we will be awarding many more contracts than we have had in 2016. So in terms of public sector contracts awarded, you can be assured that 2017 will see significantly more projects than 2016," he said.

Mr Wong added that in order to improve the quality of the built environment sector, the government "intends to 're-balance' the price and quality equation by putting more emphasis on quality for both consultancy and contractor services." As such, the public sector procurement processes will be reviewed.

CDL CONTINUES TO CHAMPION CONSTRUCTION QUALITY, PRODUCTIVITY AND SUSTAINABILITY

CDL is known in the industry for its strong initiatives in influencing consultants and builders to adopt productive technologies and practices in their projects. At this year's BCA Awards ceremony, the company has emerged as the most-awarded private-sector property developer with 31 accolades. It is the first and only property developer to be awarded the inaugural top Quality Star Champion, and the only developer conferred the Quality Champion (Platinum) Award for five consecutive years.

Apart from that, CDL is the only Platinum winner for the Construction Productivity Award under the Advocates (Developer) category. This award recognises

the company's efforts in raising construction productivity. For example, in 2014 CDL became the first developer in Asia to adopt the advanced PPVC technology for a large-scale residential project, The Brownstone, a 638-unit executive condominium located next to the upcoming Canberra MRT station. This method is expected to increase productivity by over 40 percent, compared to conventional methods, said CDL. It also ensures good quality as the building modules are manufactured in factory with stringent quality control before being assembled on-site, as well as generates less waste for a cleaner and safer worksite.

The newly opened Singapore

Sustainability Academy (SSA), a collaboration by CDL and the Sustainable Energy Association of Singapore, is also a recipient of the Green Mark Platinum Award. Located at the Sky Park of CDL's City Square Mall, the SSA is the first building in Singapore to have its construction materials, cross laminated timber (CLT) and glued laminated timber (glulam), verified by the Nature's Barcode system as coming from responsible sources. Both CLT and glulam support the concept of design for manufacturing and assembly (DfMA) to significantly boost productivity.

For the SSA, the use of CLT and glulam increased productivity by more than 30

“Today, we already use the quality-fee method (QFM) and price-quality method (PQM) for the procurement of consultancy and contractor services. We intend to fine-tune the processes further. First, we will raise the weightage of quality in our overall evaluation for public sector projects. For example, in PQM today, the quality score typically accounts for about 30 percent in weightage. We will raise this percentage,” explained Mr Wong.

“Second, we will have more robust and rigorous quality assessment by examining the performance of firms in previous projects. For example, we will look at the CPAS scores (for consultants) and C4I scores (for contractors). Firms that have consistently produced quality work will have an advantage over firms that have under-performed.

“We will scrutinise the bids to see if sufficient resources have been allocated to get the job done. Hopefully, this will deter firms from fee-diving to win projects, only to cut down on man-hours or cut down on quality down the road. Essentially, we want firms to bid sustainably to deliver the high-quality work expected of them. By the same token, we will be stricter in penalising firms that fee-dive to secure contracts, but do not deliver or adhere to the necessary quality standards.”

According to Mr Wong, the government will give more weight to companies that adopt more innovative and productive methods, especially contractors that are able to get the job done with fewer manpower using advanced construction methods.

He continued, “Third, even as we focus on quality in our assessments, we will also do more to share quality scores with firms. Today, firms are aware of their price bids and that of their competitors, but they do not know where they stand in terms of quality assessments. So it is hard for them to identify areas to improve.

“We will provide greater transparency on quality assessment including the CPAS and C4I scores, so that firms are aware of where they fall short, and can also benchmark themselves against the best-in-class quality performers. What we want to achieve is a dynamic where firms compete not just on price, but also in terms of quality.”

Inaugural Quality Star Champion Award

In addition, this year marks 15 years since BCA’s Quality Mark (QM) scheme was introduced. Under the QM scheme, all dwelling units in a residential development are subject to checks on the workmanship quality of internal finishes. Units that meet a minimum workmanship

standard will receive the Quality Mark certification. Currently, one in every two new private residential units subscribe to the voluntary QM scheme. According to BCA, a survey conducted by global market research consultant JD Power in 2015 found that homeowners of QM properties experience fewer defects than non-QM properties.

To commemorate this 15th year milestone, BCA launched a new Quality Star Champion Award at the event to recognise leading developers and builders who have been committing to QM and are consistently delivering high workmanship quality in their projects. CDL and Woh Hup (Private) Limited were presented with the inaugural Quality Star Champion Award for achieving five Quality Excellence Platinum awards. Five developers and seven builders also received the Quality Excellence Award for delivering high quality projects.

Enhancing capabilities in the sector

BCA has also been working with industry firms to build up the HR capability of the built environment sector. These initiatives include the launch of the voluntary ‘Pledge for a Better Built Environment Workplace’ initiative in 2014 and funding support for HR-related training for firms in the built environment sector. To date, BCA said that more than 300 built environment firms have signed the Pledge to show their commitment towards adopting good HR practices.

At the awards ceremony, BCA launched a human resource (HR) guidebook to help firms in the built environment sector improve their HR practices, in order to attract, retain and develop talent.

To support the industry transformation and ensure graduates are equipped with the necessary skillsets when they join the sector, BCA is also planning to set up a joint taskforce with industry associations and Institutes of Higher Learning (IHL) to identify relevant content that can be incorporated into the curricula of built environment related courses at IHLs. Furthermore, BCA will be working with IHLs to explore the idea of introducing a capstone programme for graduating students to help them attain deeper industry knowledge, and better prepare them for work upon graduation.

“We expect to see steady growth in Singapore’s built environment over the next decade, with more quality buildings and infrastructure. The ongoing transformation of the built environment sector will create good jobs for Singaporeans entering and in the sector,” said Hugh Lim, CEO of BCA. ■

percent and saved around 130 mandays, according to CDL. Prefabricating the timber components off-site also improves efficiency in assembly and keeps on-site pollution to a minimum, resulting in a cleaner and safer worksite.

Over the years, CDL has pioneered innovations and championed industry-changing construction methods that enhance productivity, construction excellence and environmental sustainability, as part of the company’s steadfast commitment to achieve a minimum Green Mark Gold^{PLUS} certification for all its new developments – two tiers beyond the mandatory Green Mark certification level. Besides enabling CDL to optimise resources and achieve savings, its innovations and advanced methods have also helped to change the way it builds, creating quality, eco-friendly and safe homes and spaces.

As CDL continues to expand its overseas property development business, the company has applied the same expertise and standards for its overseas projects. ■



CDL has adopted the PPVC method for its new large-scale private residential development, The Brownstone (left).

Developer Category

CITY DEVELOPMENTS LIMITED



This is likely the world's largest and first-of-its-kind application of concrete PPVC for a large-scale private residential development.

CDL advocated the use of prefabricated prefinished volumetric construction (PPVC) for The Brownstone executive condominium in Sembawang.

City Developments Limited (CDL) is a long-standing advocate for sustainability and high construction productivity in Singapore.

Key productivity initiatives:

- CDL pioneered the use of prefabricated prefinished volumetric construction (PPVC) for The Brownstone executive condominium in Sembawang. Building modules complete with finishes, fixtures and fittings are manufactured off-site in factories and then transported to the site for installation in a 'Lego-like' manner.
- The use of PPVC is expected to increase productivity by 40 percent as compared to conventional construction methods.
- Stringent quality control is also ensured as modules are fabricated in controlled factory conditions.
- Worksites are cleaner and safer as less construction debris is generated and fewer workers are required on site.

