

BUILT ENVIRONMENT INNOVATORS 2017

The Business Times | Wednesday, May 24, 2017



Illustration: Alice Ang

Singapore construction's future in an alphabet soup

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BIM. VDC. PBU. PPVC. DFMA. MET.

The acronyms are flying thick and fast as Singapore's construction industry gets drastically reshaped.

The aim: To reduce Singapore's reliance on foreign workers, and increase productivity to offer better paying jobs for locals.

Nudged by the government through a mix of regulations, grants, quotas and levies, many construction and engineering companies here are investing in technology and exploring new ways of building.

The investment is slowly bearing fruit in an industry notorious for its reliance on cheap labour.

Annual site productivity has improved from 0.3 per cent in 2010 to 2 per cent annually from 2014 to 2016, said John Keung, chief executive officer of the Building and Construction Authority (BCA).

More companies are adopting advanced construction technologies, he said. And though these cost more initially, they offer the promise of a faster completion of projects. Thus additional costs can be offset by the earlier delivery of public goods and services, the earlier generation of revenue for private projects as well as lower financing costs.

BCA has required developers to adopt certain technologies for suitable government land sale sites, while supporting workshops and courses to educate the industry.

"We aim to champion sustained demand for such productive technologies, and considerably reduce the upfront construction cost premium over time," he said.

VIRTUAL BUILDING

The changes sweeping through the construction industry can be broadly summarised in two areas: Virtual building, and making big components off-site.

One of the first technological developments talked about as Singapore embarked on a productivity drive post-2009 was BIM, or Building Information Modelling.

It describes a computerised system of modelling the details of design, engineering and architecture in three dimensions. Models can be precise down to the last 10 millimetres, contractors said.

Hwa Seng Builder, a civil engineering and construction firm which builds roads and bridges, began implementing BIM a few years ago.

Thomas Ng, its founder and managing director, said BIM allows workers and clients to better visualise the construction process. If need be, the system can even be plugged into a virtual reality headset.

BIM is an aspect of a construction methodology called virtual design and construction, or VDC, that improves productivity.

VDC has been applied to projects like the Changi General Hospital Medical Centre, the JTC Furniture Hub, Northpoint City, and residential developments like High Park Residences and Gem Residences.

By simulating the construction process before executing it, potential design and logistics problems can be detected early. Addition and alteration works can be kept to a minimum.

With even power points, mirrors and cabinets simulated first virtually, sub-contractors can minimise mistakes, said China Construction (South Pacific) Development Co, or CCDC.

CCDC, the regional subsidiary of construction

giant China State Construction Engineering Corporation, built the High Park Residences condo in Sengkang.

FACTORY INSPIRATION

Another key development for the industry in recent years is the increasing use of off-site construction of large modules and components.

Contractors have invested in factories in Singapore, Malaysia and China to make construction components, be it 12-metre-long bridge beams, bathrooms, or even entire apartment units.

The use of prefabricated bathroom units, or PBUs, became mandatory for non-landed residential Government Land Sale sites from Nov 1, 2014.

Increasingly, for public projects, the authorities are mandating the use of prefabricated, pre-finished volumetric construction, or PPVC. This refers to how entire modules complete with finishes for walls, floors and ceilings can be made off-site.

PPVC projects include residential halls at Nanyang Technological University (NTU), an extension to the Crowne Plaza Hotel, The Brownstone executive condominium, and other residential projects.

Making units ahead of time cuts down on the actual time spent building on site, contractors said. This not only reduces the number of workers needed by 30 per cent, but also improves site safety and minimises noise and dust pollution.

For mainboard-listed BBR Holdings' chief executive officer Andrew Tan, industry study trips in 2012 to factories building apartment units from scratch showed the potential of the technology. BBR secured the first public high-rise PPVC project in Singapore in 2014 at NTU, and is now on its fourth PPVC project.

Dr Keung of BCA said that PPVC technologies

fit within an approach dubbed the Design for Manufacturing and Assembly, or DFMA. This is the practice of manufacturing as many building parts as possible in a factory.

More than 25 completed and ongoing projects have adopted the higher end of DFMA technologies like PPVC and mass-engineered timber (MET), he said. BCA targets a 40 per cent adoption rate for DFMA technologies by 2020.

Apart from DFMA, companies continue to pursue other ways to innovate and to be more productive.

Greatearth Pte Ltd, the integrated building services firm previously known as UE E&C, said it was inspired by the manufacturing industry to cut waste. It adopted the industry's efficiency programme, Lean Six Sigma, for its own operations.

For homes of the future, automation and the Internet of Things are becoming increasingly common.

German switches and systems specialist Jung Asia said that should they choose to, homeowners can control their homes from an electronic device. They can turn on security cameras for rooms, activate an intercom system, pipe in music, and even change the colour and intensity of lights.

