SOUTHEAST·ASIA CONSTRUCTION

NOVEMBER - DECEMBER 2026



Cover Story:

Central Kowloon Bypass
(Yau Ma Tei Section), Hong Kong

Features:

Singapore's research initiative for low-carbon construction

New Delhi railway station

Tadano AC 3.060-2 all-terrain crane

Bauer electric machine for cutter-soil mixing

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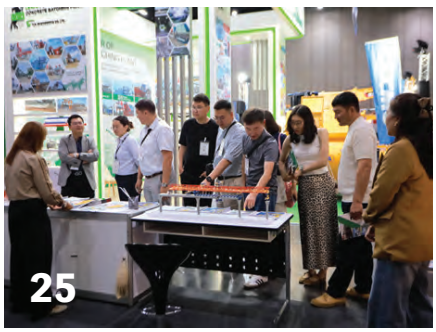





On the cover: Hong Kong's Central Kowloon Bypass (Yau Ma Tei Section) **(page 38)**

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New coastal urban area under development in Can Gio, Vietnam

Vinhomes is developing Vinhomes Green Paradise, a 2,870-ha ESG++ coastal urban area in Can Gio, southeastern Ho Chi Minh City, Vietnam.

The masterplan rests on two pillars, the developer shared. First, new transport infrastructure is expected to shorten journeys to the city centre: the Ben Thanh–Can Gio high-speed railway is designed to connect the area with downtown in about 20 minutes, while the proposed Can Gio Bridge and the widening of Rung Sac Boulevard aim to cut driving times to about 35 minutes.

Second, an on-site ecosystem comprising schools, a hospital, office space and parks, is intended to place most daily needs within reach of home.

The Ben Thanh-Can Gio high-speed railway, developed by Vingroup subsidiary VinSpeed, will run for about 54 km with a maximum design speed of 350 km/hr, said Vinhomes. Construction began in December 2025, with commercial operation targeted for the fourth quarter of 2028. The line will connect Ben Thanh station in central Ho Chi Minh City with Vinhomes Green Paradise.

Meanwhile, the Can Gio Bridge, scheduled to open in 2029, will replace the Binh Khanh ferry crossing. Rung Sac Boulevard, the main artery serving the area, is being widened to up to 10 lanes. Once complete, the two options are expected to give residents a choice between rail for direct trips to the city centre and road travel for journeys with multiple stops.



Image: Vinhomes

Upon completion, Vinhomes Green Paradise will combine new high-speed rail and road links with a self-contained ecosystem of schools, healthcare facilities, workplaces and green spaces.

In addition, Vinhomes Green Paradise is planned to bring education, healthcare, workplaces, retail and recreation within the community. According to the developer, key components will include 104 proposed schools, Vinmec Can Gio International General Hospital, more than 2 million sq m of office space, as well as more than 370 parks and green areas. ■

Bouygues Construction to build Hong Kong East Drainage Tunnel

Bouygues Construction, through its subsidiary Bouygues Travaux Publics, is collaborating with China Road and Bridge Corporation (CRBC) to build the Hong Kong East Drainage Tunnel (HKEDT). The contract, valued at €173 million, was awarded by the Drainage Services Department (DSD) of the Hong Kong Government.

This project was designed as part of the government's policy to improve Hong Kong's flood prevention infrastructure and strengthen the city's resilience to extreme weather events. Once completed, the tunnel will collect rainwater from upstream catchment areas and channel it to Pak Sha Wan, a nearby discharge point into the sea. This will relieve pressure on the existing downstream drainage network and reduce the risk of flooding in the eastern district of the island, where impermeable surfaces and high urban density are worsening the risk of flooding.

Bertrand Burtschell, deputy CEO of Bouygues Construction with responsibility for civil works, said, "Some 20 years after we handed over the Hong Kong West Drainage Tunnel, this project is a testament to our continued presence in this region and the trust that has been placed in our expertise to construct complex and essential infrastructure. Alongside our partners, we are continuing our commitment to strengthening the resilience of this region and providing its residents with better protection against extreme weather events."

The project includes the construction of a 3.6-km drainage tunnel, approximately 5 m in diameter, which will link the districts of Shau Kei Wan and Chai Wan, on the east coast of Hong Kong Island, to Pak Sha Wan. The consortium will also build seven intake structures to collect and capture surface runoff before it reaches built-up areas, six connection adits and an outfall structure to discharge water from the tunnel into the sea.

The construction of the tunnel will combine several techniques, including excavation using a tunnel boring machine (TBM), drill-and-blast excavation, the drill-and-break method for excavating rock and large concrete structures, and pipe jacking. This approach reflects the complexity of the project, which is scheduled for completion in 2030.

With more than 40 years of experience in designing and building tunnels on every continent, Bouygues Construction has expertise in all tunnelling techniques, from TBMs to traditional methods. These are adapted to each geological and environmental context. The company's capabilities have been demonstrated in landmark projects such as the Channel Tunnel and the Tuen Mun–Chek Lap Kok Tunnel in Hong Kong, which was excavated using a TBM with a diameter of 17.63 m, setting a world record in its category at the time.

More recently, in the US, the Pawtucket tunnels in Rhode Island and the Potomac River Tunnel in Washington DC also demonstrate the application of this expertise in the context of urban resilience: they both help to limit drainage system overflows during heavy rainfall and improve the quality of marine environments. ■

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2026 bauma SHANGHAI

Singapore launches programme to support startups developing embodied AI solutions in construction

Enterprise Singapore (EnterpriseSG), the Building and Construction Authority (BCA) and The GEAR by Kajima have launched Startup CoLab EAI to support Singapore-based and international startups in developing, testing and commercialising new embodied AI (EAI) solutions for the construction sector. The programme will offer identified industry use cases, construction sandboxes and live project sites, helping promising technologies move beyond trials towards wider industry deployment.

Singapore's steady construction demand presents significant opportunities to adopt technologies that can improve productivity, safety and manpower efficiency. Construction demand is expected to remain strong in the medium term, with BCA projecting annual demand to reach between S$39 billion and S$46 billion from 2027 to 2030. Embodied AI offers a promising pathway to leverage this momentum by combining artificial intelligence with physical systems, enabling machines to navigate real-world environments and handle dynamic tasks such as material handling, facade installation and surface-finishing works.

Startup CoLab EAI supports startups in the following areas:

• Shape and localise: Identify relevant industry use cases for the startups' embodied AI solutions and tailor the technologies to Singapore's market and operational requirements.

• Validate: Validate their solutions under simulated and actual conditions at facilities including construction sandboxes, live project sites and The GEAR building.

• Scale: Help successful startups connect with customers and investors to drive their growth and support broader industry adoption of their technologies.

The programme leverages Kajima's industry expertise and network of project sites, alongside public-private sector partnerships to support the customisation and validation of embodied AI solutions within the construction industry through structured lead demand. Startup CoLab EAI also builds on The GEAR's flagship startup programme, The GEAR Startup CoLab, which helps startups accelerate product and business validation. Since its launch in April 2025, The GEAR Startup CoLab has completed 15 proof-of-concepts with global and local startups.

Emily Liew, assistant managing director for innovation at EnterpriseSG, said, "Embodied AI has significant potential, but technologies need to be field-tested in real operating environments to move them from prototypes to deployable solutions. Through Startup CoLab EAI, EnterpriseSG will work with BCA and Kajima to bring together startups, industry demand and real-world testbeds to turn promising embodied AI technologies into deployable solutions for the construction sector. By doing so, we aim to accelerate industry adoption while strengthening Singapore's position as a global proving ground and launchpad for embodied AI."

Jonathan Cheng, chief technology officer of BCA, said, "Embodied AI has the potential to transform the built environment to become more productive, efficient and less manpower-intensive. BCA is committed to fostering a vibrant innovation ecosystem to accelerate the adoption of such technologies. Through our partnership with EnterpriseSG and The GEAR by Kajima via Startup CoLab EAI, we would like to catalyse more industry-led initiatives and create a conducive environment for the adoption of promising solutions."

Luke Wu, managing director of The GEAR by Kajima, said, "The GEAR by Kajima's unique position allows us to take on three roles in the Startup CoLab EAI programme: programme coordinator, technology collaborator and solution adopter. We connect startups with our ecosystem network and give them access to our living testbed and project sites to develop and validate their technologies.

"Startups can also work with Kajima Technical Research Institute, Kajima's R&D arm, to collaborate and refine their solutions. At the same time, we are driven to adopt innovative solutions that enhance productivity, safety and sustainability across the built environment sector. This gives startups a clear brief from the people who will use their solutions, a live site to test them at, and a direct path to deployment."

Applications for the Startup CoLab EAI programme will open in early 2027, with startups accepted on a rolling basis. For more information: www.thegear.sg/colab-programme. ■

OC Global signs contract for Ho Chi Minh City Urban Railway Line 4

Oriental Consultants Global (OC Global), together with the Consultancy and Construction Limited Company of the University of Transport and Communications, signed a contract on 13 October 2026 for the 'Consulting Services for Review of the Feasibility Study Report and Front-End Engineering Design (FEED) for the Ho Chi Minh City Urban Railway Line 4 (Dong Thanh – Hiep Phuoc) Project.'

The project is an urban railway development being undertaken by Sovico Group Joint Stock Company, a privately owned Vietnamese company, as the project owner. OC Global will be responsible for the technical review of the feasibility study report and the FEED. The work is scheduled to take approximately six months, starting in October 2026.

Ho Chi Minh City Urban Railway Line 4 (Dong Thanh–Hiep Phuoc) is a key urban railway line running north–south through the city, with a planned length of approximately 45 km. Depending on the final route, the underground section is expected to be about 20.7 km, while the elevated section is about 24.3 km. The line will be constructed underground in the city centre and around Tan Son Nhat International Airport, and is planned to connect the city's northern gateway with the Hiep Phuoc port and logistics hub in the south. ■

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Bauer expands global production network with new facility in India

Bauer Maschinen GmbH has strengthened its presence in the Indian market with a new production, sales and service facility in Pune. Covering approximately 15,000 sq m, the site employs around 100 people and will be part of the company's global production network.

In Pune, Bauer Maschinen combines its international manufacturing processes and development and engineering expertise with local capabilities. The aim is to integrate production, sales and service more closely,c- while providing customers in India and the region with more direct support.

Through this new location, Bauer Maschinen is expanding its local sales and service activities in particular. Closer proximity to customers enables faster coordination and enhances support across the entire machine lifecycle.

"India is an important growth market for Bauer Maschinen. With our new facility in Pune, we are expanding our long-term presence in the country," said Wulf Flos, managing director of Bauer Maschinen. "Pune will become an integral part of our international production network. At the same time, we are strengthening our local sales and service capabilities to be closer to our customers and provide even more direct support throughout the region." ■



All images: Bauer Group



ABOVE: **The Bauer Maschinen team in Pune. The company aims to integrate production, sales and service more closely, while providing customers in India and the region with more direct support.**

LEFT: **Wulf Flos, managing director of Bauer Maschinen (left), and Harald Koch, director global tools operations at Bauer Maschinen, at the grand opening of the new facility in Pune.**

FAR LEFT: **Covering approximately 15,000 sq m, the new Pune facility will be part of Bauer Maschinen's global production network.**



Denzai to deploy crawler cranes for Singapore's Changi Airport Terminal 5 project

Denzai Huationg Pte Ltd has signed contracts to supply crawler cranes for two construction packages at Singapore Changi Airport's Terminal 5 (T5) project.

The company will deploy up to 14 crawler cranes with lifting capacities ranging from 90 to 120 t. Seven units are already operating on site, with the remainder of the fleet scheduled to arrive by the end of 2026. The work is expected to continue until mid-2029.

The contracts cover two packages: the connection core, shell works and airfield facilities (design and build); and T5B structural works.

T5 is expected to open in the mid-2030s and handle around 50 million passengers a year. It is one of the largest airport infrastructure projects underway in Asia.

"Changi Terminal 5 is one of the defining infrastructure projects of Singapore's next decade, and we are proud to support it," said Alex Chua, assistant general manager at Denzai Huationg Pte Ltd.

"Running a fleet of this size for two main contractors at the same time calls for a depth of equipment, planning discipline and a strong safety culture. That is what our Singapore team delivers every day." ■

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JTC and Autodesk partner to advance digital delivery across Singapore's built environment lifecycle

JTC Corporation and Autodesk have signed a memorandum of understanding (MOU) to explore AI-enabled digital transformation across the built environment (BE) project lifecycle, with a focus on connected data, intelligent project delivery and interoperable digital workflows.

The collaboration will focus on accelerating digital transformation in the BE sector by ensuring that project information created during the design and construction stages can be trusted, exchanged and reused throughout the asset lifecycle. By combining JTC's end-to-end role in developing industrial infrastructure with Autodesk's expertise in design and make technologies, both organisations aim to assess how AI-enabled workflows can support more efficient project delivery, informed decision-making and improved sustainability outcomes.

Singapore's BE sector has made significant progress in digitalising how projects are planned, designed and delivered. As the industry looks ahead, the next opportunity is to build on these foundations by making information across the project lifecycle more connected, reusable and actionable with the help of artificial intelligence, moving from digital delivery towards more intelligent delivery.

"Singapore's vision to build an AI-ready nation presents a powerful opportunity to transform how we design, construct and manage our built environment," said Haresh Khoobchandani, vice president for Asia Pacific and Japan at Autodesk. "Through this collaboration with JTC, we aim to demonstrate how AI-driven workflows and connected data can unlock new possibilities across the design and make lifecycle, elevating efficiency, collaboration and sustainability from inception to operation."

"We've made strong digital progress in Singapore's built environment sector. The next step is to make it smarter. With Autodesk, we will explore how AI and data can be connected in a safe and accurate manner, to help us better plan, build and manage our industrial infrastructure," said Calvin Chung, assistant CEO at JTC Corporation. "The data can work for us long after a project is completed; helping us understand and operate the infrastructure more effectively, make well-informed decisions on the next project, and support Singapore's transition to an AI-enabled economy."



JTC and Autodesk will be working together to explore AI-enabled digital transformation across the built environment project lifecycle, including the design and construction stages.



FROM LEFT: **Jacqueline Poh, CEO of JTC Corporation, and Haresh Khoobchandani, VP for Asia Pacific and Japan at Autodesk, at the MOU signing ceremony.**

The collaboration will focus on three main pillars:

1. Connected data and lifecycle information management: Exploring how connected, structured and governed data can strengthen information continuity and decision-making across the project lifecycle, from early planning through to facility operations.