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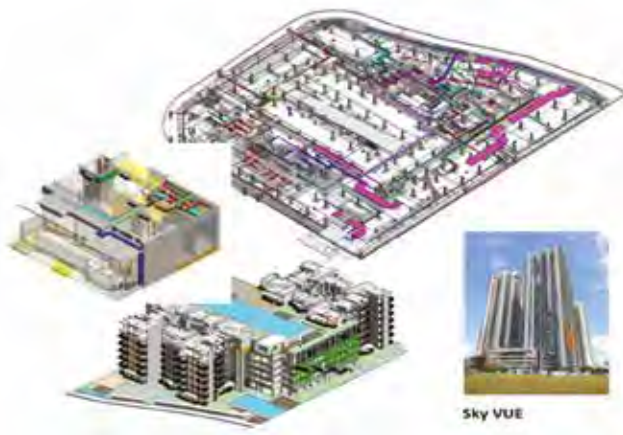
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Builder (Open) Category

DRAGAGES SINGAPORE PTE LTD



Above left: Adoption of PPVC modules.

Above: Proposed the use of the peanut shape diaphragm wall.

Left: Employed the BIM technology.

Dragages Singapore Pte Ltd (DSPL) was established in Singapore in 1984, undertaking the construction of Newton MRT station as its first project. DSPL is part of French Corporation Bouygues Construction, of which more than 1,000 employees are based in Singapore.

Key productivity initiatives:

- DSPL employed the prefabricated prefinished volumetric construction (PPVC) method for the construction of a nursing home at Woodlands Crescent.
- For the Venue Residences project, DSPL took the initiative to propose a peanut shape diaphragm wall during the tendering stage. One of the main advantages of the diaphragm wall was that it was faster to construct. In addition, the diaphragm wall forms an almost strut-free system with only two primary concrete strutting beam, making it less labour intensive for setting up and dismantling the strutting system.
- DSPL adopted the Building Information Modelling (BIM) technology as part of core strategy to drive technical and productivity competitiveness.
- DSPL adopted BIM in the Singapore Sports Hub project for design, development, construction planning and procurement. The use of BIM allowed for close coordination between the different stakeholders involved in the project.



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Builder (Open) Category

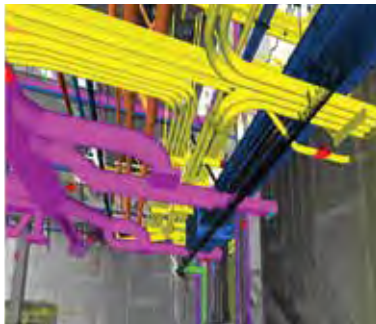
TEAMBUILD ENGINEERING & CONSTRUCTION PTE LTD



Used concrete PPVC in The Brownstone EC project.



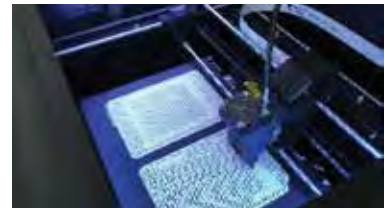
Above and left: Integrated construction and prefabrication hub (ICPH).



Adoption of BIM and VDC technologies.



Above (left and right): Mobile applications developed in-house.



Above and left: 3D printing and augmented reality used for prototype designing.

Founded in 1992, Teambuild has grown to become an established local main contractor with a wide array of projects, including both private and public residential projects, public upgrading projects as well as institutional, commercial and industrial projects. The company has also won, over the years, various accolades and awards for construction and safety excellence. It is now in the forefront of pushing for higher productivity through the use of prefabricated prefinished volumetric construction (PPVC).

Key productivity initiatives:

- Teambuild adopted the use of concrete PPVC in The Brownstone executive condominium (EC) project - the first private residential project to adopt PPVC. Although such construction method was initiated by the developer, the builder provided value-added engineering solutions to ensure early completion despite challenges on site.
- Teambuild also embarked on the development and construction of its own integrated construction and prefabrication hub (ICPH). It is a multi-storey advanced manufacturing facility that produces prefabricated construction elements and will be fitted with automated and integrated production, storage and racking systems. This will facilitate the development and manufacturing of PPVC modules locally, cutting down on transportation and further reducing the manpower needed.
- Teambuild also continually leverages on new technologies to improve and enhance work processes. The company has advocated the use of VDC (virtual design and construction) and leveraged on the capabilities of BIM (Building Information Modelling); developed in-house mobile applications (environmental health & safety, quality checking, and mobile time-card); and used 3D printer and augmented reality for prototype designing and also for research and development purposes. With the accurate and clear visualisation provided, errors in 3D will be easily detected and this in turn allowed for more productive discussions.

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  **PHILCONSTRUCT EXPO**

Developer Category

JTC



Above (left and right): Blk 81 JTC LaunchPad @ one-north Phase 2.

Top and above (left and right): JTC Space @ Tuas.

Right: The spray-painting robot, PictoBot.

Far right: The quality assessment and inspection robot, QuicaBot.



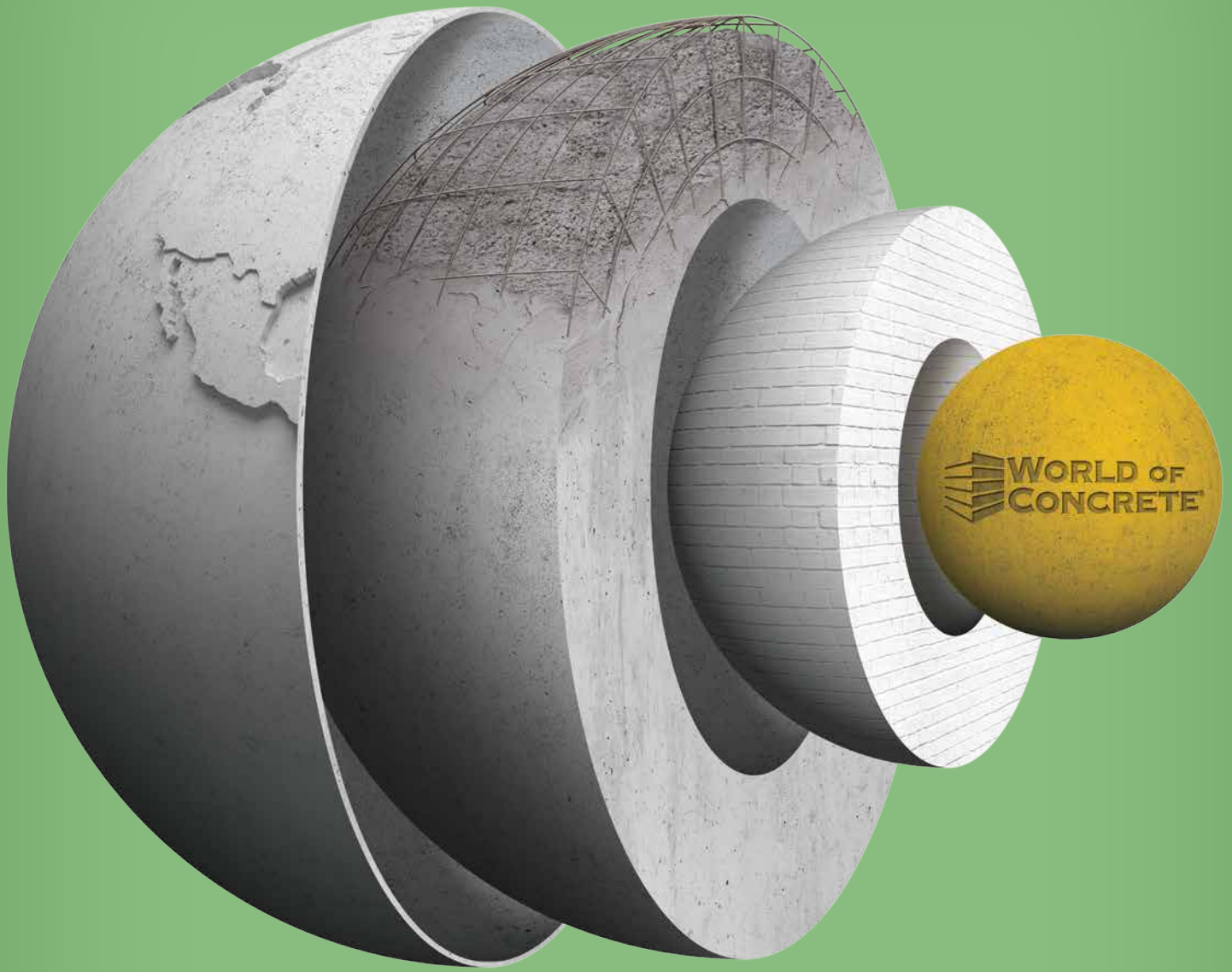
As Singapore’s lead government agency responsible for the development of industrial infrastructure, JTC pushes boundaries in innovation for construction productivity so as to respond quickly to evolving industry needs and overcome challenges such as manpower and resource constraints in today’s fast-changing built environment. JTC has adopted productive construction technologies, materials and processes, as well as innovations that enable it to build better, safer and more sustainably.