Inside

BBR Holdings (S) Ltd	16
China Construction (South Pacific) Devt Co Pte Ltd	17
Greatearth Pte Ltd	18
Hwa Seng Builder Pte Ltd	19
JUNG Asia Pte Ltd	20

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Andrew Tan,
chief executive officer,
BBR Holdings (S) Ltd

"Because we were one of the earliest adopters of prefabricated pre-finished volumetric construction (PPVC), we have a track record that enables us to secure contracts. Our early investment has reaped positive results and we are confident that it will be a new growth engine for us for many years to come."



Li Xiao Qian, managing director,
China Construction (South Pacific)
Development Co Pte Ltd

"The use of technology is deeply embedded in China Construction's culture, enabling the firm to tackle the most challenging projects. We strongly support the government's efforts to drive innovation in the construction industry."



Chang Chew Kient,
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"We have trained our staff to deploy productivity-enhancing technologies like building information modelling (BIM) and prefabricated pre-finished volumetric construction (PPVC). We strive to introduce effective, time- and cost-saving yet safe processes to deliver quality products and services."



Thomas Ng,
founder and managing director,
Hwa Seng Builder

"By using precast technology, the construction process is safer and more environmentally-friendly. We can also improve our productivity and reduce our reliance on foreign labour."



Shawn Ang,
general sales manager,
JUNG Asia

"People understand and appreciate German quality. We will continue to offer innovative switch systems and products with technical precision as well as a high standard of design."

The prefab pioneer

Mainboard-listed BBR Holdings (S) Ltd, an early adopter of PPVC technology, has supplied around 2,000 modules and is on track for 2,700 more

BBR Holdings (S) Ltd's (BBR) trailblazing role in Singapore's prefabricated pre-finished volumetric construction (PPVC) revolution began five years ago. Industry study trips took chief executive officer Andrew Tan to projects and factories in Australia and other countries, where he witnessed factory production lines building entire apartments from scratch.

"First you have raw materials coming in. Then you cut, bend and weld the steel sections and sheets accordingly to build up a three-dimensional shell. Next, the walls, floorboards are put up along with windows, electrical wirings, services pipes, internal finishes, fixtures and fittings. After the last coat of paint is applied, the module is wrapped for protection and moved off to the project site to be installed," Mr Tan said.

"Everybody was intrigued and impressed by the innovative construction concept and felt that this was the way to go forward."

The term PPVC describes a method of pre-fabricating modular units in a factory before they are transported to the construction site, as opposed to the conventional method of building at the location itself.

This technology is strongly supported by the Building and Construction Authority (BCA) and government authorities. It can reduce manpower requirements, especially Singapore's reliance on foreign workers, while minimising dust and noise pollution, and improving productivity and site safety.

BBR, a construction and engineering group established in Singapore in 1993 and part of the global Swiss-based BBR network, decided to take the plunge. It wanted to embrace innovative engineering and ride on the back of potential growth for more green buildings.

"We saw a new market evolving, so we made the commitment to adopt the new technology," Mr Tan said.

In 2014, BBR worked with a partner in Shanghai

who has been undertaking PPVC works for markets like Canada and Australia.

Soon after, BBR clinched a contract to build Singapore's first public high-rise development using PPVC technology. The project comprised six blocks of 13-storey student hostels at Nanyang Technological University (NTU), with a total of 1,213 PPVC modules.

With its track record, BBR secured a second PPVC contract in 2015 of 717 PPVC modules for another NTU hostel project.

This was followed by a third project supplying 756 PPVC modules to The Wisteria & Wisteria Mail, a private mixed-development project in Yishun, where BBR is one of the consortium developers.

The Wisteria, which is 99 per cent sold, is one of the first residential developments under the Government Land Sales programme to adopt PPVC technology and prefabricated bathroom units.

A fourth PPVC project was secured in 2016 for 1,900 modular units for four blocks of staff housing facilities at Upper Aijun Road. The same year, BBR set up a factory in Johore and Singapore to perform fitting-out works.

"Because we were one of the earliest adopters of PPVC, we have a track record that enables us to secure contracts," Mr Tan said.

Lessons for all

BBR is one of the first four companies awarded In-Principle Acceptance Certificates for its PPVC design system by seven Singapore government agencies for use in local projects, through the Building Innovation Panel. It is also the first company to use PPVC on a public project. As such, it had to undergo a steep learning curve.

For example, there were restrictions to be worked around on the size of modular units allowed on the roads, on where trailers can be parked, and on the lifting capacity of cranes.

"These were not only learning points for us, but also for the relevant government agencies as well. Certain regulations had to be reviewed and



adapted for the new technology. We are also appreciative of the support and co-operation by these agencies in advocating the adoption of PPVC," Mr Tan said.

In order to succeed in the adoption of PPVC technology, a few things need to be in place, he said.

First, the long term market demand for PPVC has to be there. Second, all industry stakeholders need to believe and mindset that this technology will be worthwhile despite the higher costs.

BCA has organised several study trips to Europe, Australia and China. "You have to see what other people have done, what is achievable overseas, and bring back the good practices," he said.