2. AI-enabled integrated digital project delivery and sustainability: Assessing AI capabilities and computational workflows to automate and streamline project delivery, model verification and sustainability analysis, including embodied carbon and whole-life carbon assessments.

3. Interoperability and ecosystem collaboration: Demonstrating open, interoperable workflows and information-exchange models across platforms, system integrations and third-party solutions to support wider digital transformation and responsible AI adoption in the sector. ■

Park Villas residential project in the Philippines adopts 'double bottom-up' construction method

Located in the heart of the Makati central business district (CBD) in the Philippines, Ayala Land Premier's Park Villas is taking a different approach not only to luxury residential design but also to construction. Jointly developed by Ayala Land and the Tagle Group, the 51-storey tower is the first in Ayala Land's residential portfolio to adopt the 'double bottom-up' construction method – a move driven by the unique constraints of its highly urban site.

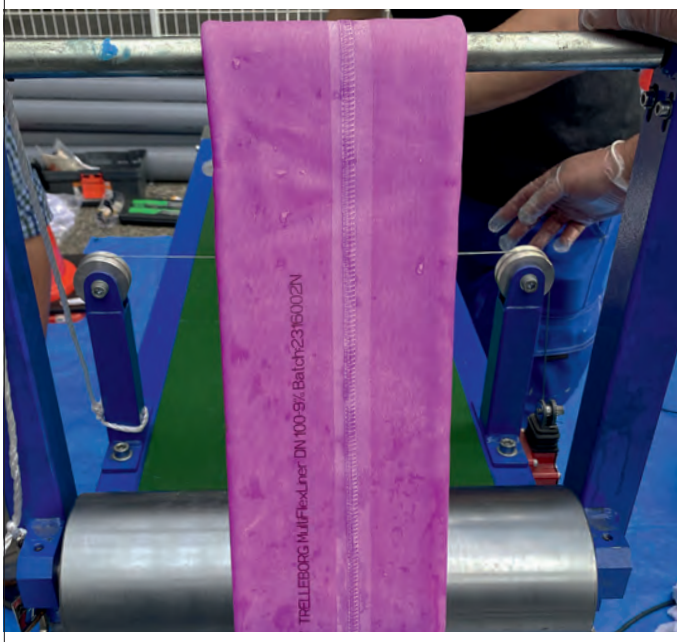
The development is being built by MDBI Construction Corporation (MDBI), a joint venture between Makati Development Corporation, a subsidiary of Ayala Land, and Bouygues Bâtiment International, a subsidiary of France's Bouygues Construction.

Unlike the conventional bottom-up approach, where excavation is completed before construction progresses upward, the double bottom-up construction method allows above-ground and below-ground structures to be built simultaneously. As excavation advances, permanent structural slabs are constructed sequentially from the upper levels downward, providing support for the surrounding retaining walls while enabling vertical construction to proceed.

According to Ayala Land, a comprehensive assessment of the site determined that this would be the most suitable solution for Park Villas. With basement levels occupying the entire building footprint and limited space available for construction logistics, the double bottom-up construction method offers a more efficient and practical approach. The system also incorporates a significantly stiffer bracing mechanism, minimising displacement and protecting adjacent structures in the densely built urban environment of Makati.

The methodology is projected to reduce the overall construction timeline, with the base build expected to be completed months ahead of schedule, while maintaining strict standards of safety and quality. More importantly, it enables the team to execute the project with greater precision, an essential requirement for a development of Park Villas' calibre.

Implementing this innovative approach requires specialised equipment, advanced engineering expertise and rigorous quality control measures, said Ayala Land. The unit handovers are targeted to begin in 2030. ■





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Singapore launches S$30.4 million research initiative to scale up lower-carbon construction

WOH HUP–SIT–A*STAR CONSORTIUM

The newly established Woh Hup–SIT–A*STAR Consortium for Sustainable Construction Technology is a three-year research programme with an overall investment of S$30.4 million, supported under Singapore's Research, Innovation and Enterprise 2025 (RIE2025) plan.

Launched on 1 October 2026 at the Construction Technology Innovation Laboratory's (CTIL) annual technical seminar, held at the Singapore Institute of Technology (SIT), the initiative aims to accelerate the development, validation and deployment of next-generation sustainable construction technologies. It is currently one of the largest private-sector R&D investments in Singapore's built environment (BE) sector, said Minister for National Development Chee Hong Tat at the event.

The research programme, which runs from 1 April 2026 to 31 March 2029, brings together SIT, A*STAR (the Agency for Science, Technology and Research) and Woh Hup (Private) Limited, along with seven other industry partners, to develop practical solutions that reduce embodied carbon, improve construction productivity and strengthen the resilience of the BE sector.

The seven partners are: EnGro Corporation Limited, Batch Technologies Pte Ltd, Cares Certification Pte Ltd, Hirose (Singapore) Pte Ltd, Hangzhou Kuyiqiang Advanced Material Technology Co (through Zhongxin Advanced Materials Technology Pte Ltd), TTJ Design & Engineering Pte Ltd, and Mlion Corporation Pte Ltd.

By drawing on expertise across the full value chain, the consortium aims to shorten the pathway from research to deployment on actual construction projects. Government agencies, including the Building and Construction Authority (BCA), JTC Corporation and the Housing & Development Board (HDB), provide guidance and participate in the programme's steering committee.

Mr Chee expects the initiative to also build Singapore's capabilities for the future. "We want our firms and professionals to develop new competencies in areas such as AI-enabled design, sustainable materials and data analytics," he said. "And we hope that by doing this, we can create more good job opportunities for our people, so that they can take on higher-value work as construction methods continue to evolve and our industry continues to transform."





Both images: Woh Hup

ABOVE AND LEFT: **The official signing ceremony of the Woh Hup–SIT–A*STAR Consortium for Sustainable Construction Technology, held at the Singapore Institute of Technology (SIT). The initiative was launched during the Construction Technology Innovation Laboratory's (CTIL) technical seminar 2026.**

Tackling industry challenges

The consortium is structured around industry-identified challenges and real-world deployment opportunities. Partners will contribute project sites, operational expertise and validation environments to test and refine technologies under actual construction conditions, helping to accelerate adoption across the sector.

The programme focuses on seven research projects to address some of the sector's most pressing challenges:

1. Transform demolition waste into materials for land reclamation

Outcome: Reduce reliance on imported fill materials and support circular construction.

2. Scale up ultra-low-carbon concrete production

Outcome: Produce cost-effective, low-embodied-carbon concrete through automated CO2 activation.

3. Digital verification and traceability for reinforcing steel

Outcome: Improve quality assurance and supply chain traceability.

4. Lightweight and long-span earth retaining and stabilising structures

Outcome: Improve productivity and safety in deep excavations.

5. Composite steel fibre-reinforced concrete slab system for deep foundations

Outcome: More durable, lower-carbon foundation construction with reduced need for maintenance.

6. AI-powered design and optimisation tool for steel-concrete composite flooring system

Outcome: Cost-effective and lower-carbon structural systems for buildings.

7. Smart reusability management platform for structural steel reuse

Outcome: Enable circular use of structural steel and reduce waste.

This initiative marks the next chapter for CTIL, SIT's flagship platform for applied research in sustainable construction technologies, which was founded in 2021. At the event, the centre also celebrated the opening of its facility at SIT's Punggol Campus.

"The work of the past five years has given us a strong foundation, but the challenges ahead – in sustainability and productivity – are more complex, and they require us to go further," said Prof Chua Kee Chaing, president of SIT, in his opening remarks. "On sustainability, there are opportunities to rethink the materials we use, new designs and construction techniques to accommodate their use. Here, new technologies such as artificial intelligence can help engineers optimise their designs, improve productivity and make better use of resources."

Among the seven research projects is an effort to scale up SIT's ultra-low-carbon concrete technology, which was developed under CTIL's Phase 1 launch. The existing technology has already demonstrated a reduction of up to 65% in embodied carbon. The next phase of this research programme will focus on further development, validation and test-bedding with industry partners.

By the end of the programme in 2029, the consortium targets a reduction of up to 40% in embodied carbon in urban development applications using the relevant technologies, compared with conventional construction approaches. It also aims to create new business opportunities and deliver operational cost savings for industry partners.

"The built environment sector is facing increasing pressure to reduce embodied carbon while improving productivity and resource efficiency. The challenge is not simply to develop new technologies, but to ensure they can be adopted at scale and create meaningful impact for industry," said Prof Chiew Sing Ping, head of CTIL at SIT.



Image: Woh Hup

Minister for National Development Chee Hong Tat announces the new initiative at the CTIL technical seminar.



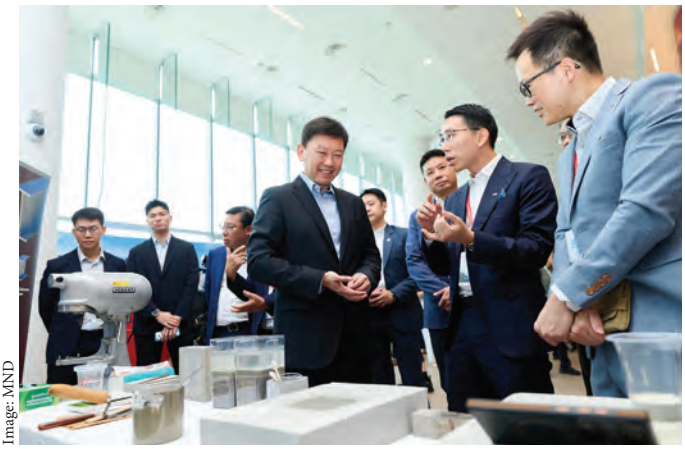
Image: Woh Hup

LEFT: **Professor Chua Kee Chaing, president of SIT, delivers his speech at the CTIL technical seminar.**

BELOW: **Mr Chee views Woh Hup and SIT's steel slag permeable concrete pavement demonstration during the event.**



Image: Woh Hup



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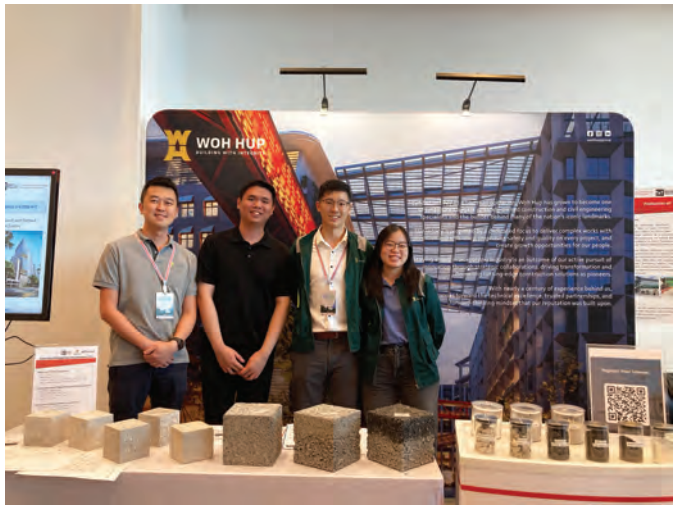


ABOVE (LEFT AND RIGHT): **The seminar took place on 1 October 2026, showcasing a variety of technologies developed under CTIL Phase 1.**

"Through this programme, we will develop and validate technologies that address these challenges, from lower-carbon materials and innovative structural systems to AI-enabled design tools and circular construction solutions. By working closely with industry partners throughout the research process, we can accelerate the translation of these innovations into practice while developing the talent needed to support the sector's transformation."

"Addressing sustainability challenges in the built environment requires innovation across advanced materials, engineering and AI-enabled optimisation," said Prof Lim Keng Hui, assistant chief executive of Science and Engineering Research Council at A*STAR. "Through this consortium, A*STAR is working closely with SIT, Woh Hup and industry partners to develop and validate practical solutions that can reduce embodied carbon, improve resource efficiency and strengthen construction productivity.

"By bringing together complementary capabilities in materials science, engineering and AI-enabled design and optimisation, alongside industry expertise, we look forward to accelerating the translation of these innovations into real-world applications that create meaningful impact for the sector."

"Woh Hup has always believed that meaningful innovation comes from bringing research and industry closer together. Our partnership with SIT, A*STAR and industry partners gives us the opportunity to co-develop solutions that are not only innovative, but also practical and scalable for the construction industry," said Yong De-Rhong, executive director at Woh Hup.

"As we work towards a lower-carbon built environment, we are committed to contributing our experience, capabilities and project sites to help turn promising technologies into real-world applications that can make a lasting impact."

Talent development

Beyond research, talent development is an integral part of the programme. It will train undergraduate and postgraduate students and engage research staff in close collaboration with industry partners. By embedding students and researchers within industry-led projects, the programme will provide opportunities to work on emerging technologies relevant to the transformation of the BE sector. In addition, it supports the capability development of industry professionals through specialised training, industry attachments and technical seminars.

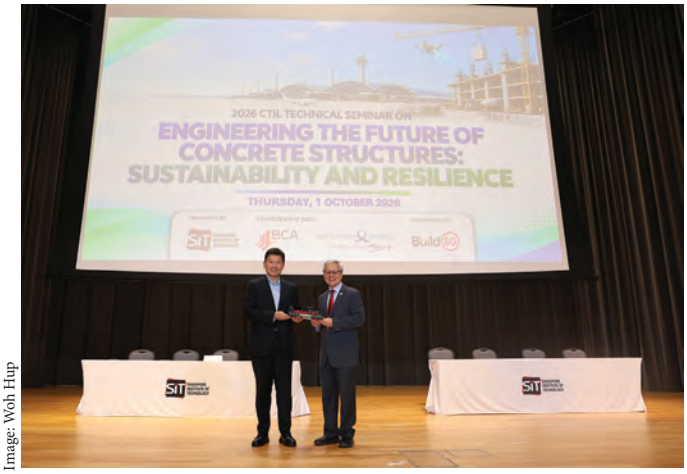


Image: Woh Hup

Mr Chee (left) and Prof Chua at the CTIL technical seminar.

"CTIL's contribution extends beyond technology. It is also about developing the talent who will shape the future of our built environment sector," said Prof Chua. "Through CTIL, students and research staff work directly with industry partners on real-world challenges, contributing to projects that move from concept to testing and deployment.

"The integration of applied research and education with industry participation is how SIT works as Singapore's university for industry. It brings industry, researchers and students together to translate ideas into practical solutions and prepares graduates who are not just technically strong, but who understand how industry works and are ready to contribute from day one." ■

CONSTRUCTION TECHNOLOGY INNOVATION LABORATORY (CTIL)

Since its launch in 2021, CTIL has worked closely with construction companies in Singapore to identify industry challenges, develop practical solutions and evaluate new technologies under actual operating conditions.