Key productivity initiatives:

- The dormitory at JTC Space @ Tuas was built with the prefabricated prefinished volumetric construction (PPVC) method instead of the conventional cast-in-situ concrete construction.
- Using the PPVC method has resulted in overall project time and manpower savings. In addition, with most of the structural, architectural and M&E (mechanical and electrical) works completed off-site, the worksite is cleaner and wastage is minimised.
- JTC has also adopted productive construction materials at another award-winning project, Block 81 at phase two of JTC LaunchPad @ one-north.
- By pioneering the use of engineered wood like cross laminated timber (CLT) and glued laminated timber (glulam) for Block 81, the overall project time was reduced and manpower saving was also achieved. There was also reduction of noise and dust generated by the construction project, thus minimising the impact on the LaunchPad community. The worksite was also cleaner and more organised.

On enabling and adopting innovative solutions:

- In the area of building inspection, JTC has co-developed a quality assessment and inspection robot - QuicaBot - with NTU. Designed to perform autonomous inspections of common building defects, the QuicaBot features many benefits including: easy access to inspection data – stored in the cloud for easy retrieval by builders and developers; autonomous and high accuracy – autonomous navigation, mapping and scanning capabilities ensure precise and accurate detection of defects; and time savings and higher productivity – two times faster than manual inspection, thus it enhances productivity in inspections of units with large gross floor areas.
- Another robot that JTC has co-developed with NTU is the PictoBot, a spray-painting robot with several benefits including: improved worker safety – 13 m high jack-up platform eliminates work-at-height risks; reliable paint consistency – in-situ scanning and precise movement of spray-gun ensures high quality painting; and time and manpower savings – autonomous painting with a six-axis robotic arm and computerised spray paint trajectory makes it four times faster than brushing or rolling.



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Developer Category

MOH HOLDINGS PTE LTD



Adopted the use of PPVC at Woodlands Crescent Nursing Home (WCNH).



Adopted the use of PCSS and BIM at Yishun Community Hospital (YCH)

MOH Holdings (MOHH) Pte Ltd is the holding company of Singapore's public healthcare clusters, comprising the National University Health System, National Healthcare Group and Singapore Health Services. Sharing the Ministry of Health's vision to champion a healthy nation and ensure that the people live well, live long and with peace of mind, MOHH's role is to enhance public healthcare sector performance by unlocking synergies and economies of scale.

Key productivity initiatives:

- The Woodlands Crescent Nursing Home (WCNH) was designed with the intent to locate areas that require larger column-free spans at lower first and second cast-in-situ floors. Upper floors from the third to ninth storey are catered for the repetitive and modular layout, which is designed in standard grid that facilitates prefabrication and the use of prefabricated prefinished volumetric construction (PPVC) method. There were 52 PPVC modules per floor, amounting to a total of 343 PPVC modules for the entire project. These PPVC modules were fabricated off-site in a controlled manufacturing environment and arrived on site fully furnished with mechanical, electrical and architectural finishes.
- The Yishun Community Hospital (YCH) in-patient blocks adopted the precast column structural steel (PCSS) system, which resulted in significant on-site productivity improvement along with other benefits such as better quality finish, reduced noise and dust pollution, and a safer worksite. The Building Information Modelling (BIM) technology was fully implemented from the beginning of the design stage as a virtual platform for better visualisation and communication among the various stakeholders. It was utilised to automate the detection of clashes between different trades such as electrical conduit or ductwork that run into beams. With the help of BIM, irregularities were discovered early and costly rework was reduced.



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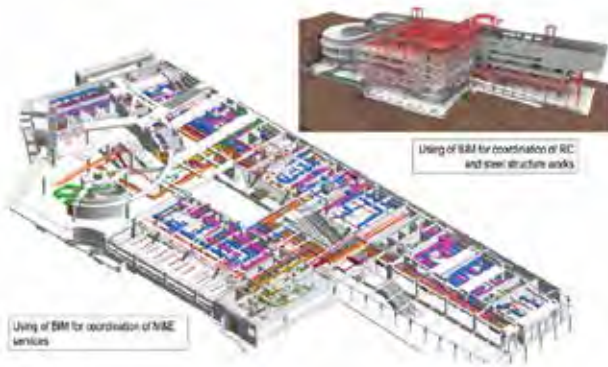
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Consultant Category

MEINHARDT (SINGAPORE) PTE LTD

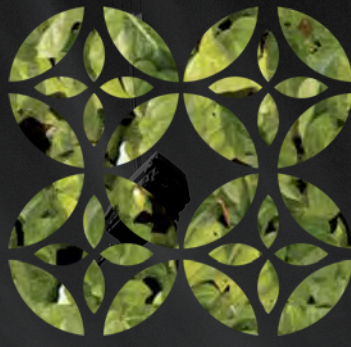


All images: The SMU School of Law is located at 55 Armenian Street.

Headquartered in Singapore, Meinhardt is regarded as Asia's largest independent engineering consultancy firm, which offers value engineering to help clients save time and money. A champion at improving productivity in Singapore's construction sector, Meinhardt has pioneered many innovative engineering firsts across a multitude of projects in Singapore for more than 40 years.

Key productivity initiatives:

- The construction of the SMU School of Law employed the use of multi-storey transfer steel trusses over the 1,400-seater column-free basement function hall, instead of the conventional reinforced concrete transfer structures. The use of steel structures, which were prefabricated off-site, greatly enhanced construction productivity and overall efficiency. The design and adoption of robust top-down construction method with minimal struts effectively controlled ground movements, enhanced site safety and improved productivity. This was carried out successfully for projects such as the SMU School of Law, Frasers Tower, Commonwealth Towers, etc.
- Building Information Modelling (BIM) was adopted extensively in Meinhardt's projects. Extensive collaboration amongst project stakeholders effectively resolved clashes upfront in the design stage, effectively reducing rework and improving on-site productivity.



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Consultant Category

SURBANA JURONG CONSULTANTS PTE LTD



Left and right: Sengkang N2C43B – Compassvale Boardwalk.

Headquartered in Singapore, Surbana Jurong Ptd Ltd was formed in June 2015 through the merger of Surbana International Consultants and Jurong International.

Key productivity initiatives:

- Surbana Jurong’s productivity strategy in holistic design and sustainability is manifested in the Compassvale Boardwalk project. From a design perspective, beyond having repetitive block designs, each room facade is meticulously replicated to deliver cost effectiveness and efficient precasting during the construction stage. Building and Information Modelling (BIM) was also adopted when designing for precast construction in a collaborative physical and virtual environment.

KAJIMA OVERSEAS ASIA PTE LTD

Above left: Adopted the use of the precast lotus root system (PLRS).