Third, a company's organisational structure has to be changed to adopt the new technology.

People have to be trained. And, finally, there are investments to be made in factories and equipment.

"For PPVC to be used effectively, quality control at the factory is critical," Mr Tan said.

"We do mock-ups, models, and identify clashes potentially affecting construction. Anything unsatisfactory has to be reworked."

Once the PPVC modules are installed on-site, final touch-up works are required but they are minimal compared to conventional methods of building, he said.

Computerised software such as building information modelling (BIM) and virtual design and construction (VDC) methods provide an advantage for PPVC construction. Design details as well as the construction process can be simulated and refined virtually before execution to reduce errors during construction.

Ultimately, the use of PPVC is accelerating in Singapore, Mr Tan said. Prefabricated, pre-finished modular units can be supplied to a wide range of developments such as schools, offices, hotels, hostels, dormitories and nursing homes.

And BBR, with its track record of combining innovative engineering with specialist know-how, is well positioned for the years ahead.

"As a builder, we will participate in tenders for PPVC projects. And through our development arm, we will also tender for land sales where PPVC is required," Mr Tan said.

"Our early investment in PPVC has reaped positive results and we are confident that it will be a new growth engine for us for many years to come."

'Because we were one of the earliest adopters of prefabricated pre-finished volumetric construction (PPVC), we have a track record that enables us to secure contracts. Our early investment has reaped positive results and we are confident that it will be a new growth engine for us for many years to come.'

- Andrew Tan,
 Chief Executive Officer of BBR Holdings (S) Ltd



DRIVEN BY INNOVATION

BBR Holdings (S) Ltd is one of Singapore's leading construction groups with more than 20 years of industry experience. It currently comprises four core business segments spanning across **General Construction, Specialised Engineering, Property Development** and **Green Technology**.

The BBR Group is well-positioned to meet the urbanisation challenge in Asia with its proven track record and good combination of innovative engineering with specialist know-how in construction methods. It has business presence in key markets such as Singapore, Malaysia, Thailand and the Philippines.



Specialised Engineering



General Construction



Property Development



Green Technology

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**BBR GROUP
OF COMPANIES:**

BBR Construction Systems Pte Ltd • BBR Development Pte Ltd • BBR Greentech Pte Ltd • BBR Piling Pte Ltd • Singapore Engineering & Construction Pte Ltd • Singa Development Pte Ltd • Moderna Homes Pte Ltd • Angels Medical Pte Ltd • BBR Construction Systems (M) Sdn. Bhd. • BBR Philippines Corporation

A smart way to build

China Construction leads the industry through computer-aided models, prefabricated prefinished modules, and the use of drones

China Construction (South Pacific) Development Co. Pte Ltd, otherwise known as CCDC, stands head and shoulders above its competitors in raising the standards of Singapore's construction industry.

It is one of the few builders in Singapore which has won the Built Environment Leadership award from the Building and Construction Authority (BCA) – one of the industry's highest accolades.

One of its award-winning projects, High Park Residences condo in Sengkang, showcases the smart construction techniques it has adopted.

All six 25-storey blocks of the development were built using building information models (BIM) and virtual design and construction (VDC) methods pioneered in Singapore by the construction giant.

These methods were also used for a polyclinic project in Punggol, an MRT project between Sembawang and Yishun, and public housing projects in Bidadani.

The use of BIM and VDC represents a paradigm shift in the construction industry to virtually simulate all aspects of design, engineering and architecture, down to the smallest detail.

CCDC managing director Li Xiao Qian said: "China Construction (South Pacific), as one of the leading construction enterprises in Singapore, is pioneering the latest technological trends in the industry."

The biggest advantage of BIM and VDC is how the construction process becomes very smooth, with every step rehearsed virtually before being executed on the ground.

This leads to significant productivity gains in terms of cost and time savings, because addition and alteration works are kept to a minimum.

"Inside the unit, even the power points, mirrors and cabinets can be replicated, so subcontractors could minimise mistakes and we can build accurately, beautifully," Mr Li said.

Stakeholders like architects, engineers and clients can view three-dimensional models to understand the construction process so design conflicts can be minimised.

'The use of technology is deeply embedded in China Construction's culture, enabling the firm to tackle the most challenging projects. We strongly support the government's efforts to drive innovation in the construction industry.'

– Li Xiao Qian,

Managing Director, China Construction (South Pacific) Development Co. Pte Ltd

With the construction models available on the cloud, site supervisors and workers can use electronic devices to scan QR (Quick Response) codes to retrieve visual mock-ups. They can review the plans more efficiently compared to the use of two-dimensional drawings previously.

As part of the construction process, a laser-guided positioning device also helps in the surveying process of setting out markers to guide BIM construction.

For its innovation, China Construction won a BCA award for setting new standards for the adoption of BIM for residential projects.

