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STATE OF THE CITY

As construction moves to factories, builders deal with new costs and tech

| BY SHARANYA PILLAI |

When construction company **BBR Holdings (S)** embarked on the building of the North Hill residential halls in 2014, there was a lot of scepticism that the company would be able to complete it. "Some of our own staff thought it was not possible. We had a project engineer who thought we were doing something crazy and said he had better not get involved," says John Mo, managing director of BBR's wholly-owned subsidiary BBR Construction Systems.

North Hill is a cluster of high-rise dormitories in Nanyang Technological University. It is also Singapore's first high-rise public project built using the Prefabricated Prefinished Volumetric Construction method. PPVC is a Lego-like building method that involves manufacturing free-standing modules — complete with finishes for walls, floors and ceilings — in factories. In BBR's case, entire rooms were produced in a manufacturing facility. These modules were installed in a building at the construction site.

PPVC can reduce the time needed to build a high-rise apartment by about 15% while raising labour productivity by about 40% and improving efficiency. But as Mo's story illustrates, companies face resistance initially when they adopt the technology. Even for BBR, which has since proved its critics wrong, challenges persist. PPVC is about 15% more expensive than traditional on-site construction, Mo estimates. Depreciation costs for PPVC factories have also weighed down the company's most recent earnings, partly contributing to a 20.4% y-o-y rise in administrative costs for 2QFY2017 ended June 30.

Mo is gung-ho enough to endure the short-term pain of embracing PPVC. And more firms have started coming on board as the Singapore government pushes for greater adoption of technologies like PPVC. However, companies have also voiced concerns about steep upfront costs amid weaker construction demand.

Factories the way forward

Globally, construction companies are already embracing this trend, called Design for Manufacturing and Assembly (DfMA). It involves bringing contractors and designers together to plan the manufacture of the units required for assembling the entire building.

The shift involves an alphabet soup of technologies. Instead of 2D drawings, architects and contractors use Building Information Modelling (BIM) to visualise a building in 3D for advance planning. The Building and Construction Authority (BCA) is also encouraging contractors to use advanced precast technology to mass-produce elements such as beams and walls. And it wants more projects to use mass engineered timber and structural steel, both of which can be assembled in factories.

Speaking to *The Edge Singapore* at an industry seminar in August, BCA CEO Hugh Lim estimates that 10% to 15% of construction companies have adopted DfMA technologies so far. He aims to raise this to 40% by 2020. Currently, about half of Government Land Sale sites require the use of PPVC. In September, the Housing and Development Board announced that it would adopt concrete PPVC in 35% of its projects over the next two years.

Such targets should help push local firms to invest in and adopt new technologies. But companies point out that it is being implemented at a difficult time. The construction sector contracted 5.7% y-o-y in 2Q2017 due to a fall in both private and public sector construction output.

Mixed reactions amid challenging outlook

Pek Lian Guan, CEO of construction firm **Tiong Seng Holdings**, is optimistic about the shift to DfMA. "We can't call our work construction anymore; I think we have to call it 'manufacturing construction'." Like BBR, Tiong Seng was an early mover in DfMA. A former BCA board member, Pek started looking into precasting technologies in the 1990s. In 2012, his company spent $36 million building Singapore's first Integrated Construction and Prefabrication Hub (ICPH) specialising in precast. Two years later, it started building its own PPVC solutions.

Pek acknowledges that the transition can be challenging. "In Singapore, it's not that easy to build a factory. Even if you have the money, you may not get the land. The [construction] process you are trying to bring to the factory must also have sufficient volume for you to justify this move," he says. Pek predicts that while contractors will have to spend more on R&D to prepare for the future of construction, the overall outlook matters too. "Can you spend money on studying if your income is not sufficient to feed yourself? You must have spare money. [Likewise], if you want to encourage R&D, the construction industry has to be healthy." Nevertheless, he believes there are sufficient projects to go around.