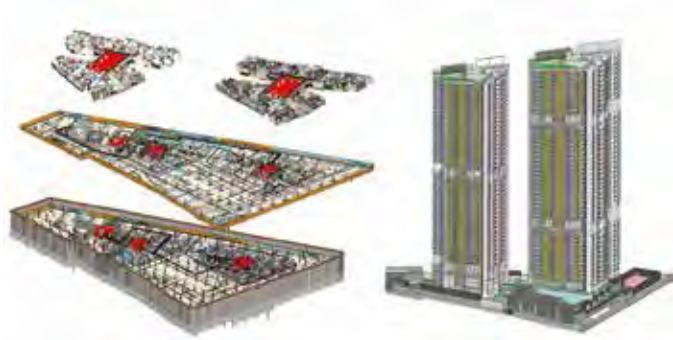
Above right: Developed a new method of hollow core slab (HCS) construction.

Left: Used a drainage blanket system in lieu of tension piles.

Kajima Overseas Asia Pte Ltd (KOA) is a subsidiary of Kajima Corporation, one of Japan's largest construction and civil engineering general contractors. Kajima in Asia has its regional office in Singapore, which was established in 1988.

Key productivity initiatives:

- The precast lotus root system (PLRS) eases complicated connection joints with the integration of beams and columns. It is much simpler and faster to install on site compared to other precast systems and cast-in-situ methods. The construction of vertical elements can proceed without waiting for the slab to be cast. This improves the cycle time and buildability of the building and helps in conserving the use of construction materials. It also gives a better quality structure and helps promote an environment-friendly construction site.
- The conventional method of hollow core slab (HCS) construction normally includes four steps: erecting the temporary formwork, casting and curing of the supporting beam, laying the HCS over the beam, and casting of the topping-up concrete slab. KOA has developed a new method of HCS construction that involves only three steps, as a result of one-time casting of the topping-up concrete slab with the RC beam. With this new method, it only takes seven days to complete a 100 sq m HCS (instead of 12 days), thereby reducing the construction cycle by five days.
- The construction of Mediacorp's new media complex at Mediapolis @ one-north faced a challenge during the design stage because the building sits on a land with high ground water table. Originally, 319 of 1,200 mm diameter RC piles were required. As an alternative, KOA proposed the use a drainage blanket system in lieu of tension piles. This solution significantly reduced the amount of manpower required.

Builder (Open) Category**KIMLY CONSTRUCTION PTE LTD**

Above: Integrated model for collaboration.

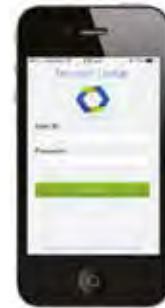
Left: Mobile battery mould (MBM) used for on-site precasting.

Founded in 1965, Kimly Construction is one of the more progressive construction companies in Singapore. Kimly Construction works hand-in-hand with its trusted partners to deliver projects safely, efficiently and on schedule. The company progressively moves ahead by adopting technologies that improve construction productivity.

Key productivity initiatives:

- The mobile battery mould (MBM) is the world's first vertical battery mould with mobility. Kimly Construction procured the MBM from Germany in 2014 to improve the productivity of on-site precasting. The MBM alleviated space and logistical constraints on site and facilitated the setting up of an on-site precast and storage yard. The project team carried out detailed construction and production planning to achieve just-in-time production with the MBM.
- Kimly Construction was one of the pioneers in the adoption of Building Information Modelling (BIM) technology, and the company has an in-house team of trained BIM specialists. The use of BIM allowed for early detection of site issues such as clashes, which prevented costly rework. The technology also allowed for accurate quantity take-off, site utilisation and tower crane planning, precast planning and visualisation, technical coordination and shop drawing production.

STRAITS CONSTRUCTION SINGAPORE PTE LTD



Top and above: Integrated concurrent engineering (ICE) sessions and BIM/VDC models.

Top, left and above: In-house innovative solutions to boost site productivity.

Straits Construction Singapore Pte Ltd was founded in 1969 and secured its first public housing construction project at Serangoon Avenue 4. The company has since grown from strength to strength.

Key productivity initiatives:

- Straits Construction has three on-going projects that adopted the use of virtual design and construction (VDC), namely Blossom Spring @ Yishun (YSN4C17), City Vue @ Henderson (BMRC53) and Sophia Hills @ Mount Sophia. The adoption of VDC brought about advantages and benefits, including a smoother and more productive MEP co-ordination. A BIM (Building Information Modelling) repository was also created for purposes such as actual construction, progress monitoring, etc.
- Straits Construction also developed several innovative solutions to boost site productivity. These solutions came in the form of software applications that are accessible through mobile devices. They include: electronic permit-to-work (e-PTW), defect inspection and rectification management (DIRM), and subcontractors defect rectifications management system (SDRM).

Builder (Open) Category

GAMMON CONSTRUCTION LIMITED SINGAPORE BRANCH



Above:
Pioneered the use of carpet reinforcement.

Left:
Adopted digital automation.

Top and above: Pioneered the use of concrete canvas.

Gammon Construction Limited Singapore Branch has been involved in constructing a number of key civil engineering projects in the country for many years.

Key productivity initiatives:

- Gammon Construction Limited Singapore Branch pioneered the use of carpet reinforcement in Singapore. It is a prefabricated roll of steel reinforcement bars bound together by steel wires. This roll of reinforcement bars is then rolled up to form a carpet reinforcement bundle. The system was utilised for the construction of roof slab at the Mayflower Station.
- Gammon Construction Limited Singapore Branch pioneered the use of the concrete canvas (CC) in Singapore. It is a flexible, concrete impregnated fabric that hardens when hydrated to form a thin, durable, waterproof and fire-resistant concrete layer. The system is used for the slope protection in temporary retaining works.
- Gammon Construction Limited Singapore Branch adopted the use of digital automation, which uses a paperless web and app-based system to allow a seamless application and approval of site inspections and safety permits. The signatures are authenticated digitally and the approved inspections and permits can be downloaded anytime from cloud.

Advocates - Merit

Builder (Open) Category

GAMMON PTE LTD



Developed a tool for the recovery of boring tools.

Above left: Pioneered the use of road rail vehicle (RRV) for sleeper replacement.

Left: Pioneered the use of zero G mechanical arm.

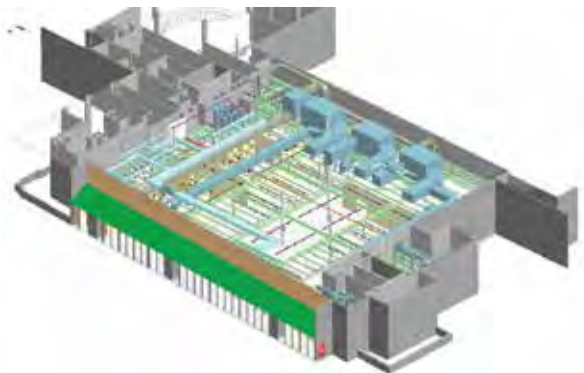
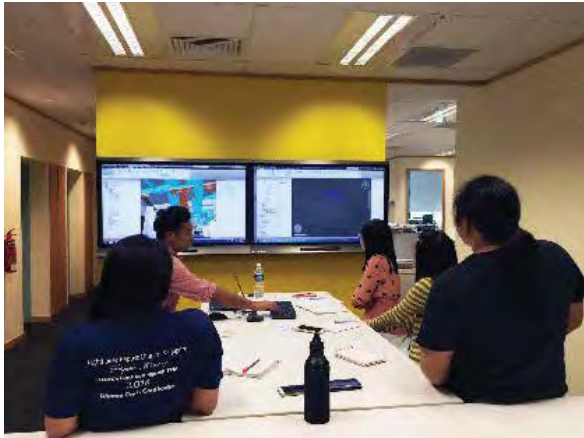
Gammon Pte Ltd focuses on building, foundation, M&E works and rail (sleeper replacement works).