An established builder

Operating for 25 years in Singapore since 1992, CCDC is the regional subsidiary of China State Construction Engineering Corporation, one of the largest construction and investment conglomerate in the world, and it is recognised as the 1st of the TOP 250 Global Contractors by Engineering News-Record (ENR) and 27th in the list of Fortune Global 500 in 2016.

Since then, China Construction has successfully built up a comprehensive portfolio across numerous residential, commercial, civil engineering and industrial projects in Singapore. In 2016, its turnover exceeded S\$1 billion.

The firm has succeeded in carving out a niche for itself as a versatile and forward-thinking builder despite being a large multi-national organisation.

In Singapore, China Construction has built 16 institutional projects, 23,090 units of premium quality private homes and 36,125 HDB flats, as well as hotels and commercial hubs.

China Construction has also won significant recognition and acceptance by the industry, consistently winning awards for its high-quality projects.

Since its local inception in 1992, it has received some 113 awards for its work, its productivity initiatives and its environmentally-friendly practices.

Having mastered the use of BIM and VDC, China Construction is progressing to the next step.

It is using prefabricated prefinished volumetric construction (PPVC), a construction method that will have modules of whole, or part of, a unit that are completed with internal finishes, fixtures and fittings that are manufactured in factories, the completed modules will be transported to site for installation.

The various modules will then be transported to the construction site



and installed in a Lego-like manner, supported by the smart building methods of BIM and VDC.

The first condominium project which China Construction used PPVC was Lake Grande, a 710-unit Jurong West project spreading over four blocks of 17 storeys each.

"PPVC is one of the game changing technologies which the authorities are encouraging in order to cut down the amount of construction activities onsite, achieve higher productivity and quality, minimise dust and noise pollution, and improve site safety," Mr Li said.

"We strongly support the government's efforts to drive innovation in the construction industry."

Shaping Singapore's future

China Construction also uses technology to ensure safety throughout the construction process of public projects.

Drones are used to monitor the progress of construction sites, such as China Construction's build-to-order (BIO) flat project in the Bidadani estate.

The drone can also collect data and spot potential safety problems. Aerial pictures and videos of defects help its teams to coordinate rectification works.

Meanwhile, it is building Canberra MRT station between Sembawang and Yishun, an especially challenging project built on an existing line.

A protection enclosure will be erected to protect existing railway tracks and trains, simulated first using BIM.

A full-scale mock-up of the station column and roof will also be installed off-site to determine the safest and most effective way to carry out the actual construction.

Ultimately, the use of technology is deeply embedded in China Construction's culture, enabling the firm to tackle the most challenging projects, Mr Li said.

"We have grown rapidly over the past 25 years, and continue to expand into the region and build upon our real estate development business.

"We look forward to a golden future of shaping a high quality, safe and sustainable living environment in Singapore."

 中国建筑(南洋)发展有限公司
 China Construction (South Pacific)
 Development Co Pte Ltd


 BUILT ENVIRONMENT LEADERSHIP award
 GOLD CLASS

 中遠地產
 CSC LAND GROUP

BUILDING A SOLID HISTORY, DEVELOPING A BRIGHTER FUTURE

Since our inception in 1992, China Construction has been laying a strong foundation upon which the building blocks for a future-ready built environment for Singapore are being developed.

As we commemorate our 25th Anniversary this year, we remain steadfast in cementing our position at the forefront of the design and construction industry by embracing game-changing initiatives.

We are spearheading collaborations with specialists and stakeholders to harness the capabilities of innovative design and construction processes, such as Prefabricated Prefinished Volumetric Construction (PPVC), Building Information Modelling and Virtual Design Construction (BIM-VDC), and drone technology.

These advanced technologies and approaches will help us enhance efficiency through increased productivity, shorter construction time and reduced manpower cost, as well as enable more effective management of all information and decisions throughout the life cycle of a construction project.

RAMPING UP PRODUCTIVITY THROUGH THE PPVC APPROACH



Oasis Terrace in Punggol

IMPROVING DESIGN & BUILDING PROCESSES WITH BIM VDC TECHNIQUES



High Park Residences

UPSCALING INTELLIGENCE BY TAPPING DRONE TECHNOLOGY



Alkaff CourtView & Alkaff LakeView

25th
 1992 - 2017

A new era of growth

Greatearth, a multi-disciplinary builder able to oversee a project from idea to completion, does not stand still despite its venerable past.

The biggest competitive advantage of Greatearth Pte Ltd, said chief executive officer (CEO) Chang Chew Kient, is its all-encompassing integrated business model spanning property development, engineering, and construction.

This means the group can tackle larger and more technically complex projects, he said.

"We can undertake a property development project from foundation works, to construction, to all other ancillary services such as mechanical and electrical engineering (M&E) and procurement," he said.

Greatearth, formerly listed on the Singapore Exchange mainboard as UE E&C, is behind some of Singapore's most recognisable landmarks including the Raffles Town Club, NUS Cultural Centre, and Mount Elizabeth Hospital.

The group stays ahead of the times by training staff on leading industry practices to improve productivity, while ensuring a safe and healthy working environment for them.