The centre recently opened its facility at the Singapore Institute of Technology's (SIT) Punggol Campus, marking the next phase of its development. As a co-creation and innovation hub, it brings together researchers, students and industry partners to develop, test and showcase solutions for the built environment (BE) sector.

In its first phase (2021 to 2026), CTIL completed 13 applied research projects with 26 industry partners. Five technologies have already progressed to deployment in actual construction projects. In 2024, the centre received recognition at the Institution of Engineers Singapore (IES) Prestigious Engineering Achievement Award for its ultra-low-carbon concrete production system.

"A key strength of CTIL is its focus on meeting industry needs. Companies bring forward their challenges, researchers contribute expertise, partners co-invest, and real-world construction projects provide opportunities to test the new solutions," said Minister for National Development Chee Hong Tat, who officially inaugurated CTIL's new facility on 1 October 2026.



Image: Woh Hup

The official opening of CTIL's new facility at the SIT Punggol Campus.



CTIL Phase 1

Established through a collaboration between SIT and Woh Hup, one of Singapore's largest privately owned construction and civil engineering companies, CTIL focuses on translating research into practical, deployable technologies. Its work spans sustainable construction materials, structural and sub-structural engineering, as well as construction digitalisation and automation.

"From the beginning, CTIL was never intended to work apart from industry. It was designed as a platform where researchers, students and industry practitioners could work side by side to solve the challenges faced on the ground and develop solutions that could be tested and validated under actual operating conditions," said Prof Chua Kee Chaing, president of SIT.

Phase 1 of CTIL concluded in January 2026. Over this period, the centre:

- Completed 13 applied research projects with 26 industry partners.
- Secured S$5.95 million in funding from Woh Hup, government agencies and industry partners.
- Successfully translated five technologies into deployment on live construction projects.
- Completed applied research projects with support from the Building and Construction Authority's (BCA) Built Environment Technology Alliance (BETA) Catalyst Funding Programme.

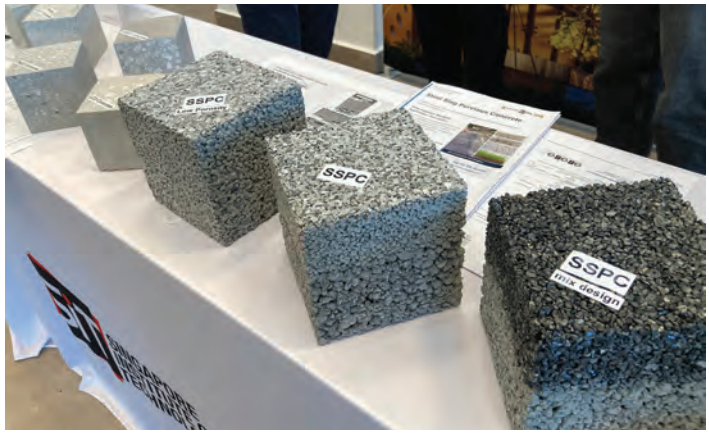
In addition to research, CTIL fosters capability building through technical seminars, industry workshops, design guides, publications and specialised professional development programmes. It also provides opportunities for undergraduate students, postgraduate researchers and research engineers to work on industry-led applied research projects, helping to develop future-ready engineering talent.

With its new facility at the SIT Punggol Campus, CTIL now has a dedicated space to engage with industry, government agencies and research partners, enabling larger-scale collaborative initiatives, accelerating technology validation and strengthening the translation of research outcomes into industry adoption. These efforts will contribute to Singapore's ambition to achieve net-zero emissions by 2050. The facility will also support the development and demonstration of emerging technologies, including AI and digital twin solutions for sustainable construction.

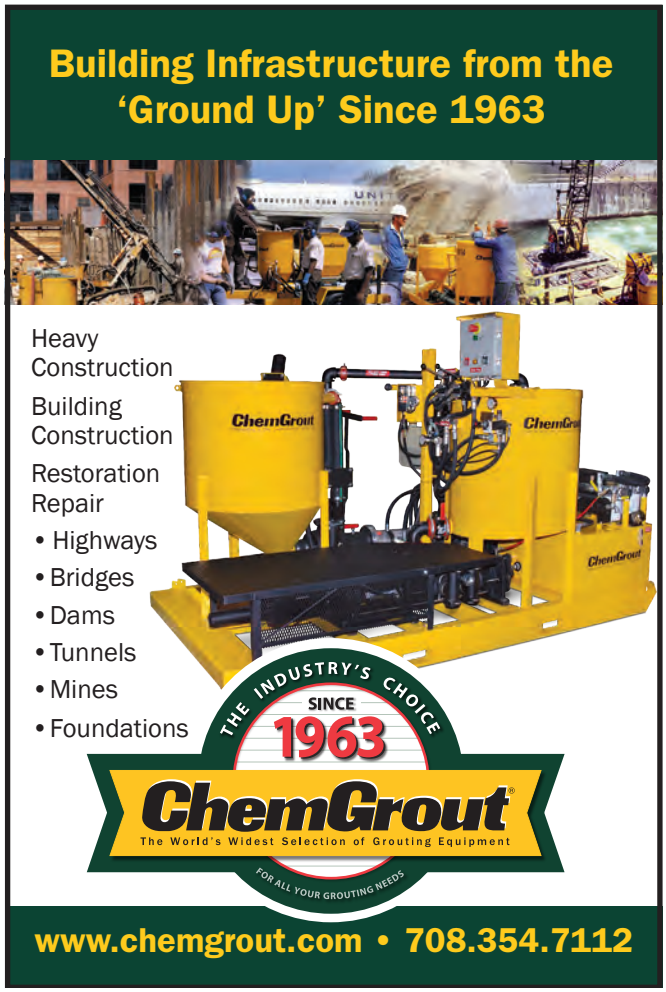


FAR LEFT: **CTIL introduces a new technical reference, 'Design of Headed Anchorage Bars in Reinforced Concrete Structures'.**

LEFT: **Headed bars enhance constructability by reducing reinforcement congestion, improving concrete quality and increasing on-site productivity.**



Innovative sustainable solutions featured at the CTIL seminar.



Continued on page 21...

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Continued from page 19...

Headed anchorage bars

At the seminar, CTIL introduced 'Design of Headed Anchorage Bars in Reinforced Concrete Structures', a new technical reference developed with industry partners to help engineers apply the latest design approaches for reinforced concrete structures.

Building on the previous Association of Consulting Engineers Singapore (ACES) design guide published in 2025, the team further developed and consolidated the design methodology for headed-bar reinforcement into a comprehensive technical book. The work brings together the mechanics of force transfer, product qualification and testing, anchorage verification, detailing requirements and construction control, along with practical procedures and worked examples for engineers.

The book provides an evidence-based reference for the safe and efficient use of headed bars in complex and heavily reinforced concrete structures. By translating research and design principles into practical engineering guidance, it supports wider industry adoption while improving constructability, workmanship and confidence in headed-bar applications.

The work has also facilitated the use of headed bars in three local projects, helping to reduce reinforcement congestion, simplify cage assembly, and enhance concrete placement and compaction. These applications demonstrate tangible improvements in construction quality and productivity.

From lab to site

The examples below illustrate how applied research is being translated into real-world construction projects during CTIL's first phase. These technologies are either being implemented or are planned for adoption in ongoing Woh Hup projects.

Ultra-low-carbon concrete

CTIL developed a cost-effective aqueous carbon sequestration and utilisation system that produces ultra-low-carbon ready-mixed concrete. The technology uses carbon dioxide-enriched water during concrete production, enabling up to 80% replacement of conventional cement with blast furnace slag while maintaining comparable performance. This cuts embodied carbon by up to 65%. The technology has progressed to pilot production and field testing with industry partners.

"This is not just a promising idea in the lab. It has already been deployed in actual projects, including the completed Copen Grand and Lumina Grand executive condominium developments, as well as Union Square and the redevelopment of Clifford Centre, which are currently under construction," shared Mr Chee.

Histeel

This high-performance steel kingpost system boosts productivity in deep excavation works. The lightweight structural system increases working space, minimises material usage and enhances site safety compared with conventional excavation support systems.

"Working closely with industry partners Woh Hup and TTJ Design & Engineering, CTIL developed a welding protocol that allows S690 steel, which is almost twice as strong as conventional S355 steel, to be fabricated into structural sections without compromising its strength," explained Prof Chua.

"The result is a stronger and lighter construction solution that can use up to 40% less steel by tonnage, while improving productivity and safety on construction sites. The technology has moved beyond the lab and into actual developments, including Newport Plaza and Marina View Residences, with BCA approving its use across numerous other projects."

Headed bars

CTIL worked with industry partners to develop new design guidance supporting the adoption of headed bars in reinforced concrete structures. Headed bars enhance constructability by reducing reinforcement congestion, improving concrete quality and increasing productivity on site. The research has contributed to industry guidance aligned with the latest Eurocode developments *(see the 'Headed anchorage bars' section on the left)*.

High-performance composite steel beams

CTIL developed a high-performance, pre-engineered steel-concrete composite beam system for industrial and commercial buildings. The system reduces embodied carbon while increasing structural efficiency and lowering construction costs, resulting in more sustainable building design.

Steel slag permeable concrete

Steel slag permeable concrete (SSPC) is a low-carbon, multifunctional pavement developed by CTIL that valorises locally produced steel slag. The technology has been deployed at a Woh Hup project site for full-scale demonstration, where its performance in stormwater management, urban heat mitigation and long-term durability is being monitored. ■

Note: For enquiries about CTIL or opportunities to participate, please contact the centre at **ctil@singaporetech.edu.sg**

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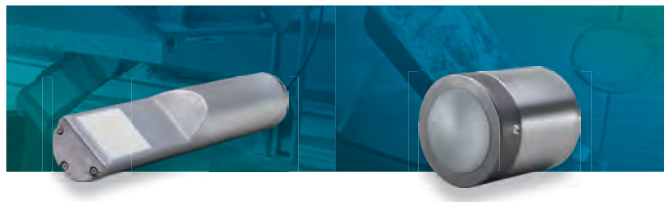

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CALENDAR OF EVENTS

// Events in Asia

Bauma China
23 to 27 Nov 2026
Shanghai New International Expo Centre & Shanghai World Expo Exhibition and Convention Centre
Shanghai, China
Website: www.bauma-china.com

Worldbex
11 to 14 Mar 2027
World Trade Centre Metro Manila & SMX Convention Centre Manila
Manila, The Philippines
Website: www.worldbex.com

Digital Construction Asia
17 to 18 Mar 2027
Sands Expo and Convention Centre
Singapore
Website: www.digitalconstructionasia.com

Trenchless Asia
24 to 25 May 2027
Kuala Lumpur Convention Centre
Kuala Lumpur, Malaysia
Website: www.trenchlessasia.com

MBAM OneBuild
11 to 13 Aug 2027
Malaysia International Trade and Exhibition Centre
Kuala Lumpur, Malaysia
Website: www.mbamonebuild.com.my

BEX Asia | IBEW
1 to 3 Sept 2027
Sands Expo and Convention Centre
Singapore
Website: www.bex-asia.com | www.ibew.sg

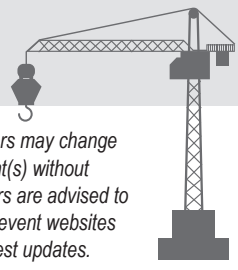
BCT Expo
8 to 10 Sept 2027
Impact Exhibition and Convention Centre
Bangkok, Thailand
Website: www.bct-construction.com

CBA Expo | Concrete Expo Asia | Mining Expo Thailand
27 to 29 Oct 2027
Bangkok International Trade and Exhibition Centre
Bangkok, Thailand
Website: www.cba-expo.com | www.concrete-expoasia.com | www.miningexpo-thailand.com

// Events outside Asia

World of Concrete
19 to 21 Jan 2027
Las Vegas Convention Centre
Las Vegas, USA
Website: www.worldofconcrete.com

World of Asphalt
15 to 17 Mar 2027
Ernest N. Morial Convention Centre
New Orleans, USA
Website: www.worldofasphalt.com



Note: *The organisers may change or cancel their event(s) without prior notice. Readers are advised to visit the respective event websites regularly for the latest updates.*

K-Consafety Expo 2026 honours advancements in construction safety

Korea International Construction & Industrial Safety Expo (K-Consafety Expo) recently took place from 14 to 16 October 2026 at the Korea International Exhibition Centre (Kintex) in Goyang, South Korea. Held under the theme 'Industrial & Construction AX Transformation and the Hyper Safety Platform', the event showcased a wide range of AI, robotics, smart construction and advanced safety solutions.

A key programme of K-Consafety Expo 2026 was its awards ceremony, which celebrated companies and organisations for their contributions to construction safety. These awards recognised practical technologies that help prevent serious accidents, improve safety management at construction sites, and promote innovation and shared growth across the construction industry.

This year, the Construction AI Awards category was introduced alongside the Innovative Technology and ESG & Shared Growth categories. Of 54 applicants, 14 winners were selected by an eight-member panel of industry, academic and media experts.

Under the Innovative Technology Awards, winners included Meissa for its smart safety monitoring solution and K2 Safety for its smart airbag vest. Daehan Heavy Industries, JK, Isan Engineering and OneMoreSecurity were also recognised for equipment safety, worker protection and intelligent monitoring technologies.

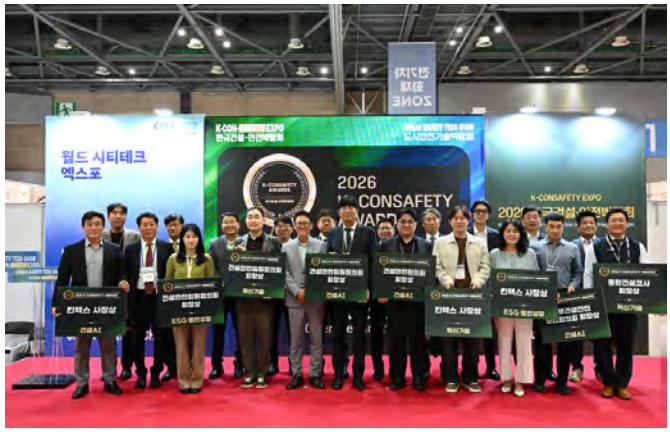
Under the Construction AI Awards, Seonggeon Engineering received recognition for Oasis-L, an AI safety monitoring system designed for areas without communications coverage. KCT E&C was honoured for Meerkat, an AIoT sensor-based, real-time hazard alert system. Other winners included Youngshin D&C (NexusCAM), Saige (Saige Safety), HiLocal (HiWorker) and Itone (GeoNEX).