Key productivity initiatives:

- During boring operations, a commonly encountered problem is the dislodging of the boring tools such as auger, boring bucket, core barrel, cleaning bucket from Kelly bar into deep bored holes. Gammon brainstormed and came up with a solution by developing a recovery tool.
- The conventional method of sleeper replacement involves manually handling and removal of sleepers in the case of timber sleepers. Gammon proposed an alternative method of sleeper replacement by using a special equipment called road rail vehicle (RRV).
- The zero G mechanical arm enables tools to be mounted to any supporting frames. This allows tools, parts and other payloads to be manoeuvred as if weightless. There is complete freedom of motion – providing its users with a level of performance that is unmatched by crane-based systems, torque arms and tool balancers. By eliminating the strain and fatigue associated with repetitive tasks and making tools effectively weightless, zero G technology can significantly boost productivity, reduce injury costs and improve quality.

Builder (Prime) Category

DLE M&E PTE LTD



Above left and left: Adopted the use of ICE and BIM/VDC technologies.

Above: DLE M&E Pte Ltd's Year 2012 Diploma Scholar.

Based in Singapore, DLE M&E Pte Ltd has over 35 years of experience in mechanical and electrical engineering services. Previously known as Double Lion Electrical Pte Ltd, DLE is a one-stop integrated M&E contracting firm with the highest BCA grading of L6 in electrical, airconditioning, refrigeration and ventilation works as well as integrated building services workheads.

Key productivity initiatives:

- DLE has adopted the use of BIM/VDC technology to effectively manage projects. An ICE space was setup to enhance collaboration between various stakeholders including subcontractors.
- DLE also actively participates in grooming the next generation by offering various scholarship and sponsorship programmes.

Advocates - Merit

Builder (Prime) Category

LIGHTRUS PTE LTD



Developed the Lightrus prefab system, based on the light gauge steel (LGS) technology.



Adopted the use of 3D models that can be incorporated into BIM during the design stage.

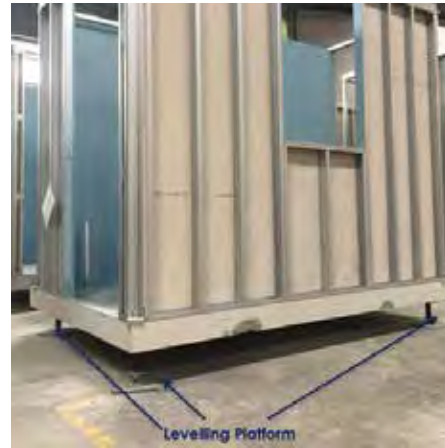
Lightrus is a construction technology firm that specialises in the use of light gauge steel (LGS) for the construction of buildings.

Key productivity initiatives:

- LGS can be adopted as prefabricated structural systems in low-rise buildings such as landed houses, shop houses and town houses. Lightrus prefab system enables connections to be made through the use of cold joints, including rivets, self-drilling screws or anchor bolts. This simplicity of using only battery drills and power drills for connections effectively improved site productivity.
- 3D modelling was adopted to aid in visualising the construction designs. Through the adoption of 3D modelling, Lightrus was better able to enhance communication of construction plans and designs with the various project stakeholders. Design clashes between architectural, structural and M&E were easily identified, communicated and rectified.

Builder (Prime) Category

TONG HAI YANG PTE LTD



Customised four-point levelling platforms.



Above and left: Customised D.PBU trolleys with mechanical mover.

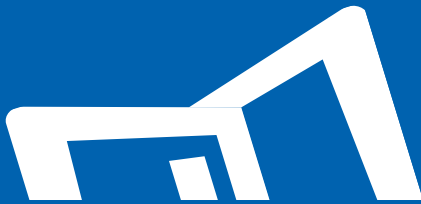


Adopted the use of machines and automated equipment for cutting cementitious panels and Zyclum studs.

Tong Hai Yang Pte Ltd (THY) is a homegrown construction and interior firm founded in 1974. With a key emphasis on quality and productivity, THY has created a sub-division to explore the design for manufacture and assembly (DfMA) method and also developed its modular dynamic prefabricated bathroom units (D.PBU). While the D.PBU has secured both IPA and MAS from local authorities, THY continues to explore means to improve both its products and production processes.

Key productivity initiatives:

- Movement of PBUs to their installation position on site is often a very labour intensive process. As such, THY has developed a moving system comprising a customised D.PBU trolley and heavy-duty mover. This moving system not only reduces the manpower required during the installation process, but also enable precise manoeuvres of PBUs on site.
- To ensure accuracy during fabrication of PBUs, it is important that the PBUs are rested on levelled ground. For this, THY has developed a four-point levelling metal platform using steel plates and integrating adjustable heights screws. These platforms can be reused and the screws can be easily adjusted to facilitate and expedite the levelling process. Furthermore, THY has also adopted the use of CNC machines for panel cutting. As CNC machines are computerised, the operator only requires to input required cuts and loading of drywall panel. Replacing sawing mechanism with shearing, the CNC machine produces accurate sized panels of uniformly straight cuts. This process also eliminates health and safety hazards such as sparks, noise and dust which traditional sawing methods produce.



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Residential Landed Buildings Category

HAUS@SERANGOON GARDEN

HAUS@Serangoon Garden consists of 97 units of two-storey landed housing, each equipped with an attic and a basement. Each unit comprises five bedrooms with one located on the first floor to cater for multi-generational living.

Project Team

Developer: Sparkland Holdings Pte Ltd (City Developments Ltd)

Architectural Consultant: ADDP Architects LLP

Structural Consultant: Tham & Wong LLP

M&E Consultant: United Project Consultants Pte Ltd

Design and Build Contractor: Tiong Seng Contractors Pte Ltd

Construction Cost: S\$91,000,000

Gross Floor Area: 30,306 sq m

Key features:

- The strut-free open cut method was adopted for basement excavation, saving manpower and time on site.
- Precast components such as structural walls, columns, balconies, aircon ledges, bay windows and roof terrace parapet walls were used in the project. Other precast elements used included non-structural service risers and meter chambers. With the use of precast concrete, plastering works were eliminated and a better quality of concrete finishes was achieved.
- Prefabricated bathroom units (PBUs) were adopted in the project to improve efficiency and quality control. With PBUs, different trades such as waterproofing works, tiling works and fitting works were integrated more efficiently at the PBU factory before delivery and installation on site. This resulted in a cleaner site.
- Use of advanced system formwork for the cast-in-situ slabs helped to boost the construction cycle of a typical storey.
- Mobile elevated working platforms (MEWPs), in lieu of conventional scaffolding system, were used during the construction process to carry out finishing works and M&E installation.
- Internal staircases leading to the upper floors of the units were designed and fabricated in steel. This simplified the assembly and installation process and contributed to less manpower deployed on site.
- Off-form concrete was used for the external perimeter walls, which required no skim coat and helped to achieve better finishes in quality. This also improved safety on site as the risk of falling from height was reduced.

Projects - Platinum

Residential Non-Landed Buildings Category $\geq 25,000$ sq m**RIVERVALE DELTA**

Rivervale Delta is a public housing development comprising nine residential blocks with 884 dwelling units, a multi-storey carpark, two precinct pavilions, two electrical sub-stations, a senior care centre and a residents' committee centre.

Project Team

Developer: Housing & Development Board
 Architectural Consultant: Ong&Ong Pte Ltd
 Structural and M&E Consultant: Rankine&Hill (Singapore) Pte Ltd
 Builder: Teambuild Engineering & Construction Pte Ltd
 Construction Cost: S\$133,334,604.50
 Gross Floor Area: 118,606.6 sq m

Key features:

- Extensive use of precast components including facade, column, household shelter, staircase and infill wall cut down construction time and manpower usage as compared to cast-in-situ method.
- Column connection areas were provided with skin wall to eliminate the need for any external formwork.
- Easy connection of column-to-column joint was designed using spiral connector connection system.
- Prefabricated welded mesh was used for this project, which reduced the positioning and tying of rebars to improve productivity.
- Most of the architectural features were designed with repeated sizes and dimensions throughout the different blocks for ease of construction and fabrication. The high repetition also helped to maximise the precast mould usage.
- Roof screen wall was converted from cast-in-situ to precast concrete for all the residential blocks. This helped to speed up the roof construction process and increase productivity. It also enhanced safety as erecting external cantilever scaffold was not needed.
- Drone was used to take photos for site progress monitoring and safety checks.
- Machines like scissors lift, boom lift, telescopic handler were widely used to boost work productivity.