Jeffrey Teo, construction director of Lian Beng Construction, is less enthusiastic. At his company, which is part of locally listed **Lian Beng Group**, employees have been undergoing training in PPVC for some time. Also, Lian Beng has just taken on its first project involv-

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Making construction hot again with government support

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ing PPVC: the Defu Industrial City. But Teo says that if PPVC had not been a requirement of the tender, the company might not be using the technology at this point in time. A shortage of projects makes it more challenging for companies to get on board DfMA, he says. Also, Lian Beng does not have its own PPVC manufacturing facility and therefore has difficulty controlling its costs.

At private construction firm Woh Hup, director of engineering Wong Keam Tong says the adoption of BIM software in 2009 required high upfront costs for retraining staff. "Right now, in our organisation, we have two groups of BIM modellers and three [BIM] managers. There is a set-up cost for that," he said at an HSBC industry roundtable last month. "And furthermore, you have to buy different software."

Because DfMA is so new, many firms are unfamiliar with the exact costs involved. And they sometimes bid for projects at unrealistically low prices. BBR's Mo says this puts experienced firms like his at a disadvantage "when the client is looking primarily at the price".

Short-term pain, long-term gain

The government is not blind to the challenges the industry faces. It has announced plans to move towards a more holistic assessment of bids for public projects, taking into acc the quality of the bid and the company's ty track record. "This is good news for th dustry because we can sift out those unr tic bids by companies that think they car bid first and figure out how to do the tecl ogies later," Mo says.

At the launch of a new ICPH facility o 3, Finance Minister Heng Swee Keat ackn edged that cyclical factors can affect con tors' willingness to innovate. "The boom-bust cycle in the sector incentivises comp to rely more heavily on variable factors of duction such as labour and less on capit vestments in new technologies," he says

However, Heng emphasised that DfM critical for improving productivity in cons tion. ICPHs can optimise land use and imp the quality of prefabricated components. I also improves labour productivity and cr new and higher-skilled jobs.

Heng said construction firms shoul the Land Intensification Allowance scher defray the upfront capital costs of develc ICPHs. Other financial aid schemes avai are the Public Sector Construction Produ ity Fund and the Construction Product and Capability Fund. Heng also annou that BCA will start to provide a forecast c number of tenders with specified DfMA nologies to be called in each year.

A spokesperson at construction firm na Construction (South Pacific) Develop welcomes the government's initiatives in moting DfMA. "Government support for improvements will only benefit the ind in the long run as better benchmarks ar across the board," the spokesperson say

Expectations of a recovery in the ind could also bolster innovation. James Ca on, Asia co-head of the infrastructure anc estate group at HSBC, expects the numb residential construction projects to incr "The market expectation is for the Singa residential market to bottom out by 2018 a latest. We are already observing increase vestment with both new build and replace of older developments, both of which will demand for construction activity," he sa

Meanwhile, the government is pum money into the sector. In a Sept 28 Face post, Minister for National Development rence Wong announced that the governi would bring forward some $700 million w of public sector construction projects. Th in addition to the $700 million worth of jects announced in the 2017 Budget.

To Lian Beng's Teo, the availability of projects will mean that builders can finall cus on testing DfMA technologies rather competing solely on price. "When mo us are using things like precast elements PPVC, then the price will come down. An smaller players can get on board too," he

For some contractors, the move tow DfMA also represents a revitalisation o image of construction among young Sing reans. "When I was a board member at I we once joked that we should tell Mediaco stop producing *Phua Chu Kang*," Tiong S Pek recounts. The sitcom centres on a c cally inept contractor. "It misleads peopl what contractors really do, and the low-image really stays with people."

BBR's Mo agrees, saying that factory c tions will also counter perceptions of cons tion being a dangerous job. "Some young p think that if you work in a construction site don't know what's going to fall on your at anytime and you don't know if you'll r home at the end of the day," he says. "But be when young people see that the sector is high-tech, they'll join the industry. We ne make construction hot again."