These technologies illustrate a transition from labour-intensive inspection towards AI-enabled, real-time detection and data-driven prevention.

The Construction Safety Monitoring Association was honoured for improving the professionalism and public role of safety monitors, while the Gyeonggi-do Construction Safety Technology Division was recognised for advancing a practical ESG management framework in the regional construction industry.

"This year's awards demonstrated the future direction of construction safety through AI technologies, practical innovations and ESG initiatives," said the organiser. "We will continue to strengthen cooperation between innovators, construction companies and public institutions to help deploy these technologies and prevent serious accidents." ■

Website: www.k-consafetyexpo.com

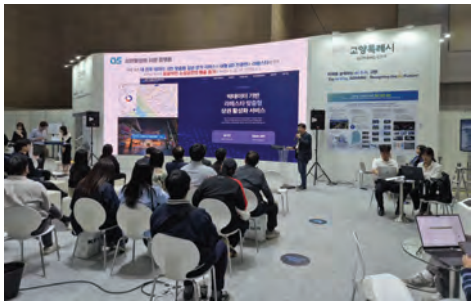




TOP AND ABOVE: **A key programme of K-Consafety Expo 2026 was its awards ceremony, which honoured companies and organisations for their contributions to construction safety.**







ABOVE, LEFT AND FAR LEFT: **This year's K-Consafety Expo showcased a wide range of AI, robotics, smart construction and advanced safety solutions.**



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CBA Expo, Concrete Expo Asia and Mining Expo Thailand 2026 conclude; events to return in Oct 2027

CBA Expo, Concrete Expo Asia and Mining Expo Thailand 2026 recently concluded, drawing professionals and businesses from the construction, concrete and mining industries. The co-located events took place at the Bangkok International Trade and Exhibition Centre (BITEC) from 23 to 25 September 2026.

Bringing the three sectors together provided a valuable opportunity for industry participants to explore machinery, discover new technologies and connect with potential business partners. According to the organiser, BMEX Ltd, the response from both Thai and international visitors reflected continued interest in solutions that can help businesses adapt to changing market conditions and strengthen their operational capabilities.

"We welcomed visitors from Thailand and overseas across the construction, concrete and mining industries. Transactions concluded during the exhibitions exceeded US$5 million, reflecting the strong business interest generated by this year's events," shared Paul Kanton, director – exhibition business at BMEX.

Held under the theme 'Technology and Innovation Drive the Industries', the 2026 edition highlighted the growing role of modern technology and innovation in industrial development. Against the backdrop of ongoing business challenges, the theme underscored how companies are adapting their operations and exploring new approaches to improving productivity, efficiency and long-term competitiveness.

Building on the success of the 2026 edition, preparations are underway for next year's CBA Expo, Concrete Expo Asia and Mining Expo Thailand. The events are scheduled to return to BITEC from 27 to 29 October 2027, featuring an extensive showcase of advanced machinery and cutting-edge technologies, alongside a seminar programme addressing the latest issues and developments in these sectors. ■

Website: www.cba-expo.com / www.concrete-expoasia.com / www.miningexpo-thailand.com







ALL IMAGES: **Held under the theme 'Technology and Innovation Drive the Industries', CBA Expo, Concrete Expo Asia and Mining Expo Thailand 2026 recently concluded, drawing professionals and businesses from the construction, concrete and mining industries.**









IPAF publishes new guidance on installing additional systems and devices on MEWPS

The International Powered Access Federation (IPAF) has published new guidance to help MEWP owners, competent persons and service providers safely install, manage and inspect additional systems or devices fitted to mobile elevating work platforms (MEWPs).

'The Installation of Additional Systems or Devices Fitted to MEWPs' provides practical guidance for anyone considering adding equipment to a MEWP, helping duty holders understand the safety and technical considerations involved.

Additional systems and devices can include pipe racks, material stands and tool trays, as well as more complex systems such as secondary guarding, high-voltage detection, motion control and harness or anchorage point monitoring.

The guidance sets out key principles to follow, including checking that the system or device is suitable for the specific MEWP, following installation instructions, using trained and competent personnel, and ensuring the installation does not introduce new hazards.

It also sets out two main pathways for installations:

Path A: OEM-approved systems or devices

Where a system or device has been approved by the MEWP manufacturer (OEM), installed according to the manufacturer's instructions and passed the required checks, it can generally be managed through the machine's normal inspection and maintenance processes.

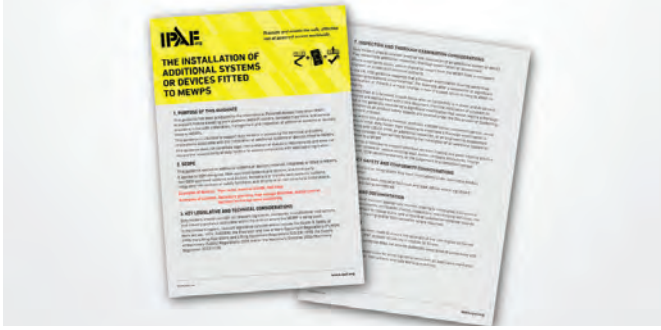
The OEM approval process should also confirm whether the existing Declaration of Conformity remains valid or whether a new one is required.

Path B: Non-OEM-approved systems or devices

Where a system or device has not been approved by the OEM and affects controls, safety functions or the operating characteristics of the MEWP, an additional technical assessment may be required.

The guidance highlights that significant modifications affecting stability, structural integrity, rated capacity, safety systems or the intended use of a MEWP may require specialist technical advice.

Before a MEWP is returned to service following installation, appropriate checks should be completed. These may include functional testing, checking controls, inspecting fixings, reviewing



emergency lowering and rescue arrangements, and updating maintenance or inspection requirements. Operator training or familiarisation may also be required.

"MEWPs are often fitted with additional systems and devices to improve safety, productivity or functionality. However, it is important that these installations are properly assessed and do not introduce new risks or affect the safe operation of the machine," said Brian Parker, IPAF's head of safety & technical. "This new guidance provides a practical framework to help duty holders understand what needs to be considered when installing additional systems or devices, including when OEM approval is required and when further technical assessment may be needed."

The guidance also covers inspection and thorough examination requirements. Following installation, the duty holder should determine – taking account of the nature and extent of the installation, the OEM's instructions, the findings of the installation checks and applicable legal requirements – whether further inspection, testing or thorough examination is required before the MEWP is returned to service.

However, duty holders must continue to meet all applicable legal requirements, including LOLER 1998 in the UK. Where there is any uncertainty, advice should be sought from the MEWP OEM, a competent engineer or specialist technical authority.

The guidance also recommends keeping appropriate records of installation, verification, inspections, maintenance, risk assessments and any changes to operator competence or rescue arrangements. ■



Revised Hong Kong Labour Department guidance drives surge in IPAF operator training

The release of revised guidance by the Hong Kong Labour Department on 4 February 2026 introduced updated requirements and specific training standards for operators across the region. This regulatory update is pushing the local industry to adopt operator training that fully aligns with the new requirements.

Reflecting this shift, Hong Kong reached a major milestone earlier in September, with 1,114 Powered Access Licences (PAL Cards) issued. This achievement highlights the local industry's transition towards reputable, internationally recognised mobile elevating work platform (MEWP) operator training, such as the IPAF PAL Card.



Conforming to ISO 18878, the IPAF MEWP operator training course provides training centres in Hong Kong with full assurance of compliance with the Labour Department guidance notes. Becoming an IPAF approved training centre offers significant advantages to providers, including:

- Reduced administrative burden: Eliminates the need to create course materials from scratch.
- Liability protection: Frees training centres from courseware liability through standardised, audited content.

Currently, the IPAF approved training centres in Hong Kong are: Occupational Safety and Health Council, Modern (International) Access & Scaffolding Ltd, and Shing Fung Engineering & Equipment Ltd.

A number of new training centres are also in the pipeline to meet the growing demand for accredited operator training. ■

IPAF'S 2026 global safety campaign focuses on MEWP inspections

The International Powered Access Federation (IPAF) has launched its 2026 global safety campaign, titled 'Check It!', aimed at promoting the importance of pre-use inspections, proper maintenance and regular servicing of powered access equipment.

This year's campaign calls on everyone involved in the powered access industry – from operators and managers to rental companies and contractors – to take shared responsibility for safety when working at height.

While powered access remains one of the safest methods for performing temporary work at height, incidents involving mechanical or technical failures can still lead to serious injuries and fatalities. IPAF emphasises that many of these incidents are preventable through consistent inspection routines, proper maintenance and adherence to safety procedures.

The 2026 'Check It!' campaign highlights key safety priorities, including:

- The hazards associated with technical and mechanical equipment failure
- The risks of inadequate maintenance, inspection and equipment checks
- Practical steps to reduce these risks
- Who is responsible for different types of checks
- The importance of reporting incidents and near-misses to IPAF to improve global safety data

"In 2024, IPAF received eight reports of fatal and major injuries relating to mechanical or technical failures on all types of powered access equipment, with six fatalities reported. Although this data represents a 33% year-on-year decrease in reports and a 45% year-on-year decrease in fatalities, every incident and life lost is one too many," said Brian Parker, head of safety & technical at IPAF.

"Many incidents involving powered access equipment are avoidable. By ensuring that machines are properly maintained, inspected and checked before use, we can significantly reduce risks and protect lives."



The campaign aims to raise awareness while providing practical, actionable guidance for industry professionals to help reduce risks and prevent incidents across the industry.

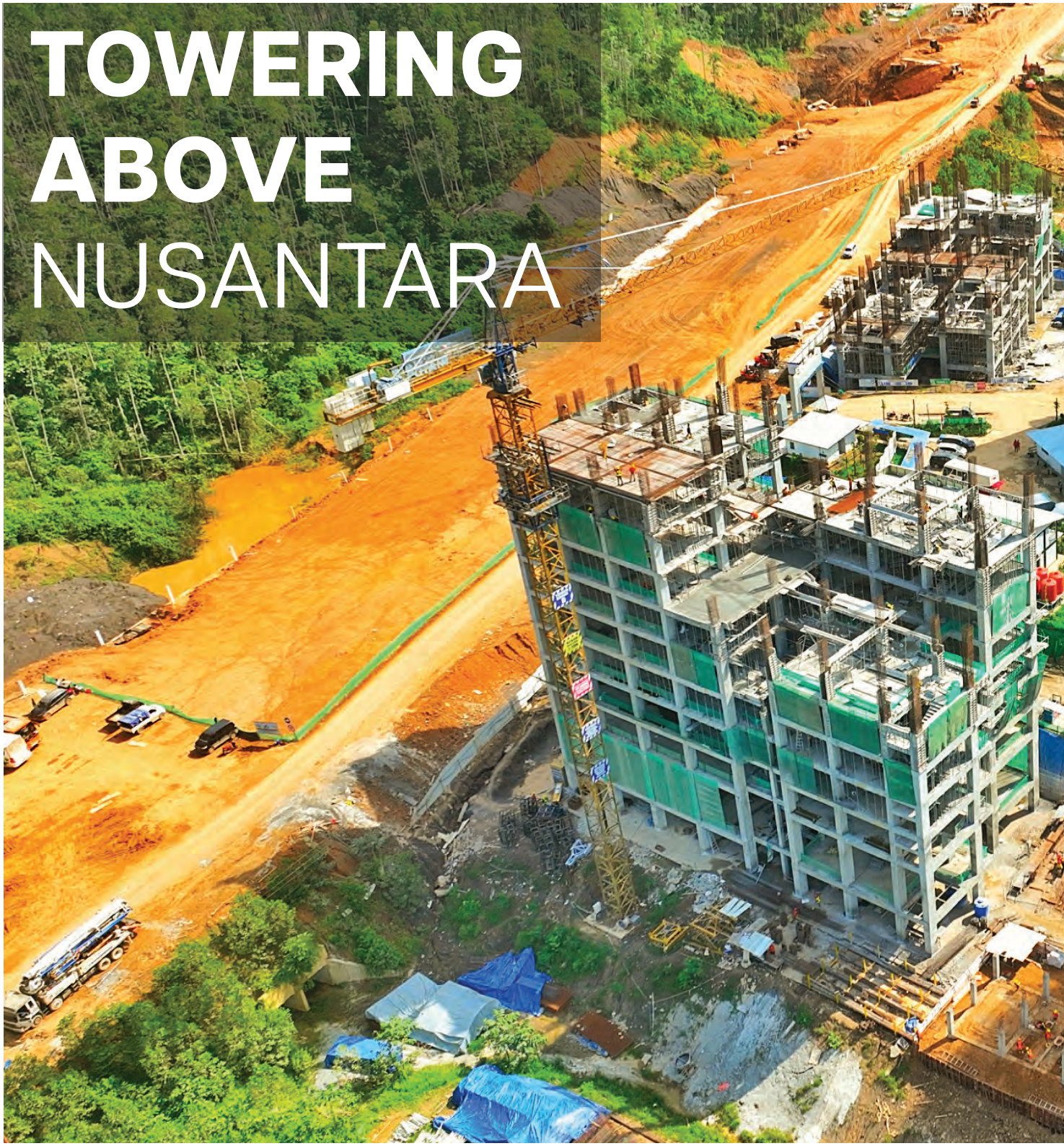
As part of this campaign, IPAF has released the following new guidance:

- Guidance on Buying a Pre-Owned MEWP
- The Principles of Service, Maintenance & Inspections of Powered Access Equipment
- Toolbox Talk: Pre-Delivery Inspections of MEWPs (Rental)
- Andy Access poster: Pre-Hire Inspections
- Andy Access poster: Check Your MEWP (existing poster)

These downloadable resources are designed for a wide audience to help managers, operators, rental companies, contractors and safety professionals seeking to enhance best practices in work--at-height safety. ■

Website: www.ipaf.org/safe

TOWERING ABOVE NUSANTARA



Potain MC 310 K12 and MC 205 B tower cranes are supporting the construction of Indonesia's new presidential palaces in Nusantara, with units deployed at both the Garuda Palace (Istana Garuda) and the State Palace (Istana Negara). The project forms part of the first phase of development for the country's new capital city, marking a significant milestone in Indonesia's long-term national development plans.

The two cranes started work in February 2023 and are rented out to the project by PT Potaindo Machinery, which also provides service support, including technician teams and parts availability.