Institutional Category

YISHUN COMMUNITY HOSPITAL



Project Team

Developer's Agent: MOH Holdings Pte Ltd
 Architectural Consultant: CIAP Architects Pte Ltd
 Structural Consultant: Beca Carter Hollings & Ferner (SE Asia) Pte Ltd
 M&E Consultant: Parsons Brinckerhoff Pte Ltd
 Builder: Kimly-Shimizu Joint Venture
 Construction Cost: S\$210,599,551
 Gross Floor Area: 56,247.51 sq m

The Yishun Community Hospital (YCH) is strategically located next to the Khoo Teck Puat Hospital (KTPH). The project involved two basements, which required 15 m deep excavation and three blocks of part 9-/part 10-storey high superstructure construction. YCH and KTPH require integration to provide an integrated and seamless care for patients discharged from general and acute hospitals, in order to rehabilitate and recover in a new community hospital. To achieve this, several interfacing structures have been introduced consisting of: a four-level linkbridge; a service tunnel and vehicular tunnel links; and a thoroughfare covered walkway at ground level involving A&A works to existing KTPH.

Key features:

- Precast column structural steel system (PCSS) was adopted for the in-patient (IP) blocks. The columns were precast and steel beams were fabricated at factory. With this prefabrication method, PCSS not only increased site productivity and efficiency, but also improved quality of construction.
- With Bondek slab designed as permanent slab in PCSS, the Lysaght Bondek sheet was used as a temporary support/formwork for casting, which had substituted the conventional and tedious scaffolding formwork.
- Standardisation of precast columns was adopted as a further refinement of PCSS. Higher strength of concrete was also used for the columns, which further reduced the weight of overall PCSS superstructure works. These value engineering efforts helped to enhance production for speed and ease of construction.
- Conventional spray type vermiculite for fire protection of steel beams was opted out for a new product called Makibee fire-proof blanket. This fire-proof blanket allowed M&E installation and architectural works to be carried out concurrently. The system also eliminated dust particles associated with vermiculite spraying, which was beneficial for a healthcare environment.
- Production of the bamboo-textured concrete facade panels, planter boxes and columns was done in one go by using an advanced precast technology. The technology not only produced off-form finishes but also simplified the installation on site with just one hoisting.
- Top-down method was adopted for the 14 m deep excavation with two basements, where the construction of the basements and the superstructure works proceeded simultaneously. This eliminated extensive strutting and ground anchors works and provided better control of ground movement during excavation.
- Building Information Modelling (BIM) was adopted in the project as an essential planning tool to achieve productivity from the conceptualisation stage to the downstream operation stage.

Projects - Platinum

Institutional Category

OASIS PRIMARY SCHOOL

The new Oasis Primary School incorporates Peri Upgrading with the addition of New Norms facilities, Indoor Sports Hall (ISH), Synthetic Turf Field and Educational White Space. The design concept was to provide a wide, welcoming feeling to the school upon entry from Edgefield Plains, with a very colourful and cheerful atmosphere for the students and staff. Good views between the entry to the school and the school field was also important, and a strong connecting spine to connect all blocks was the main identity for the school buildings.

Project Team

Developer: Ministry of Education
 Architectural Consultant: VivATA Pte Ltd
 Structural Consultant: DE Consultants (S) Pte Ltd
 M&E Consultant: PTP Engineers Pte Ltd
 Builder: Kwan Yong Construction Pte Ltd
 Construction Cost: S\$40,500,000
 Gross Floor Area: 25,738.87 sq m

Key features:

- Precast construction method was adopted for the classroom block, multi-purpose hall, indoor sports hall and administration block to reduce labour on site and maximise productivity. The precast components included precast columns, beams and hollow core slabs.
- Metal roofing on steel trusses were used for all blocks. The steel sections were optimised and prefabricated independently for easy site assembly.
- Drywalls that can be erected easily were used as internal walls between classrooms.
- Use of PEX flexible water pipes in lieu of copper pipes made plumbing connection works simpler and more efficient.
- Tiling works directly laid over structural floor omitted the need for screeding, thus saving time.
- Building Information Modelling (BIM) was used to allow better visualisation of building details and detect clashes to avoid abortive works.

Civil Engineering Category

C912 – DESIGN AND CONSTRUCTION OF STATION AT BUKIT PANJANG AND TUNNELS FOR DOWNTOWN LINE STAGE 2



Project Team

Developer: Land Transport Authority (LTA)

Architectural Consultant: SAA Architects Pte Ltd

Structural Consultant: T.Y. Lin International Pte Ltd

Collaborating Structural Consultant: LSW Consulting Engineers Pte Ltd

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

Design and Build Contractor: Lum Chang Building Contractors Pte Ltd

Construction Cost: S\$504,566,000

Contract 912 comprised the design, construction and completion of Bukit Panjang station and its connecting tunnels between Contract 911 boundary and Contract 913 boundary. The station is located along Upper Bukit Timah Road at the junction of Bukit Panjang and Choa Chu Kang Road. The connecting tunnels run under and parallel to Upper Bukit Timah Road, Woodlands Road and end just after KJE flyover.

Key features:

- The west side of the station, entrance and ventilation structures were in close proximity to existing LRT viaduct and at some locations abutting its foundations. Design of earth retaining structural system was changed from diaphragm wall to secant bored piles (SBP) in the form of donuts and peanuts for the west entrance and ventilation shafts structures. These helped to limit pier movements to existing LRT viaduct foundation to within permissible limit.
- With the change in design, a strut free excavation for the west entrance and ventilation shafts was made possible, resulting in time savings.
- Three stages of traffic diversions were required for the diversion of 1,800 mm diameter PUB water pipes and supporting large sized SingTel manholes. To reduce the time for diversion and traffic disruption, a roundabout was designed and implemented to allow the works to be completed in a single stage.
- A 21-m canal located along Woodlands Road, which runs above the tunnels, required diversion. Due to the presence of SingTel cables and lack of as-built information, the diversion of the canal was replaced by underpinning the canal with micropiles, which resulted in the removal of this activity from the critical path.
- Adopted electronic deck blasting instead of normal electric blasting to accelerate excavation works in hard rock. For electronic deck blasting, the depth of charge is twice that of normal electric blasting, which led to faster excavation and increase in productivity.
- System formwork and shoring systems for tunnels and station were adopted. Being lightweight, these systems enabled fast and safe assembly on site.
- Spray applied waterproofing membrane system for the station, tunnel external walls and roof slab helped to expedite waterproofing works.
- Utilising Building Information Modelling (BIM) as a key enabler, the project team was able to communicate the design concepts clearly to all the stakeholders, collaborate seamlessly on design issues through visualisation, conduct clash detection on compact spaces and packed services to reduce abortive works as well as improve productivity of shop drawings generation and documentation.

CROWNE PLAZA HOTEL EXTENSION



Crowne Plaza Hotel Extension is a new 10-storey business hotel at Changi Airport, with 243 rooms joined by a two-storey linkway to the existing Crowne Plaza Changi Airport Hotel. It is connected to Changi Airport Terminal 3 at both the arrival and departure levels and is easily accessible from Terminals 1 and 2 by the airport skytrain. The new extension hotel is within a short distance to the Changi Business Park and Singapore Expo, and is connected to the city by expressway and MRT.