"We have trained our staff to deploy productivity-enhancing technologies like building information modelling (BIM) and prefabricated prefinished volumetric construction (PPVC) in our operations," said Mr Chang.

"We also send them on various courses to keep abreast of disruptive technologies and developments. We strive to introduce effective, time- and cost-saving yet safe processes to deliver quality products and services."

Greatearth embarked on the Lean Six Sigma journey which enables the group to cut waste and costs, as well as improve cycle time and quality. This is to enhance project delivery and increase customer satisfaction, Mr Chang said.

Meanwhile, the group constantly deploys appropriate resources to ensure a safe and healthy working environment for its staff.

"We are committed to keep up with industry changes through introducing



game-changing technologies and equipment, as well as building methods and practices which help tackle new workplace safety and health-related challenges and risks."

Not standing still

Greatearth is one of the most enduring engineering and construction brand names in the region, with a history of evolving to keep up with its times – be it design-and-build projects, infrastructure projects, or property development.

Its engineering roots can be traced to 1912 when two engineering powerhouses, Riley Hargreaves & Co., Ltd. and Howarth Erskine & Co., Ltd., merged to form United Engineers Limited. The firm helped rebuild Singapore after the Second World War.

Greatearth Construction was founded in 1981 and acquired by United Engineers in 1990 to be its principal construction subsidiary.

In 1994, Greatearth secured a \$5107-million construction contract for the Institute of Health and National Dental

Centre, one of the group's largest projects then.

Long established in Brunei, it built the Brunei National Indoor Stadium and the flyover at Lebuhraya Muara in 1997, its first infrastructure project there.

Its first design-and-build project, which was ahead of its time, was the Sunrider Singapore Factory completed in 1998. And in 2004, its first design-and-build residential project, The Serenade, was completed.

At the turn of the millennium, Greatearth became one of the first established contractors to venture into property development.

"We wanted to exercise greater control over our projects. By being responsible for building and design, we can minimise inefficiencies and save costs," Mr Chang said.

"Our first residential development project was Haugang private condominium Kovan Melody. It was completed in 2006, well before the wave of contractors foraying into property development after the 2007 property boom."

Infrastructure and condos

In 2009, the group completed the construction of Pioneer and Joo Koon MRT stations, its first major Singapore infrastructure project.

The group's first executive condominium (EC) project was secured in 2010. The same year, it completed M&E works at the Marina Bay Sands hotel. Its second EC project Watercolours was launched in 2012, and its third EC project, Waterwoods, secured in 2013.

The year 2011 marked its debut on the Singapore Exchange as UE E&C. That year, it completed building a mixed-use development at one-north comprising The Rochester condominium, Park Avenue Rochester hotel and serviced suites, as well as Rochester Mall.

In 2014, it won a \$243.5 million contract to build the Lee Kong Chian School of Medicine at Nanyang Technological University at Mandalay Road, and the School of Medicine at Nanyang Drive.

In 2015, UE E&C was privatised and delisted, and renamed Greatearth. In 2016, it launched Gem Residences, the first condominium to be launched in Toa Payoh since 2009.

'We have trained our staff to deploy productivity-enhancing technologies like building information modelling (BIM) and prefabricated prefinished volumetric construction (PPVC). We strive to introduce effective, time- and cost-saving yet safe processes to deliver quality products and services.'

— Chang Chew Kient, Greatearth Pte Ltd Chief Executive Officer

Today, the group has around 1,200 staff in Singapore and more than 300 abroad. In 2016, about 11 per cent of its revenue comes from countries like Malaysia, China, Vietnam, Brunei and Indonesia.

It has won multiple awards for construction excellence, safety, productivity and environmental consciousness.

Looking ahead, the firm will continue doing what it is best at – transforming Singapore's landscape through condominiums, hotels and offices, schools and universities, healthcare and transport infrastructure, along with country clubs and shopping malls.

Said Mr Chang: "As an independent company with a rich heritage, Greatearth is well positioned in a new era of growth. Our multi-disciplinary building services across property development, engineering and construction will enable us to stay ahead of the competition, even as we strive for excellence across all fronts."

Building better and greater lives together

Greatearth Pte Ltd has an integrated business model across property development, engineering and construction. Its detailed services are below:

Property Development

- Private condominiums
- Executive condominiums (ECs)
- Public housing
- Mixed-use developments and industrial parks

Engineering

- High and low-voltage electrical power distribution
- Air-conditioning and mechanical ventilation (ACMV) systems
- Fire protection, alarm and sanitary systems

Construction

- Design-and-build
- Civil works
- General construction

Geo-Technical Foundation Work

- Geo-technical engineering
- Foundation engineering
- Soil improvement works
- Structural works

Total Power Solutions

- Total power solutions to industries that require emergency, immediate and uninterrupted power supply
- Supply and rental of diesel power generators, loadbanks, transformers, power distribution panels and cable accessories