The Potain MC 310 K12 and MC 205 B tower cranes were selected for their reliability and consistency on jobsites with demanding timelines. Work on the presidential complex must be completed as soon as possible, so maintaining steady construction progress has been essential.

"The construction of Indonesia's new presidential palaces is a landmark project that demands reliable equipment capable of supporting consistent progress. Our Potain MC 310 K12 and



Potain MC 310 and MC 205 tower cranes support construction of landmark buildings in Indonesia's new capital.

MC 205 B tower cranes are well-suited to these requirements, combining lifting performance, reach and reliability to help contractors maintain productivity on complex projects," said Johnny Kuah, regional sales manager for Potain.

The cranes are suitable for the project, offering long reach and high freestanding heights. The 12 t capacity Potain MC 310 K12 is working at a freestanding height of 52 m and is configured with a 70 m jib. It can lift 3.2 t at its jib end. The 10 t capacity Potain MC 205 B is working at a freestanding height of 59.7 m and is equipped with a 60 m jib. It can lift 2.4 t at the jib end.

Both cranes are used for lifting steel and structural components. The MC 310 K12 and the MC 205 B have now been updated in the Potain range with the MCT 325 L12 and MCT 205, respectively.

The project is a key symbol of Indonesia's future capital and reflects the scale and ambition of the Nusantara development. It has also achieved Zero Accident certification, demonstrating a strong commitment to safety throughout construction. ■

Website: www.manitowoc.com

Technology and innovation boost productivity in **Singapore's public housing construction**

Singapore's Housing and Development Board (HDB) has announced its plans to progressively deploy smart passenger and material (PM) hoists at approximately half of its Build-To-Order (BTO) construction sites tendered from 2027, and expand trials of screeding robots to at least four more BTO projects next year.

To drive greater standardisation and strengthen productivity and supply resilience across its building programme, HDB has also launched the Enhanced Precast Components Catalogue. This will apply to design tenders from December 2026.

In another development, HDB has completed its first Construction Transformation Project, Garden Waterfront II @ Tengah, which aims to change the way public housing is built.

Smart PM hoists and robotics

Following promising preliminary trials at project sites in Woodlands, Yishun and Rochor, HDB now plans to gradually



ABOVE: **The smart PM hoist features 2D LiDAR sensors (right) that scan for obstructions before moving, and anti-pinch sensors that prevent objects from getting caught in its doors.**

BELOW: **In conventional methods of screeding (left), level pegs (centre) are manually set out before levelling and smoothing the floor surface for the laying of tiles or vinyl. The screeding robot eliminates the need for manual level pegs and assists workers in levelling and smoothing the floor surface for a more consistent surface finish.**





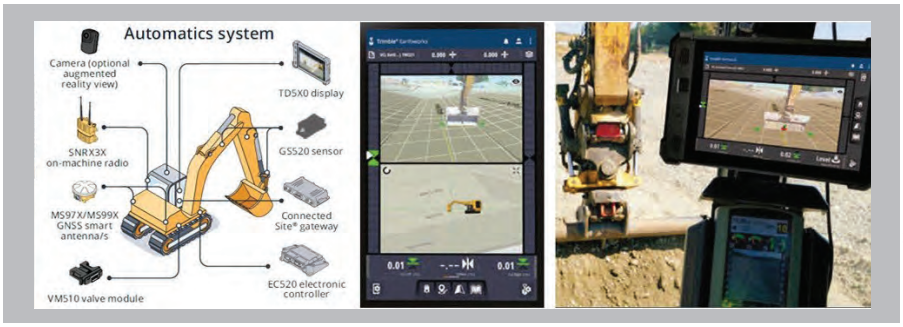


Image: Trimble

ABOVE: **The 3D machine control (3DMC) excavator uses satellite positioning and digital terrain models to carry out excavation works more precisely.**

LEFT: **The inloader for precast component handling utilises hydraulics for loading and unloading of precast components without the need for conventional crane lifting operations.**





Precast staircases (left) and household shelters (right) will be standardised across all HDB projects.

introduce smart PM hoists at about 50% of BTO sites tendered from 2027. This phased approach will allow the supporting industry ecosystem, including equipment supply, logistics and maintenance capabilities, to develop in tandem with the wider deployment of smart PM hoists. This will also give contractors and technology providers time to build up their capabilities and integrate smart PM hoists into site operations.

Unlike conventional hoists, which require a dedicated operator for each hoist, smart PM hoists can be called directly by workers to the floors where they are needed. Safety features, such as 2D LiDAR sensors that scan for obstructions and anti-pinch sensors at the doors, enable the hoists to operate without a dedicated operator.

As a result, one worker can supervise up to three smart PM hoists, compared with one operator for each conventional hoist. At a project with six smart PM hoists, for example, two workers would be needed instead of six, translating to a productivity gain of about 200% for hoist operations. The actual productivity gain will vary depending on the number of hoists deployed, as well as project site conditions.

Furthermore, HDB is exploring robotics for other labour-intensive processes, including floor screeding. While conventional screeding methods require workers to manually set up level pegs, screeding robots eliminate this need and assist workers in levelling and smoothing floors before tiles or vinyl are laid. Following preliminary trials at BTO sites in Bukit Merah and Ghim Moh, HDB will extend the trials to at least four more BTO projects in 2027 to assess the robots under different site conditions and their potential for wider deployment subsequently.

Partnering the industry

HDB also works with industry partners to develop and test productive construction solutions. Under the Shortened Time for Completion Scheme (STCS), contractors tendering for selected BTO projects commit to completing their projects three months earlier than the stipulated construction period. As part of their tender, contractors propose construction methods and technologies that help improve productivity and support the shorter construction timeline. Planning for these solutions from the tender stage enables them to be implemented and tested once construction begins.

One such solution is the inloader for precast component handling, which streamlines the transportation and delivery of precast components from the fabrication yard to the construction site. Instead of relying on cranes for loading and unloading, the inloader uses a hydraulic jack system, reducing crane operations and the supporting manpower required.

Technology is also being applied at earlier stages of construction. Supported by the Public Sector Science & Technology Policy & Plans Office (S&TPPO), HDB is piloting a 3D machine control (3DMC) excavator for earthworks at a site in Tengah. Instead of relying on physical survey stakes and manual checks, the system uses satellite positioning and digital terrain models to guide excavation more precisely based on the approved earthworks design, reducing the manpower required to support excavation works. The pilot commenced in mid-September 2026 and is expected to conclude in the first half of 2027. HDB will assess its performance and potential for wider deployment subsequently.

Precast standardisation

Beyond on-site technology and automation, greater standardisation can achieve productivity gains throughout the building process. HDB has adopted prefabrication since the 1980s to manufacture building components off-site, and today, up to 70% of the concrete volume in a typical HDB project is made up of precast components. Over the years, HDB has also standardised the dimensions of components such as floor slabs, refuse chutes and water tanks, so that they can be used in multiple projects.

Building on this foundation, the newly launched Enhanced Precast Components Catalogue (EPCC) provides a library of detailed specifications and drawings





While facade components are standardised within the Enhanced Precast Components Catalogue (EPCC), consultants will still be able to design visually distinctive facades through the use of attachments such as canopies and fins, as well as tools such as formliners to create textures on the facade or painted patterns.

showing how precast components should be fabricated. It is now available for download through HDB's BGBiz system. The EPCC could help industry partners save up to 20% in project man-hours across the planning, design and construction stages.

In addition to the component dimensions covered in HDB's current catalogue, the EPCC sets out specifications such as concrete grades, reinforcement provisions and connection details. Developed based on HDB's experience in precast construction and in consultation with industry stakeholders, the EPCC enhances consistency while retaining sufficient flexibility for consultants to create distinctive BTO projects.

The EPCC groups precast components according to how far they can be standardised. Components that typically do not require project-specific changes – like staircases and household shelters – will use common specifications across all HDB projects. For the first time, this creates 'off-the-shelf' standardised precast components, giving precast suppliers the option of building up stocks of these components to support future supply tenders. The EPCC allows specified variations, including dimensional changes in fixed increments for other components, such as facades, prefabricated bathroom units, columns and beams, that require varying degrees of design flexibility.

Greater standardisation will bring benefits to the entire construction value chain:

• Consultants can draw on established specifications and drawings for standardised components instead of developing them from scratch for every BTO project. This speeds up design work and frees up time for elements that require greater customisation, such as facades, block form and layout, and landscaping, or are technically complex such as sky bridges.

• By working repeatedly with common components, workers can build up their expertise, making it easier for contractors to deploy manpower more flexibly across BTO projects. Contractors can also procure standardised components from a larger pool of suppliers, strengthening supply resilience, as components from alternative sources can fit seamlessly into their projects.

• For precast suppliers, more consistent component designs reduce manufacturing variability and allow production moulds to be reused across projects. This improves economies of scale and gives suppliers greater confidence to invest in automation and mechanisation, reducing reliance on manual labour and the risk of human error, while raising quality and productivity.



Garden Waterfront II @ Tengah, the first of two BTO projects under the Construction Transformation Project (CTP), was completed in June 2026.

Construction Transformation Project

HDB has recently completed its first Construction Transformation Project (CTP), the Garden Waterfront II @ Tengah. The second project, Garden Waterfront I @ Tengah, is on track for completion by the end of 2026.

Through the use of advanced construction technologies and more productive building methods, both BTO projects are expected to achieve the targeted 25% improvement in site productivity over the projected baseline productivity rate of 0.6 sq m/man-day.

Launched in 2022 in partnership with construction company Obayashi Singapore Pte Ltd, the CTP was conceived as a testbed for HDB to trial new ways of building more productively and safely, with less reliance on manpower. The 25% improvement in site productivity was achieved through a combination of measures, including greater prefabrication and the adoption of technologies that enabled tasks to be completed with more precision in a shorter time.

According to HDB, several innovations are now being adapted and progressively introduced into other BTO projects, helping the board to reap productivity gains on a wider scale as it continues to deliver a strong supply of homes.

"As Singapore's largest housing developer, HDB is constantly looking for more innovative and efficient ways to build at scale. Garden Waterfront gave us the opportunity to test new technologies and construction methods in an actual BTO development and learn what works," said Dr Johnny Wong, HDB's deputy chief executive officer (building).

"We are now taking the successful innovations beyond this testbed and applying them more widely. This is part of our continued efforts to make construction safer, more productive and less manpower-intensive while delivering quality homes for Singaporeans."



Comparison of HDB flats with beams (images on the left) and the beamless system adopted for the CTP at Garden Waterfront (images on the right).

Greater standardisation and flexibility

One area explored under the CTP was how greater standardisation and prefabrication could make construction more productive, without compromising the design of the flats. At Garden Waterfront I & II @ Tengah, HDB adopted a fabrication system that allowed more structural works to be completed off-site, reducing the volume and complexity of work on-site. This minimised crane usage and manpower requirements, while easing coordination demands and site congestion, enabling works to proceed more efficiently.

In addition, by using more standardised, prefabricated building components and moulds that can be replicated and produced at scale, the modular system reduces reliance on manual labour and improves construction productivity. This higher level of standardisation also allows common precast components to be used



The intelligent lifting frame (ILF) uses real-time sensing to detect any imbalance. The operator can fine-tune the lifting points using a controller for more precise load positioning – all from a safer distance.

Continued on page 35...

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Continued from page 33...

across more HDB projects, giving the board greater flexibility to redirect supply where needed, thereby strengthening the resilience of its building programme.

Based on this modular design, HDB subsequently developed flats with beam- and column-free living spaces, providing residents with more flexibility to configure their homes according to their needs. This design has since been rolled out to a total of six projects – in Bayshore, Bukit Merah, Kallang/Whampoa and Mount Pleasant.

Safer, more productive heavy lifting

Lifting large and heavy precast components into position is an integral part of HDB construction. Traditionally, several workers are needed to manually guide and adjust the orientation of these components as they are lifted by cranes. Under the CTP, HDB piloted the SkyJuster, a gyroscopic device that controls the rotation and stabilisation of precast components during lifting operations. Used together with a tower crane, the SkyJuster required fewer workers to manually guide and adjust the components as they were lifted and installed.

Building on this technology, HDB has developed an intelligent lifting frame (ILF) in collaboration with the National University of Singapore and A*STAR. Using real-time sensing, the ILF can detect imbalances and enable the crane operator to remotely fine-tune the lifting points. This keeps heavy loads level, minimises swaying and facilitates more accurate positioning of precast components, while allowing workers to operate from a safer distance.

HDB said the ILF has the potential to improve productivity in the lifting process by up to 30%. The technology has been trialled in a Jurong West BTO project and is currently undergoing further refinement before wider deployment.

3D concrete printing

Under the CTP, HDB was also able to explore new possibilities with 3D concrete printing, creating complex architectural forms without the moulds and formwork typically required by conventional methods. One example is the botanic arbour at the common green between Garden Waterfront I and II @ Tengah. Comprising 22 uniquely shaped, curved segments, the structure was 'printed' at HDB's Centre of Building Research in Woodlands. Measuring up to 13.6 m in length, 3.7 m in width and 3.6 m in height, the arbour is the largest 3D-printed freestanding landscape structure in an HDB development to date.

The structure was fabricated using a combination of 3D concrete printing and cast infill, with new fibre-reinforced concrete materials. Through parametric modelling – a smart, rule-based digital design process – and structural analysis, HDB and Obayashi optimised the thickness of each segment, reducing the volume of concrete required by an estimated 50% compared to a conventionally built structure of equivalent size.

Innovation under the CTP extends beyond how flats are built to how residents can live more sustainably in their homes. HDB shared that Garden Waterfront I and II @ Tengah are the first BTO projects in Tengah where flats will be equipped with a smart adapter, enabling residents to monitor their household electricity consumption in real time.

Drawing on the learnings from the CTP, HDB will continue to work with industry and research partners to explore the next generation of construction solutions. This includes harnessing the growing capabilities of artificial intelligence and advanced robotics, as well as standardising more precast components, to develop solutions that can be deployed at scale. ■





ABOVE AND LEFT: **Under the CTP, HDB was also able to explore new possibilities with 3D concrete printing, such as this uniquely shaped, curved botanic arbour.**

All images: HDB (unless stated otherwise)



Efficient lifting for a Hong Kong **residential development**

New Orient Development Ltd is developing a new residential project on Lot No. 2195 in D.D. 244, within the Ho Chung area of Sai Kung, Hong Kong. Foundation, excavation and lateral support works have been underway since December 2024 and are expected to continue until the end of 2026. Two Liebherr NC-B 12-70 tower cranes are being used to lift construction materials, ensuring a steady flow of supplies across the site.