Project Team

Developer: OUE Airport Hotel Pte Ltd

Architectural Consultant: WOHA Architects Pte Ltd

Structural Consultant: RSP Architects Planners & Engineers (Pte) Ltd

M&E Consultant: Surbana Jurong Consultants Pte Ltd

Design and Build Contractor: Dragages Singapore Pte Ltd

Construction Cost: S\$68,700,420

Gross Floor Area: 9,864 sq m

Key features:

- Prefabricated prefinished volumetric construction (PPVC) was adopted for the project. Off-site production of 252 units of PPVC modules were prefabricated in Shanghai, China. Each module was assembled in a factory setting where the quality is maintained and controlled effectively.
- Using PPVC technology further enhanced site productivity due to its off-site fabrication and finishing works. All trades such as waterproofing, tiling, ceiling, wall laminates, mirrors, wardrobes, shower screens and curtain wall panels were fixed in the PPVC fit-out factory in China.
- With the 100 percent off-site completion of the finishing works of the modules, PPVC resulted in minimal on-site works for the lobby and mechanical, electrical, plumbing and fire protection connection works to be completed.
- The entire core area was constructed in precast concrete. This helped to achieve good quality finish and verticality, thus reducing abortive works. Other intangible benefits included reducing the risk of exposure to work at height, which in turn improved site safety.
- Facade fins and mesh screens were installed by boom lifts and gondolas. This method saved time instead of erecting scaffolding on site.
- Self-compacting concrete was used for the transfer floor due to congested beam reinforcement details. The self-compacting concrete with no vibration procedure required during concrete placement significantly reduced noise to prevent complaints from the guests staying at the existing Crowne Plaza Hotel.
- Use of Building Information Modelling (BIM) technology allowed the project to be explored and reviewed digitally, even before it started. All the M&E services clashes were reviewed and readjusted prior to actual site installations.

Residential Non-Landed Buildings Category $\geq 25,000$ sq m**FERNVALE LEA**

Sengkang N4C24&25 (Fernvale Lea) is a public housing development comprising eight blocks of 26 storey residential blocks, a multi-storey carpark with roof garden, two electrical substations, two precinct pavilions, a common green and 1,150 dwelling units.

Project Team

Developer: Housing & Development Board
 Architectural Consultant: ADDP Architects LLP
 Structural Consultant: KTP Consultants Pte Ltd
 M&E Consultant: United Project Consultants Pte Ltd
 Builder: Qingjian International (South Pacific) Group Development Co Pte Ltd
 Construction Cost: S\$155,271,106.46
 Gross Floor Area: 137,181.60 sq m

Key features:

- Adopted a full precast construction system, whereby almost 90 percent of the elements were precast components. These included columns, facade walls, gable end walls, household shelters, parapet walls, fascia walls, planks and aircon ledges.
- First HDB project to adopt prefabricated bathroom units (PBU) in its construction, which reduced manpower on site. In addition, only two types of PBUs were used for all the residential units. The standardisation of the PBUs enabled repetition of internal architectural finishes and components, thus shortening the cycle time for both structural and architectural works.
- Adoption of precast column skin eliminated the need for workers to fabricate external formwork at the column/beam interface. This in turn enhanced the safety of the workers working at height.
- Standardisation of precast installation using spiral connectors and splice sleeves allowed for an easy learning curve for the workers, which in turn helped to speed up the construction process.
- Repetitive unit designs and layouts enabled the repeated use of precast moulds, saving time and manpower.

Projects - Gold

Residential Non-Landed Buildings Category $\geq 25,000$ sq m**SEA ESTA CONDOMINIUM**

Sea Esta is a 376-unit condominium development comprising four blocks of 13-storey and two blocks of 12-storey residential units, a level of basement carpark, a swimming pool and ancillary facilities.

Project Team

Developer: Hoi Hup Sunway Pasir Ris Pte Ltd

Architectural Consultant: Consortium 168 Architects Pte Ltd

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

Design and Build Contractor: Straits Construction Singapore Pte Ltd

Construction Cost: S\$104,572,176.68

Gross Floor Area: 39,805.41 sq m

Key features:

- Extensive use of precast lightweight concrete panels and dry partition walls for the non-structural elements helped pave the way for downstream architectural works to be carried out in an efficient and productive manner.
- The repetitive nature of the block layout throughout the residential blocks translated to substructure and floor layouts that were almost identical. This greatly facilitated ease of construction. Co-ordination work at the site as well as the amount of coordinated services workshop drawings required to be produced was also significantly reduced.
- Aluminium formwork system was adopted to substitute conventional timber and metal formwork for cast-in-situ construction. Such system enabled the project to achieve improved trade productivity (e.g. less labour required, shortened cycle time, etc) and structural quality.
- The project mobilised the use of scissors lift and boom lift to achieve higher productivity for architectural works at the high void areas.
- Spray painting was adopted for all painting works in the project, in place of conventional painting method with rolling. This resulted in less manpower and yet was able to provide better finishing compared to conventional method.

Commercial Category

TIMBRE+ AT 73A AYER RAJAH CRESCENT

Timbre+ is a gastropark located in the heart of JTC LaunchPad @ one-north at 73A Ayer Rajah Crescent. It was conceived as an amenity space, which serves as a food centre during the day and a gastropark with live music entertainment in the evening. It houses a total of 700 seats and 40 food stalls: 19 hawker stalls, eight caravan stalls, three container stalls, eight restaurants, a bottle shop and a live performance stage.

Project Team

Developer: JTC Corporation

Architectural Consultant: Tan + Tsakonas Architects

Structural Consultant: Harvest Consulting Engineers LLP

M&E Consultant: Unipac Consulting Engineers LLP

Builder: QXY Resources Pte Ltd

Construction Cost: S\$8,753,875

Gross Floor Area: 2,324.17 sq m

Key features:

- Adopted steel frame as the building's main structural system, which facilitated ease of construction on site.
- Steel frame was designed along a regular grid for modular column-beam fabrication with bolt and nut assembly. This ensured on-site work was avoided where possible, especially structural welding that requires rigorous testing of the joints.
- Steel columns were fabricated off-site with arms and connectors for easy nut and bolt assembly of corresponding steel beams.
- Recycled prefabricated shipping containers were used as building facade, walls and food stalls to achieve the design concept and aesthetics.
- Ten prefabricated Airstream caravans were imported, then retrofitted off-site as food trucks before they were delivered to the site for positioning. This reduced the amount of works on site.

ASM TECHNOLOGY PARK BUILDING 2



Located in between Yishun Fire Station and ASM Technology Building, the new ASM Factory lies along Yishun Industrial Park A in the northern region of Singapore. The development comprises a six-storey block with part mezzanine floor between first and second storey and with a RC flat roof.

Project Team

Developer: ASM Technology Singapore Pte Ltd
 Architectural Consultant: Mode Architects Pte Ltd
 Structural Consultant: OCC Consultants Pte Ltd
 Collaborating Architectural Consultant: S T Yeo & Associates
 M&E Consultant: Surbana Jurong Consultants Pte Ltd
 Builder: Kimly Construction Pte Ltd
 Construction Cost: S\$50,300,000
 Gross Floor Area: 24,988.24 sq m

Key features:

- Precast elements such as precast columns, beams, hollow core slabs and planks were adopted and delivered to site for just-in-time (JIT) installation.
- Design of a consistent floor-to-floor height from second to roof storey helped to save time, as additional design of formwork and coordination works were omitted due to the standardisation.
- Nuform wall formwork system was used for core walls and helped to achieve productivity improvement as compared to traditional timber formwork.
- Curtain wall for the external facade reduced the amount of site work and allowed for greater control over component quality with less workmanship issues.
- Installation of curtain wall was carried out using boom lifts and gondolas without the need for scaffolding.
- Adopted Greencast EcoWall as a non-load bearing internal and external partition wall, which can be customised up to 6,000 mm for vertical and horizontal placement.
- Use of mechanical joints for M&E piping systems eliminated the need for skilled labour for hot works (welding).
- Adopted Building Information Modelling (BIM) to check for clashes between M&E services, structural provision and architectural components. BIM was also used to produce M&E coordination drawings, architectural shop drawings, and concrete body plan for construction purposes.