Procurement

- Procurement of materials including flooring tiles and sanitary wares
- Supply and rental of metal forms

BUILDING GREATER STRENGTHS



Greatearth is one of Singapore's most enduring brand names in integrated building services with over 150 years of engineering and construction heritage together with its predecessors. Today, its time-tested competencies span Property Development, Engineering, Construction as well as specialty services such as Geo-Technical Foundation Work and Total Power Solutions. Headquartered in Singapore and has operations across Southeast Asia, Greatearth boasts a stellar track record including urban landmarks, housing projects and public infrastructure. Always striving for excellence on all fronts, Greatearth has received accolades including United Kingdom-based The Royal Society for the Prevention of Accidents Award, Workplace Safety & Health Performance Award, Safety and Health Award Recognition for Projects, as well as Building and Construction Authority Green Mark Award.



At technology's fore

An upcoming Punggol bridge showcases Hwa Seng Builder's groundbreaking use of precast technology

In the far reaches of Singapore, a vehicular bridge will be built over Punggol's Serangoon River using methods at the forefront of civil engineering innovation.

What is unusual is how almost every component of the massive structure will be made in a factory elsewhere. Concrete columns with a height of 12 metres and crosshead pieces joining 160-ton beams will be transported to the construction site. There, they will be installed, Lego-like, to form the finished structure.

"Traditionally we would place the moulds, cast the columns and the crossheads, and place the reinforcement bars at the construction site," said Thomas Ng, 48, founder and managing director of Hwa Seng Builder (HSB), the homegrown firm handling the project.

"By using precast technology, the construction process is safer, and more environmentally-friendly. We can also improve our productivity and reduce our reliance on foreign labour."

Precast technology, the process of making construction materials away from the construction site, has been used for easily repeatable items like walls and floor slabs.

It is less commonly used in the civil engineering space, like the Punggol bridge.

HSB can forge new ground and stand apart from its peers because of the willingness of its relatively young, mid-40s management team to adopt and act on new trends, Mr Ng said.

Its use of precast technology has multiple benefits. For one, the construction process is safer. Workers do not have to clamber up and down tall bridge columns, which would otherwise have been made on site.

The installation process is also faster, with a precast column installed in a week instead of three weeks on-site.

It is also more environmentally-friendly, said Alan Nah, 45, executive director of projects.

"There is less noise disturbance. The waterway is an active reservoir and casting on site would have resulted in debris dropping into the water," he said.

Virtual modelling

Precast technology is not the only way which HSB stays ahead. For the past few years, it has been using building information models (BIM), a three-dimensional, computer-aided modelling system.

BIMs allow engineers to better visualise the



Mr Alan Nah, Executive Director of Projects (Left) and Mr Thomas Ng, 48, Founder and Managing Director

PHOTO CREDIT: KELVIN CHOY

'By using precast technology, the construction process is safer, and more environmentally-friendly. We can also improve our productivity and reduce our reliance on foreign labour.'

- Thomas Ng,
 Founder and Managing Director of
 Hwa Seng Builder

construction process down to the smallest details before work begins. This minimises design incompatibilities and reduces the chance of wasted work.

HSB has also begun to manage its construction process through virtual design and construction (VDC), a management method that incorporates BIM to improve productivity and efficiency.

Mr Nah said the use of technology helps the communication process with workers, suppliers and clients. The BIM system can even be plugged into virtual reality headsets, allowing for virtual walkthroughs.

On the ground, specialised sorting machines are used to improve productivity, a GPS tracking system manages logistics, and closed-circuit TVs allow for remote monitoring.

An electronic permit-to-work system for critical activities, enabled using Novade software, helps speed up workflow and enhances work safety. The software also helps to collate near misses and non-conformance.

25 years of developing people

HSB has grown significantly from its beginnings in 1992 as a sub-contractor performing minor road and drain works to a 400-strong company with annual revenues of above S\$100 million. The group celebrated their 25th Silver Jubilee this year.

"I started the business because I was influenced by my late father, who was a sub-contractor running a small company," Mr Ng said. His sister Jacqueline, a HSB director, is in charge of finance.

In 2010, HSB has qualified as an A1 contractor with the Building and Construction Authority (BCA), enabling it to bid for projects of unlimited value within the public sector.

Its Punggol bridge project is part of a S\$185-million tender awarded by the Land Transport Authority (LTA) in 2015 for the design and construction of vehicular bridges and piled roadways on the former municipal landfill area at Kallang-Paya Lebar Expressway (KPE) and the Tampines Expressway (TPE) interchange, including Link Road to Punggol Central.

In January 2017, HSB was awarded another S\$74-million tender to build a new road in the area.

A key reason for the company's success through the years is its team of qualified, competent and committed staff, Mr Ng said.

"Our most important asset is people. Everyone is looking for opportunities and better career advancement. You have to give good people opportunities, and treasure them, so they continue to contribute to the company."