The NC-B 12-70 belongs to Liebherr's flat-top range, a series purpose-built for construction sites where space is at a premium. The crane achieves a maximum lifting capacity of 12 t



and a maximum radius of 70 m, with a tip load of 2,000 kg at maximum jib length. Its freestanding hook height reaches up to 76.9 m. By doing away with the conventional A-frame at the tower head, the flat-top design has a lower overall height. This is a particular advantage at Ho Chung, where space is limited and residential buildings, hills and watercourses are in close proximity.

For assembly, the NC-B 12-70's slewing part, including a 70-m jib, can be transported to the site using standard-sized containers. The crane's LiConnect quick-connection system allows the jib to be assembled in 5-m sections, supporting an efficient set-up. At the Ho Chung project, the cranes are tasked with lifting general construction materials, keeping supplies moving across the working area throughout the foundation and excavation phases.

A key consideration for this job was how the cranes would be removed once their work is complete. Rather than undergoing a lengthy, staged dismantling process, both NC-B 12-70 cranes will be taken down using a single 100-t mobile crane. This approach shortens the dismantling period and reduces the logistical footprint on site towards the end of the project, an important factor given the proximity of existing residential developments.

The project was designed by P&T Architects Ltd. Construction Phase 1 covers a site area of 7,102 sq m and comprises 26 houses of up to three storeys, plus one basement level, with a total gross floor area of up to 5,262 sq m.

The compact dimensions and efficient operation of the NC-B 12-70 cranes support a construction process that minimises disruption to the surrounding neighbourhood while maintaining a consistent pace through to the planned completion of the foundation, excavation and soil nailing works. ■

Website: www.liebherr.com

LEFT: **A new residential development is under construction in Ho Chung, Sai Kung. Foundation, excavation and lateral support works have been underway since December 2024 and are expected to continue until the end of 2026.**

BELOW: **For this project, two Liebherr NC-B 12-70 cranes are being used to lift construction materials, ensuring a steady flow of supplies across the site. These compact cranes offer a maximum lifting capacity of 12 t and a maximum radius of 70 m, with a tip load of 2,000 kg at maximum jib length.**





Transforming connections across Hong Kong's most intense urban environment

By:
Arup and Mott MacDonald





ABOVE: **The Central Kowloon Bypass (Yau Ma Tei Section) stands out for the way it was delivered: through deep rock tunnelling under Kowloon's densest districts and the construction of a technically demanding underwater tunnel beneath Victoria Harbour – all while keeping the city above fully operational. This photo shows the Yau Ma Tei connection bridges.**

TOP RIGHT: **The eastern portal of the Central Kowloon Bypass (Yau Ma Tei Section).**

IN A CITY WHERE SPACE IS BOTH FINITE AND FIERCELY CONTESTED, DELIVERING NEW INFRASTRUCTURE REQUIRES ENGINEERING THAT IS NOT ONLY TECHNICALLY ROBUST BUT ALSO ACUTELY SENSITIVE TO ITS URBAN AND SOCIAL CONTEXT. THE CENTRAL KOWLOON BYPASS (YAU MA TEI SECTION) STANDS AS A COMPELLING EXAMPLE OF HOW DEEP ENGINEERING INNOVATION, DISCIPLINED PROJECT MANAGEMENT AND COMMUNITY-CENTRED PLANNING CAN RESHAPE MOBILITY BENEATH ONE OF HONG KONG'S MOST COMPLEX URBAN ENVIRONMENTS.

Stretching 4.7 km, the dual three-lane highway connects the Yau Ma Tei Interchange in West Kowloon with the Kai Tak Development Area and Kowloon Bay in East Kowloon. As Kowloon is the most densely populated part of Hong Kong, the route had to be threaded underground, beneath a continuous fabric of residential towers, live arterial roads, seven operating railway lines, service reservoirs and more than 200 existing buildings. In places, the works passed within 3.5 m of adjacent structures, and the alignment crossed seven geological fault zones.

Designed as a strategic relief route, the tunnelled highway alleviates pressure on heavily congested surface roads, reducing peak-hour travel times between Yau Ma Tei and Kowloon Bay from 30 minutes to approximately five minutes. Construction commenced in 2017, and the road opened to traffic on 21 December 2025, marking the culmination of more than a decade of planning and delivery. The Arup–Mott MacDonald Joint Venture was appointed by the Highways Department to deliver comprehensive multidisciplinary services for the project.

What distinguishes the Central Kowloon Bypass (Yau Ma Tei Section) is not simply its scale or alignment, but the way it was delivered: through deep rock tunnelling under Kowloon's densest districts and the construction of a technically demanding underwater tunnel beneath Victoria Harbour – all while keeping the city above fully operational.

Crossing Kowloon Bay

One of the project's defining achievements is the 370-m underwater tunnel crossing Kowloon Bay beneath Victoria Harbour. Constructing a permanent highway tunnel beneath active marine waters required a methodology that balanced safety, constructability, environmental protection and programme risk. After extensive technical evaluation, a cut-and-cover approach within a temporary cofferdam was selected for its enhanced control and predictable risk profile. This method eliminates the risks of tunnelling under shallow cover of this underwater tunnel section, and minimises impacts on the water quality and the seabed by using a cofferdam rather than open dredging.

Marine works demanded exceptional environmental sensitivity. A two-stage temporary reclamation strategy was implemented to preserve navigation routes while safeguarding adjacent critical infrastructure, including a major rainwater outlet and a gas pier facility. Throughout construction, more than 50 monitoring points were established to protect neighbouring structures and ensure real-time verification of environmental and structural performance.

Temporary reclamation within Victoria Harbour required rigorous justification. Demonstrating that the approach was essential, with no viable alternatives, involved detailed technical assessments and extensive engagement with regulators and stakeholders. Building confidence around its temporary nature and minimal environmental footprint proved critical to achieving regulatory approval and genuine public acceptance. Upon completion, the seabed was fully reinstated, restoring the marine environment to its original condition.

Safety and efficiency were further enhanced through the deployment of a mega truss skidding system, which eliminated high-risk over-water operations. The system significantly reduced manpower requirements and plant usage while maximising reuse of structural components. This smarter, more sustainable approach to marine construction improved safety, reduced resource requirements and increased construction efficiency.

Planning for a dense city

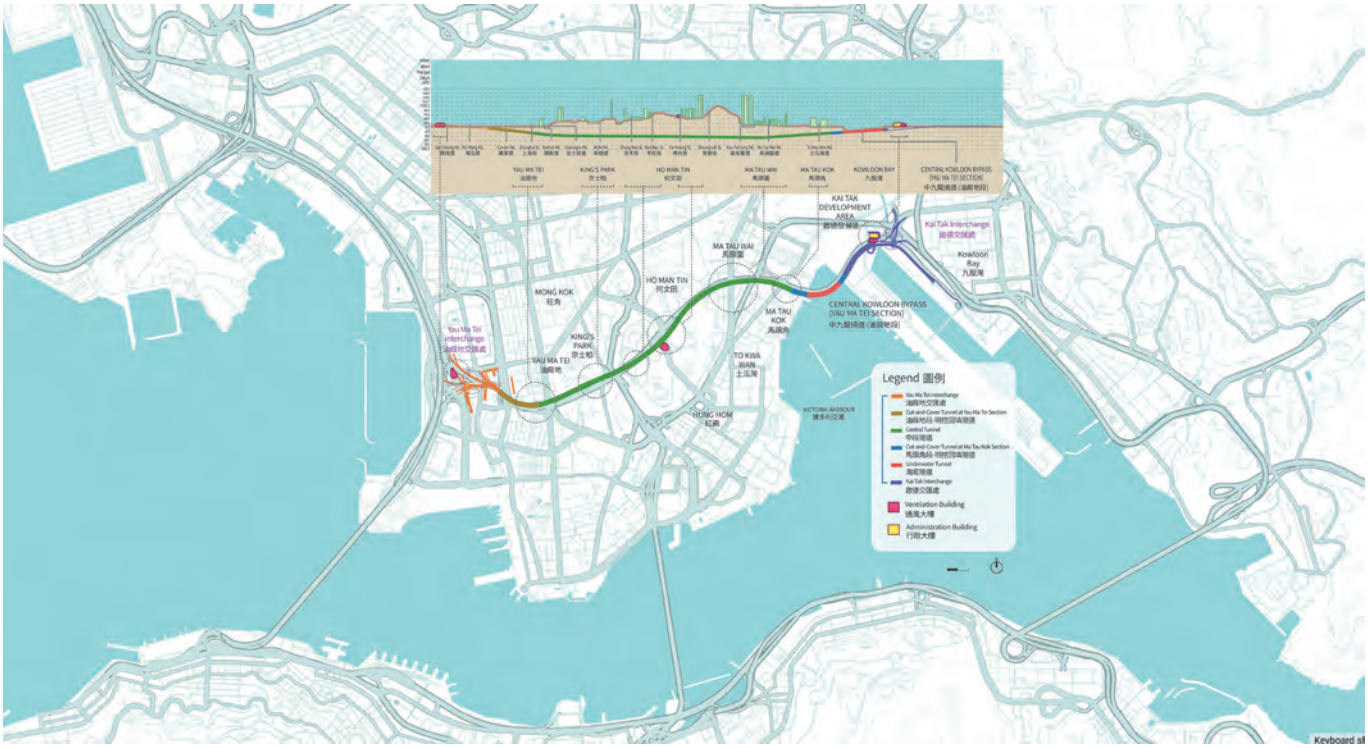
Development of the alignment was supported by extensive public engagement and a clearly defined sustainability framework focused on minimising social impact, re-provisioning affected facilities and enhancing the urban environment. More than 40 alignment options were evaluated before selecting a predominantly deep-underground tunnel solution, allowing the bypass to avoid private land acquisition and significantly reduce surface disruption in densely occupied neighbourhoods.

At its core, the tunnel passes between 30 m and 148 m below ground through bedrock, requiring meticulous control of vibration, settlement and groundwater, particularly where the alignment crossed geological fault zones with variable ground conditions.

To maximise efficiency without compromising protection criteria, the team adopted a double-deck blasting technique, enabling excavation productivity to be doubled while maintaining strict vibration limits essential in a metropolitan environment. A comprehensive environmental and structural monitoring regime supported these works, while advanced ventilation systems with integrated filtration, together with temporary acoustic enclosures at shaft openings, mitigated air and noise impacts on surrounding communities.

Drill-and-blast methods were adopted for the great majority of the tunnel excavation. In response to the geological conditions, an earth pressure balance tunnel boring machine was deployed to drive a 720-m pilot tunnel between the Ho Man Tin and Ma Tau Kok access shafts ahead of the main works, substantially improving construction logistics. Large gantry cranes installed within the deep shafts enabled efficient spoil extraction at a rate of 7,800 t per day.







ABOVE: **Construction of the underwater tunnel.**

LEFT: **Assembly of the tunnel boring machine inside the tunnel.**

OPPOSITE: **A map of the Central Kowloon Bypass (Yau Ma Tei Section). Stretching 4.7 km, this dual three-lane highway connects the Yau Ma Tei Interchange in West Kowloon with the Kai Tak Development Area and Kowloon Bay in East Kowloon.**

Building through Yau Ma Tei

The most logistically constrained section of the project was in Yau Ma Tei, where approximately 400 m of cut-and-cover tunnelling was constructed beneath one of Kowloon's most congested urban areas. The tunnel alignment along Kansu Street required partial re-provisioning of the existing Gascoigne Road Flyover and the demolition of the adjacent Yau Ma Tei Carpark Building, all while Temple Street and the surrounding community remained fully operational above.

As the flyover is a critical arterial route that could not be disrupted during daytime operations, a meticulously phased construction programme was developed. The replacement flyover section was constructed using an in-situ balanced cantilever method, allowing works to proceed without obstructing ground-level activities or disrupting Temple Street's vibrant commercial life.

Demolition of the 13-storey carpark building required exceptional precision. With only 500 mm clearance from the flyover, 400 mm from the Yau Ma Tei Temporary Public Library, and a minimum headroom requirement of 6.4 m, a top-down demolition methodology was adopted. Real-time deformation monitoring was deployed throughout to ensure the stability of adjacent structures and the safety of live traffic operations.

One of the most sensitive engineering operations occurred beneath the Grade II-listed Former Yau Ma Tei Police Station, where the tunnel passes just 2.3 m below the structure. A comprehensive underpinning scheme was implemented, incorporating ground strengthening through specialised grouting, temporary steel micropiles for immediate support, and new deeper piles drilled into bedrock. These were integrated with the existing foundation using a precisely controlled jacking system, allowing the original piles to be safely removed while maintaining structural integrity throughout excavation.

Throughout this complex phase, a 're-provision first' principle guided stakeholder engagement and construction planning. Hawkers from the Jade Hawker Bazaar were temporarily relocated, public facilities were re-provided in advance, and essential services were maintained without interruption.

Greening infrastructure

Beyond mitigation, the Central Kowloon Bypass (Yau Ma Tei Section) has been conceived as an opportunity to enhance



ABOVE: **Excavation and lateral support system for the cut-and-cover underwater tunnel.**
BELOW: **Demolition of the Yau Ma Tei Carpark Building.**





environmental quality and deliver lasting community value. A defining environmental feature is the introduction of landscaped decks at both Yau Ma Tei and Kai Tak. The Yau Ma Tei Landscaped Deck, spanning approximately 32,000 sq m, creates a vital green corridor linking Yau Ma Tei with the landscaped deck above West Kowloon Station. By bridging previously fragmented urban areas, the deck encourages walking and active travel, enhances district-wide connectivity and provides new recreational space with harbour views.

Environmental performance has also been embedded into the project's architectural and operational design. The Kai Tak Administration Building has achieved a Platinum rating in the assessment under the BEAM Plus New Buildings Version 2.0, reflecting the project's strong commitment to sustainable design, energy efficiency and environmental stewardship.

To further minimise operational impacts, an air purification system (APS) has been incorporated into the tunnel ventilation strategy. The system treats air extracted from the tunnel before discharge, reducing impacts on nearby air-sensitive receivers. It combines electrostatic precipitators to remove particulate matter, including PM10 and PM2.5, with a nitrogen dioxide removal process to lower NO_2 concentrations. The APS is continuously



TOP: **Re-provisioning of Gascoigne Road Flyover.**
ABOVE: **The central tunnel running through the heart of Kowloon.**



Yau Ma Tei Landscaped Deck.

monitored and controlled from the administration building, with 24-hour tunnel operations ensuring consistent environmental performance.