Civil Engineering Category

JUBILEE BRIDGE

The new pedestrian bridge, known as the Jubilee Bridge and brainchild of Singapore's founding father, the late Mr Lee Kuan Yew, was conceived as a barrier-free access pedestrian bridge that forms a seamless link with the Marina Bay waterfront pedestrian loop. The bridge, which was created to cater for large crowds up to 2,000 pedestrians, is three times wider than its adjacent Esplanade Bridge.

Project Team

Developer: Urban Redevelopment Authority
 Architectural Consultant: Architects 61 Pte Ltd
 Structural and M&E Consultant: Arup Singapore Pte Ltd
 Builder: Marina Technology and Construction Pte Ltd
 Construction Cost: S\$19,406,227.75

Key features:

- Precast segmental balance cantilever construction approach was adopted to minimise construction in water and on site. Precast segments were added progressively on alternating sides of a central pillar, with precast half shell being used as a permanent formwork for the pier diaphragm where concrete was cast in-situ inside the shells.
- Segments were cast at an off-site yard, eliminating the use of temporary staging works. This translated to cost, time and resource efficiency and also minimised obstruction to maritime, road and pedestrian traffic.
- Bare high quality concrete surface with only mere painting eliminated the need for extra cladding. At the same time, railing balustrade with tension cable helped to ensure fast installation.
- O-Cell pile test methodology was used and this removed the need to transport large amount of concrete blocks.



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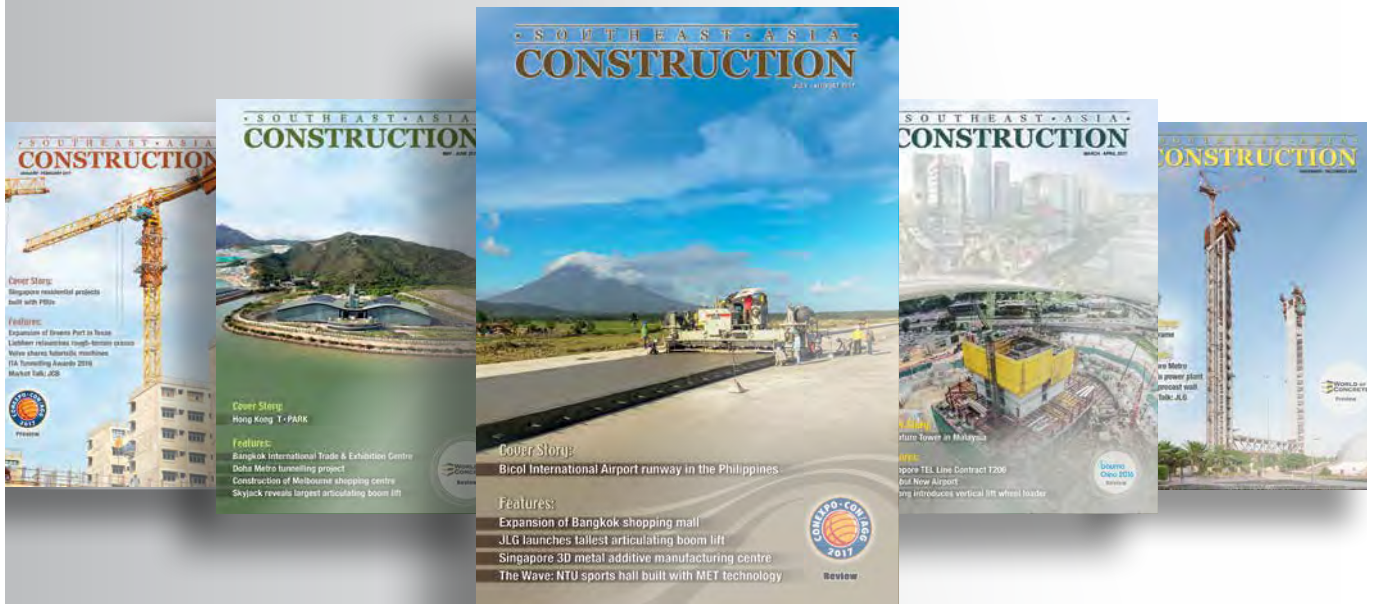
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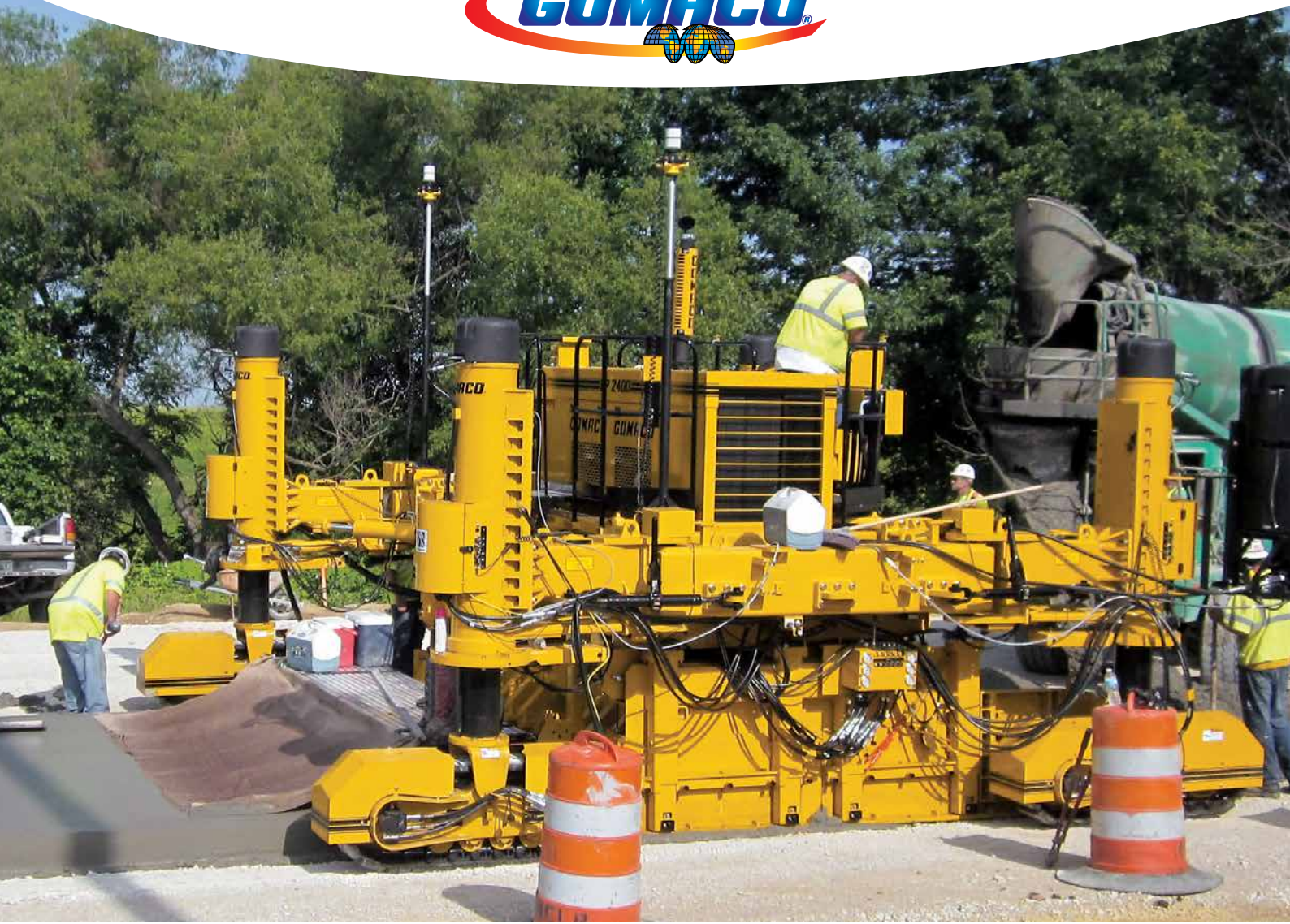
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