HSB thus sends managers and staff for overseas training. It also offers scholarships to existing staff as well as to university students so as to bring in new blood.

The company aims to be the long-term trusted and preferred civil engineering contractor among its clients by demonstrating its professional expertise and quality work within a safe, healthy and environmentally-conscious workplace, he said.

"We would also like to thank BCA for guiding and supporting us, and also our clients like LTA and Changi Airport Group for placing their trust in us and giving us the opportunity to explore new technology."

Advancing with TECHNOLOGY



Be a leader and a trusted civil engineering contractor among our clients by demonstrating professional expertise, providing quality work, taking ownership and to continuously inspire to strive for excellence in Workplace Safety, Health & Environment performances



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 CERT NO: 2006-0349
 ISO 14001:2004
 CERT NO: CHS-2006-0148
 BS OHSAS 18001:2007

A German mark of excellence

JUNG, a switches and systems specialist, prides itself on precise workmanship, timeless design and unparalleled service

Technology, sophisticated design and German-made quality have ensured JUNG's success for over 100 years. The family-run electrical installation supplier's classic, elegant designs for its switches, socket outlets and light dimmers are acclaimed by architects, interior designers and home owners across the world. Other well-known JUNG products include smoke devices, USB charging sockets and home automation systems.

JUNG has an established client list including numerous luxury condominiums, hotels, and residential homes. Projects in Singapore include the Four Seasons Hotel, Shangri-La hotels and apartments, condominiums like The Sherrill and The Marq on Paterson Hill, and Sentosa Cove homes.

"People understand and appreciate German quality," said Shawn Ang, general sales manager of JUNG Asia.

"We strongly believe in the quality of our products and designs, and we pride ourselves on our after-sales service. When we sell our products, we want to be there for our customers," he said.

Today, JUNG is at the forefront of the "smart home" revolution. It provides innovative systems for controlling lighting, blinds and air-conditioning in the home.

These systems incorporate wireless technologies to enable a wide range of functions including intercom messaging, multimedia control, and security cameras. They also meet requirements of cost-effectiveness and energy efficiency.

JUNG's team of support engineers here includes a certified expert in KNX, the network communications protocol behind home automation.

"Our motto is 'Progress as a Tradition'," Mr Ang said. "We will continue to offer innovative switch systems and products with technical precision as well as a high standard of design."

Q: What is JUNG's heritage and its tradition of innovation?

In 1912, electrician Albrecht Jung, aged 40, founded a factory in the idyllic town of Schalksmühle to produce his patented invention: A pull switch with a 1/8 rotation. Due to market demand, JUNG quickly specialised in making switches and sockets.



In the 1960s, the company launched a push-button switch which became a classic of contemporary switch design. As modern building requirements became tougher, JUNG stood out by continuously improving its product portfolio.

Today, JUNG is confident that with its innovative approach and commitment to quality, the company can continue making successful products over the next 100 years.

Q: What's the significance of JUNG's made-in-Germany products?

Germans emphasise technology, design, functionality and product capabilities. German products are well known for their reliability and safety.

Since 1912, JUNG has been based in Schalksmühle, a small town in Germany's state of North Rhine-Westphalia. It has a second production facility in Lünen, Westphalia, since 1941.

JUNG is fully committed to its German manufacturing location, ensuring that its "Made in Germany" products are of the highest quality.

Q: What features are customers looking for today?

Automation is increasingly common. Centralised switches can control lighting and ventilation in different parts of the house like the kitchen or the car porch. A communication system has to be put in place.

We offer switch systems according to what our customers need, be it piped music coming into the dining room or a smartphone program that can remotely turn on security cameras.

A new trend is LED lights replacing halogen lights. Last year, we introduced a switch that can brighten or dim different colours of lights, in addition to dimming or brightening them.

Q: Please elaborate on JUNG's collaboration with the foundation of a famous architect.

Renowned Swiss-French architect Le Corbusier, who created architectural masterpieces in the 20th century, was concerned with chromatic harmony and the effects colours have on people and spaces.

Inspired by his colours, JUNG is offering its classic LS 990 range of switches in the 63 shades of Les Couleurs® Le Corbusier as a worldwide exclusive.

Each of the colours can be harmoniously combined with others in the system. The switches are hand-painted using a special process, giving them an exceptional matt surface.

Other than switches, sockets, rotary and touch dimmers, devices to control room functions like lighting or ventilation can also be integrated into the Les Couleurs system.

Q: What awards has JUNG won?

JUNG has time and again measured itself successfully against the best in the field.

It has consistently won prizes in the German Design Awards, one of the most recognised design competitions in the world. Awards were given to the real brass, Les Couleurs® Le Corbusier, and dark aluminium colours of its classic LS 990 Switch.

Other recent wins include the Iconic Awards: Interior Innovation, The Most Innovative Brand Award 2016, Trade Award of the Year 2016, Best Product 2016/2017, and the Innovation Award for Architecture + Technology 2016.

Q: What are JUNG's plans for regional growth?