A new benchmark for the city

Digital innovation played a central role in managing the scale and complexity of the works beneath Kowloon. Implemented in March 2022, the Smart Site Management Hub (SSMH) brought together more than 40 subsystems – including the Integrated Digital Works Supervision System (iDWSS), BIM and IoT sensors – into a single, unified digital platform. This enabled real-time monitoring and analytics across safety, quality and programme performance, supporting timely, evidence-based decision-making throughout construction.

A milestone achievement was the first-of-its-kind deployment of iDWSS to consolidate data streams from six concurrent contracts into a holistic oversight dashboard. Replacing fragmented, paper-based supervision with a single digital interface, the system significantly strengthened governance and risk control. Reinforced by extensive CCTV coverage, this approach demonstrated the value of integrated digital supervision on large, complex, multi-contract infrastructure projects.

Equally critical to project success was the collaborative delivery framework under NEC (New Engineering Contract) contracts. Constructing such a major infrastructure project within the densely populated urban fabric of Kowloon demanded a culture of trust, transparency and proactive problem-solving. By fully embracing NEC principles, the Arup–Mott MacDonald Joint Venture fostered close collaboration with contractors and subconsultants, supported by clear early-warning mechanisms, robust programme management and fair risk-sharing. This enabled challenges to be addressed collectively and efficiently, driving optimal outcomes across technical, commercial and programme objectives.

The effectiveness of this collaborative approach was formally recognised by the NEC Users' Group of the Institution of Civil Engineers (ICE), which named the Arup–Mott MacDonald Joint Venture NEC Consultant of the Year.

The Central Kowloon Bypass (Yau Ma Tei Section) demonstrates how major transport infrastructure can be delivered beneath



ABOVE: **Kai Tak Administration Building.**

BELOW: **Commissioned on 21 December 2025, the Central Kowloon Bypass (Yau Ma Tei Section) demonstrates that even in the most constrained urban environments, infrastructure can be delivered intelligently, responsibly and with lasting civic value.**



a living city without compromising what exists above. Through deep tunnelling, precision marine works and meticulous urban construction, the project provides valuable lessons in technical excellence, safety innovation and digital project control for future underground infrastructure schemes in constrained urban environments.

Now open to the public, the bypass improves east-west connectivity across Kowloon while showcasing how technical innovation, collaborative delivery and careful stakeholder management come together to deliver major infrastructure. The project shows that even in the most constrained urban environments, infrastructure can be delivered intelligently, responsibly and with lasting civic value. ■

All images: Hong Kong Highways Department



Image: Studio Archohm

New Delhi railway station



Image: Studio Archohm

TOP: **Construction of India's new 'Multi-Modal Transit Hub' in New Delhi aims to deliver world-class infrastructure. The new building will extend across multiple underground and above-ground levels, replacing traditional pedestrian footbridges and significantly improving accessibility.**

ABOVE: **Scheduled for completion in 2029, the upgraded station will be able to handle up to 700,000 passengers per day, transforming it into a modern interchange capable of meeting the Indian capital's growing demand for mobility.**

New Delhi railway station is currently undergoing a major redevelopment led by the Rail Land Development Authority, India's statutory body responsible for developing surplus railway land to generate non-fare revenue. It is part of the Amrit Bharat Station Scheme (ABSS), an initiative launched in 2022 by the Indian Ministry of Railways to redevelop 1,275 stations across the country.

As well as modernising the existing station, the project seeks to ease congestion in the surrounding urban fabric and create a strategic public transport hub. Scheduled for completion in 2029, the upgraded station will be able to handle up to 700,000 passengers per day, compared to the current 400,000-500,000, transforming it into a modern interchange capable of meeting the Indian capital's growing demand for mobility.

This new 'Multi-Modal Transit Hub' is set to deliver world-class infrastructure. The new building will extend across multiple underground and above-ground levels, replacing traditional pedestrian footbridges and significantly improving accessibility.

The station will be equipped with 86 lifts, 67 escalators, multi-storey car parks and dedicated airport transfer areas. Site logistics have been carefully planned to ensure the continuity of rail services and passenger flows throughout all construction phases.

Environmental sustainability is a key focus of the project, which aims to achieve IGBC Platinum certification from the Indian Green Building Council. This is the highest level under the Indian rating system and assesses energy efficiency, water management, indoor environmental quality, responsible use of materials and correct waste management.

As part of the project, the main contractor engaged Mapei India in the selection and supply of concrete admixtures for the construction of the main structure, as well as advanced waterproofing systems for the underground structures.

High-performance concrete admixture

The concrete mix used for the main structure includes Dynamon SR 747, a PCE-based superplasticiser manufactured and distributed in the local market by Mapei India and specifically formulated for the ready-mixed concrete sector. Its specialised formulation combines high water-reduction capability with extended workability retention, making the product suitable for concrete mixes that need to be transported over long distances and cast in complex pours.

At the same time, Dynamon SR 747 helps control the cement hydration process, allowing a suitable set of concrete and a rapid development of compressive strength.

Advanced waterproofing system

The solution chosen to waterproof the underground structures is the Mapeproof AL S AP membrane, which consists of a synthetic HDPE (high-density polyethylene) sheet with an adhesive side covered by a sand-coated, pressure-sensitive protective coating. When it comes into contact with freshly poured concrete, the membrane bonds monolithically with the concrete itself, ensuring strong adhesion.

Mapeproof AL S AP is resistant to aggressive natural agents normally found in groundwater and soil. It is durable, resists UV ageing during normal site operations and forms an effective barrier against groundwater and soil moisture.

This strategic project forms part of the ongoing transformation of India's transport system, which is increasingly oriented towards integrated infrastructure capable of meeting the growing demand for mobility in the country's major metropolitan areas. ■

Website: www.mapei.com.sg

The article courtesy of Realta Mapei International 110



The concrete mix used for building several structures in the station includes Dynamon SR 747, a PCE-based superplasticiser manufactured by Mapei India and specifically formulated for the ready-mixed concrete sector.



The new MK 88-4.2E is designed for economical operation and mobility worldwide.

NEW **LIEBHERR** MK 88-4.2E MOBILE CONSTRUCTION CRANE

Liebherr has launched the MK 88-4.2E, a new mobile construction crane and successor to the MK 88-4.1E. In addition to operating modes with axle loads of 12 t and 10 t, the new model offers the option of travelling on public roads with an axle load of less than 9.2 t and a gross vehicle weight below 36.3 t. This may facilitate approval and road use in markets with corresponding weight limits. Series delivery is planned to begin in the second quarter of 2027.

While the boom system has been largely carried over from the MK 88-4.1E, Liebherr has redesigned the crane chassis and counterweight to achieve lower axle loads. The counterweight is divided into several removable sections, and the outrigger beams can also be easily removed.

Self-ballasting is available as an option: the counterweight can be installed quickly and easily without an auxiliary crane. A robust system, monitored from the crane, helps ensure safe and reliable operations. Depending on the distance to the ballast transport vehicle, the crane lifts the counterweight onto the chassis in two or three stages. To enable the entire ballast to be fitted and removed, the ballast cylinders are integrated into the chassis. This solution is new to the MK crane range.

A new option makes it possible to deploy the crane electro-hydraulically while it is being supported and ballasted on site. Using on-site electricity or an external battery power pack, these tasks can be carried out locally without producing any CO2 emissions.

Besides the standard 32 A and 63 A options, a 16 A mains connection is now included as standard. The benefit is that the new MK 88-4.2E can also operate on mains power at construction sites with a low mains voltage, albeit at reduced speeds. Thanks to intelligent and flexible energy management, combined with fully electric drives, the crane can quickly adapt to any given situation.

The new MK 88-4.2E has retained components and technology from its predecessor. It combines high maximum load capacities of up to 8 t with excellent manoeuvrability. Featuring a turning circle of just 11.88 m and independent rear-axle steering, this four-axle vehicle is suitable for a wide range of applications, from inner-city construction sites to industrial projects. With a maximum boom radius of 45 m, the crane can still lift 2,200 kg at its tip. The intelligent Load-Plus control system allows automatic increases in lifting capacity of up to 10%.

The Liebherr MK cranes' hybrid power concept enables fully electric operation using either site power or another external power source. This means that the machine runs quietly, which can be an advantage for projects taking place at night. The MK cranes are compatible with Liebherr's Liduro Power Port (LPO), a mobile energy storage system that supplies power to construction sites. If an external power source is not available, an efficient diesel generator ensures self-sufficient operation. ■

Website: www.liebherr.com



With a turning circle of just 11.88 m and independent rear-axle steering, this four-axle crane is suitable for a wide range of applications, from inner-city construction sites to industrial projects.

MANITOWOC OFFERS ENERGY SYSTEMS FOR CRANES AND JOBSITES IN EMERGING MARKETS



Potain Power Solutions are purpose-built for the demanding operational needs of tower cranes. Available to customers across Asia Pacific, the Middle East, India, Africa, Latin America and other emerging markets, these systems can handle the high-intensity duty cycles and peak power demands of heavy-lifting applications.



With easy maintenance, quieter operation and zero on-site emissions, Potain Power Solutions are particularly suited to urban jobsites where environmental and noise regulations are stringent. The systems integrate with the Potain tower crane range, from entry-level models to larger specialised units, while also supplying power for additional jobsite equipment.

Manitowoc has launched Potain Power Solutions, a new range of energy storage systems to support tower crane operations and reduce reliance on generators or unstable local power infrastructure. They are suitable for a host of applications, from remote off-grid projects to urban jobsites, where their clean, silent operation helps meet strict noise and emissions regulations.

The systems are purpose-built for the demanding operational needs of tower cranes. Unlike conventional battery systems, Potain Power Solutions can handle the high-intensity duty cycles and peak power demands of heavy lifting applications.

The systems are available to customers across Asia Pacific, the Middle East, India, Africa, Latin America, and other emerging markets. Output capacity options include 135 kVA and 270 kVA configurations, as well as larger capacities exceeding 375 kVA. They integrate with the Potain tower crane range, from entry-level models to larger specialised units, while also supplying power for additional jobsite equipment.

Engineered to support high-rate discharge and peak current demand during hoisting, the systems enable cranes to maintain full lifting performance and operating speeds without voltage drops or power interruptions. They also provide grid stabilisation and uninterruptible power supply (UPS) functionality to help protect the crane's electronics during unstable power conditions or outages.

Potain Power Solutions incorporate advanced liquid cooling technology to ensure stable battery performance in high-temperature, high-humidity environments. They are designed for easy forklift handling and can withstand vibration, impacts and the rough movements associated with transport and jobsite relocation.

Their compact footprint allows for efficient transportation and redeployment. Intelligent energy management reduces fuel consumption by up to 70% compared with conventional diesel generators. In pure electric operating mode, the diesel generator can be replaced entirely. Another benefit of the systems is ease of maintenance.

"Potain Power Solutions help tower crane owners move toward smarter, more independent construction sites by maintaining peak productivity regardless of local infrastructure gaps. By drastically reducing reliance on diesel generators, they lower daily operating costs and help users meet their sustainability targets," said Robin Chen, new product development manager at Potain. ■

Website: www.manitowoc.com



BAUER INTRODUCES ELECTRIC MACHINE FOR CUTTER-SOIL MIXING AND BG 50 DRILLING RIG





ABOVE AND LEFT: **Bauer Maschinen is introducing a fully electric machine for cutter-soil mixing (CSM), the eCSM 100 compact. It was developed in close collaboration with Seiwa Renewal Works Co Ltd, a specialist foundation engineering company within Japan's Taisei Group.**

eCSM 100 compact

With the new eCSM 100 compact, Bauer Maschinen GmbH is introducing a fully electric machine for cutter-soil mixing (CSM), ideal for applications in densely built-up urban areas. It was developed in close collaboration with Seiwa Renewal Works Co Ltd, a specialist foundation engineering company within Japan's Taisei Group.

In CSM, the existing soil is loosened using rotating cutting wheels and mixed on site with a cement slurry. This creates a soil-cement mixture that can be used, for example, in the construction of cut-off walls. The process is applied, among other things, when excavation pits need to be sealed against groundwater ingress or when specific areas of the subsoil need to be stabilised.

Thanks to its side-cutter configuration, the eCSM 100 compact can operate even in extremely confined spaces. The machine achieves mixing depths of up to 70 m, combining a small footprint with considerable working depths.

The next-generation tandem cutter system is also designed to ensure an efficient mixing process. Optimised material flow and improved flap kinematics complement Bauer Maschinen's BCM gearbox technology.

"With the eCSM 100 compact, we have translated the requirements of demanding urban construction sites into a machine concept. Our key objective was to combine compact dimensions, deep mixing capabilities and a fully electric drive without compromising performance or reliability," said Christian Riedl, product manager at Bauer Maschinen.

At the heart of the eCSM 100 compact is its electrified upper carriage, which is based on a cable-powered base carrier specifically designed for electric operation. The machine produces

no local exhaust emissions when operating electrically, and the sound power level of the upper carriage is half that of its diesel-powered counterpart. The result is a significantly quieter working environment, making it particularly suitable for projects near residential buildings and sensitive infrastructure.

"Our projects require a high degree of precision in execution within limited space. At the same time, we must minimise noise and vibration and meet high safety standards. The compact design, side-cutter configuration, and fully electric drive of the eCSM 100 compact open up possibilities for us that were difficult to achieve with conventional CSM machines," explained Nobuo Otaka, executive officer and project manager at Seiwa Renewal Works.

It's not just operation on the construction site that presents challenges for machine operators; transporting the equipment to the site does, too. That's why Bauer designed the eCSM 100 compact with efficient mobilisation in mind. The machine can be disassembled into transport-optimised components. The maximum transport weight per unit is 30 t. An integrated jack-up system facilitates on-site handling and setup.

The field test was carried out at Bauer Maschinen's facility in Aresing, Germany. In the presence of Seiwa Renewal Works representatives, two CSM panels were successfully constructed to a depth of 25 m.



Thanks to its side-cutter configuration, the eCSM 100 compact can operate in extremely confined spaces. The machine achieves mixing depths of up to 70 m.

BG 50 drilling rig

In April this year, Bauer Maschinen unveiled the new BG 50 rotary drilling rig as the successor to the BG 45. Built on the new Bauer BT 145 carrier and equipped with a service platform integrated into all BT carriers, the BG 50 offers significant advantages in terms of productivity, cost efficiency, safety and reliability on the jobsite. Key upgrades include higher torque, enhanced drilling performance, and improvements in mobilisation and handling.