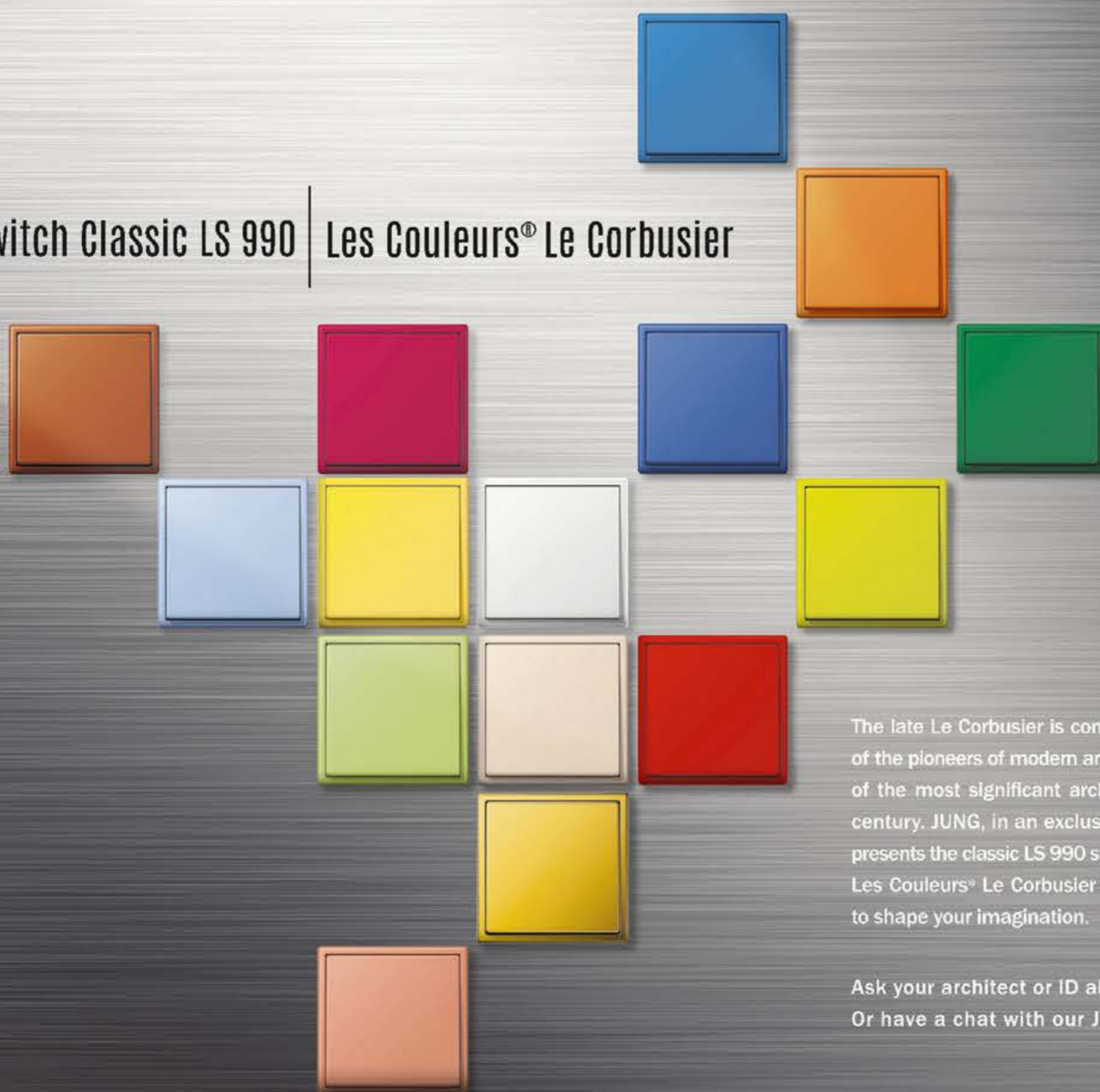
JUNG's Asian headquarters were established in Singapore in 1997, initially covering Singapore, Malaysia, Bangkok, and Indonesia. The company then ventured into Hong Kong as a stepping stone into China, before expanding to Korea and Taiwan.

Today, JUNG aims to grow in Singapore and the region by sharing the future of technology with architects and designers. Singapore is a regional design hub, with many international firms involved in projects in China, India, Hong Kong, and the Middle East.

'People understand and appreciate German quality. We will continue to offer innovative switch systems and products with technical precision as well as a high standard of design.'

- Shawn Ang,
 General Sales Manager of JUNG Asia

Switch Classic LS 990 | Les Couleurs® Le Corbusier



The late Le Corbusier is considered to be one of the pioneers of modern architecture and one of the most significant architects of the 20th century. JUNG, in an exclusive collaboration, presents the classic LS 990 switch in 63 original Les Couleurs® Le Corbusier colours, designed to shape your imagination.

Ask your architect or ID about JUNG today. Or have a chat with our JUNG consultant.