Specifically, the single-pass drilling depth has increased by 7% and the main winch pull by 11%. With 470 kW of power, the BG 50 also delivers around 8% more output than its predecessor. "The result is a true powerhouse that delivers outstanding performance even in the most demanding drilling applications," said Johann Kraxenberger, head of the rotary drilling rigs product line at Bauer Maschinen.

The extended mast allows the rig to be set up without an additional assist crane. This simplifies mobilisation and demobilisation, reduces logistics and setup costs, and minimises the space required on the jobsite – an increasingly important factor in urban or confined areas. Particularly noteworthy is that, despite its significantly higher performance compared with the BG 45, the operating weight has remained virtually unchanged.

With B-Tronic 5, the BG 50 features a modern, intuitive user interface. Configurable by the operator, the system clearly displays all relevant machine and process data and supports safe and efficient operation. Integrated assistance functions provide direct support during operation.



The new BG 50 drilling rig, with 470 kW, delivers around 8% more power than its predecessor, the BG 45.

Before delivery to customers, the BG 50 will undergo an extensive validation and testing programme at Bauer's Aresing plant through the end of the year. Under real-world jobsite conditions, the rig's performance, reliability and safety will be rigorously put to the test. Series production is scheduled to begin in early 2027.

Celebrating 50 years

This year, Bauer celebrates the 50th anniversary of its drilling rigs. The company introduced its first model in 1976, the BG 7, which featured a robust mast, a heavy-duty Kelly bar, powerful hydraulics and an innovative cylinder crowd system. Whereas previously it was often possible to complete only two piles per week, the BG 7 was capable of installing several piles per day. Its triple-telescopic Kelly bar enabled drilling depths of up to 18 m and maximum drilling diameters of 1,500 mm.

According to Bauer, the drilling rigs available at the time could no longer meet the growing demands of construction sites. For Dr Karlheinz Bauer, who was then leading the family-owned company in its sixth generation, the answer was clear: "Then we'll build one ourselves."

Originally developed for internal use, Bauer's drilling rigs quickly attracted strong interest from the market. The BG 7 was followed by additional models, such as the BG 11 and BG 22. In 1989, the company unveiled the BG 30 at the bauma exhibition in Munich, featuring a maximum torque of 367 kNm, a crowd force of 350 kN and drilling diameters of up to 2,000 mm.

Today, the Bauer rotary drilling rig portfolio covers a wide range of performance classes, from the compact BG 15 H, with its rear-folding mast, and the electrically powered eBG 33 to the BG 55, equipped with a BTM 720 torque multiplier for cased drilling at greater depths and diameters. At bauma 2025, the company presented its new BTM 600 torque multiplier for cased continuous flight auger (CCFA) applications.



The BG 55 is currently the largest rotary drilling rig in Bauer Maschinen's product portfolio.

"In the early days, everything in rotary drilling rigs was purely hydraulic – a few levers, a few pressure gauges, and that was basically it," noted Mr Kraxenberger. "Today, we work with digital interfaces, electric joysticks and live data. The technology has fundamentally changed over the past decades."

Alongside digitalisation, sustainability and energy efficiency are becoming increasingly important in construction equipment. For years, Bauer has relied on its Energy-Efficient-Power technology (EEP). Among other benefits, it improves overall efficiency, enables energy recovery and optimises auxiliary consumers.

"Thanks to EEP, the fuel consumption of our rotary drilling rigs is reduced by up to 20% – a tangible benefit for both the environment and our customers," said Mr Kraxenberger. This is complemented by numerous assistance systems, including Stability Plus, the adaptive Kelly retraction assistant, and the Kelly winch Speed Limiter for critical soil conditions. These systems help the machines operate more efficiently and safely while reducing wear on the equipment and conserving resources.

New B-Tronic control system

B-Tronic is used in a wide range of Bauer's machines, from its rotary drilling rigs and duty-cycle cranes to piling rigs from RTG. The system supports operators during daily operations, automates recurring tasks and provides valuable data for analysis and project planning. Sensors continuously capture operating data, making it available in the cab, on mobile devices and in the office. The result is a seamless flow of information – from work on the ground to project documentation.

To further enhance and expand the system, Bauer has introduced the latest version, B-Tronic 5. Developed specifically for rotary drilling rigs, it focuses on dynamic operation, process support and practical usability for demanding drilling applications.

B-Tronic 5 was developed in close collaboration with experienced equipment operators. Their feedback from real-world jobsites played a decisive role in shaping the system's structure, operating logic and functionality. The user interface can be individually configured, and functions are tailored to typical operating conditions. The goal is to reduce operator workload and allow users to focus on the drilling process itself.



Bauer introduced the BG 7 to the market in 1976.

The dynamic user interface is the highlight of B-Tronic 5. Rather than relying on static displays, the system automatically adapts to the current stage of operation. Content and visualisations change dynamically as work progresses through different process phases. User-defined thresholds provide visual feedback whenever deviations occur. This ensures that operators receive exactly the information they need at the moment they need it.

"You're not working with a rigid screen. The functions are flexible and can be customised to your needs. Many key parameters are calculated automatically, allowing you to focus more on the work itself. At the same time, you can optimise your workflows. That's why I enjoy working with B-Tronic 5 – no other machine offers that," said Maik Breuning, equipment operator at Demler Spezialtiefbau GmbH.

In day-to-day operations, clarity matters. B-Tronic 5 presents all relevant machine and process data in a clear, structured format. Messages, functions and guidance are logically organised and quickly accessible. Integrated support tools assist operators directly during operation and are complemented by practical usage tips. This reduces time



spent searching for information and simplifies operation, particularly in complex working situations.

Every operator works differently, and B-Tronic 5 reflects that reality. Personal user profiles enable customised work screens tailored to individual preferences. Frequently used functions can be arranged as widgets, creating an operating environment that matches each user's needs and supports uninterrupted workflows.

"With B-Tronic 5, we have specifically aligned the next stage of development of our machine control system with the requirements of modern rotary drilling rigs. Throughout the development process, our focus remained firmly on the operators and their workflows," said Franz Harnisch, product manager for drilling rigs at Bauer Maschinen. "At the same time, B-Tronic 4 remains an integral part of our portfolio and will continue to serve as the proven standard solution for our rotary drilling rigs, piling rigs and duty-cycle cranes." ■

Website: www.bauer.de

LEFT: **The BG 30 made its debut at bauma in 1989.**

BELOW LEFT: **Ideal for demanding drilling applications, the new B-Tronic 5 control system features a modern, intuitive user interface.**

BELOW: **The dynamic user interface is the highlight of B-Tronic 5. Rather than relying on static displays, the system automatically adapts to the current stage of operation. Content and visualisations change dynamically as work progresses through different process phases.**

All images: Bauer Group







Tadano has introduced its new AC 3.060-2 all-terrain crane, offering quick setup and versatility. It is ideal for concrete work, unloading, hall construction, prefabricated house construction, and a wide range of other lifting operations on construction sites.

NEW AC 3.060-2 ALL-TERRAIN AND V320RC PICK-AND-CARRY CRANES FROM **TADANO**



AC 3.060-2 all-terrain crane

Tadano has introduced a new, compact and versatile all-terrain crane, the AC 3.060-2. Thanks to its quick setup capability, this model can easily handle several jobs in one day. It can be used for concrete work, unloading, hall construction, prefabricated house construction, and various other lifting operations on construction sites.

"With our new AC 3.060-2, we have created a compact and powerful crane that can cover an extremely wide range of applications without much effort. That was our development goal – and we have definitely achieved it," said Masafumi Nakamura from the product development division at Tadano Japan.

The manufacturer said the new AC 3.060-2 is now available in Asia, the Americas and Oceania, while its availability in Europe is planned for early 2027. Customers will also benefit from greater



The new AC 3.060-2 is now available in Asia, the Americas and Oceania, while its availability in Europe is planned for early 2027.



availability and shorter lead times in this highly versatile crane class, as Tadano has expanded its production capacity by launching production of two- and three-axle all-terrain cranes in Japan, with the AC 3.060-2 being the second model.

'Strong performance'

The AC 3.060-2 is especially powerful at steep boom angles. With its 50-m main boom fully extended and a full 13-t counterweight, the crane can lift a 5.8-t load at a working radius of 18 m. With the main boom fully extended and a 16-m extension angled at 20°, it can lift a 2.3-t load with the full counterweight at a radius of 28 m. The crane achieves a maximum system length of 69 m. "This strong performance at a steep boom angle proves particularly advantageous when lifting heavy loads over obstacles," said Mr Nakamura.

The AC 3.060-2 offers a line pull of 6.7 t using a single line. With triple reeving on the single-sheave hook block, the rope can even handle up to 20 t. This allows the crane to lift heavy loads even with the small hook block and perform a variety of tasks as a taxi crane. According to Tadano, the exceptional line pull is a major advantage during setup, as less reeving saves time and enhances safety.

Flexible and safe on the road

As a classic taxi crane, the AC 3.060-2 can be driven on the road within the 12-t axle load limit when equipped with wide 16-in tyres, a large drivetrain (6 x 6 x 6), 4.2 t of counterweight, a single-sheave hook block, and a 300 kg payload. This makes the AC 3.060-2 suitable for many one-person jobs without the need for additional transport. The crane's turning assistant helps the driver maintain a clear overview of the road, improving safety during operation.

Featuring a low clearance height of just 3.71 m, the AC 3.060-2 is an excellent choice for tight construction sites, especially indoors. Its compact design, with a width of 2.55 m and a carrier length of 9.49 m, makes it ideal for use in confined spaces. The optional Tadano Surround View system, with its four cameras that facilitate crane positioning, and the stepless outrigger positioning system, Flex Base, are also helpful features.

Flex Base allows the outriggers to be extended to varying lengths right up to obstacles. Thanks to the intelligent IC-1 Plus crane control system with capacity radar, the AC 3.060-2 can always utilise the maximum possible lifting capacity, even with asymmetrical outrigger setups. Another technical highlight is the underfloor boom positioning, which enables safe reeving and easy setup of extensions, for example.

With Tadano's parts-sharing strategy, the AC 3.060-2 can share various components cost-effectively with other cranes from the manufacturer, such as the runner and the jib. In addition, the crane can be equipped with e-Pack, allowing for emission-free operation. Optional load and winch cameras are available as well.

V320RC pick-and-carry crane

The new V320RC crane (Valla series) from Tadano aims to redefine traditional market benchmarks in the high-tonnage pick-and-carry segment. According to the manufacturer, rather than being an evolution of existing solutions, this latest model introduces a new philosophy, with technologies and features capable of setting new standards in the lifting sector.

The achievement was also made possible through close collaboration with NMG Italia, the first customer and an active partner in the development of the machine, which brought hands-on field experience and the requirements of industrial lifting customers directly into the project.

Offering a lifting capacity of up to 35 t, overall dimensions of 5,000 mm x 2,150 mm and a height of just 2,400 mm, the V320RC makes maximum lifting power accessible in confined industrial spaces



TOP AND ABOVE: **The AC 3.060-2 is especially powerful at steep boom angles. With its 50-m main boom fully extended and a full 13-t counterweight, the crane can lift a 5.8-t load at a working radius of 18 m. With the main boom fully extended and a 16-m extension angled at 20°, it can lift a 2.3-t load with the full counterweight at a radius of 28 m.**

where high-capacity machines often struggle to operate.

The V320RC is powered by a 120V–1,120 Ah battery system (also available with a lithium-ion option) and has a gross weight of 31,150 kg, including 9,500 kg of removable counterweights, providing flexibility for transport and handling operations.

Equipped with a comprehensive range of attachments to meet a wide variety of lifting tasks, the crane is available in both a radio-controlled version – ensuring optimal remote control and total visibility during manoeuvres – and a cab-operated configuration.

Among the highlights of the V320RC is its innovative hydraulic system, which incorporates a variable-displacement pump paired with a high-end electro-hydraulic control valve. This feature is said to be a first in the pick-and-carry crane segment.

The evolution of the hydraulic system, alongside next-generation control software, takes manoeuvring precision and responsiveness to a higher level, said Tadano, while the variable-displacement pump optimises energy consumption and battery utilisation.

Tadano further shared that, during on-site operations, NMG Italia recorded a 50% increase in productivity compared with competing cranes working under equivalent load conditions. As a result, the V320RC can deliver sufficient battery



As a classic taxi crane, the AC 3.060-2 can be driven on the road within the 12-t axle load limit when equipped with wide 16-in tyres, a large drivetrain (6 x 6 x 6), 4.2 t of counterweight, a single-sheave hook block, and a 300 kg payload.



Featuring a low clearance height of just 3.71 m, the AC 3.060-2 is an excellent choice for tight construction sites, especially indoors.



The new Tadano V320RC pick-and-carry crane is powered by a 120V–1,120 Ah battery system (also available with a lithium-ion option).



autonomy to operate for multiple days without recharging.

The V320RC assists the operator in selecting the appropriate operating mode configuration through integrated reading systems that detect the installed attachment and counterweights. A new 10-in display also provides real-time access to the corresponding load charts, helping the operator plan the manoeuvre in advance.

On the safety front, the new GPSS (ground pressure selection system) enables real-time monitoring of wheel loads on the ground, while an integrated system promptly alerts the operator if the ground pressure exceeds preset limits. This is a critical feature in industrial plants and other environments where floor load capacity is essential for safe operations.

In addition, the fully hydraulic telescopic boom system eliminates the need for traditional mechanical components such as wire ropes or chains, thereby reducing maintenance requirements and improving overall efficiency.

The V320RC has already demonstrated its performance in the field during setup operations at Marmomac, the Italian trade fair dedicated to the marble industry, held annually in Verona. According to NMG Italia, the crane's debut exceeded expectations, showcasing its precision, autonomy, quiet operation and manoeuvrability. ■

Website: www.tadano.com





TOP AND ABOVE (LEFT AND RIGHT): **With a lifting capacity of up to 35 t, overall dimensions of 5,000 mm x 2,150 mm and a height of just 2,400 mm, the V320RC makes maximum lifting power accessible in confined industrial spaces where high-capacity machines often struggle to operate.**







ABOVE, TOP LEFT AND LEFT: **Equipped with various attachments to meet a wide range of lifting tasks, the V320RC is available in both a radio-controlled version and a cab-operated configuration.**

BELOW: **The V320RC's innovative hydraulic system incorporates a variable-displacement pump paired with a high-end electro-hydraulic control valve. This feature is said to be a first in the pick-and-carry crane segment.**



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