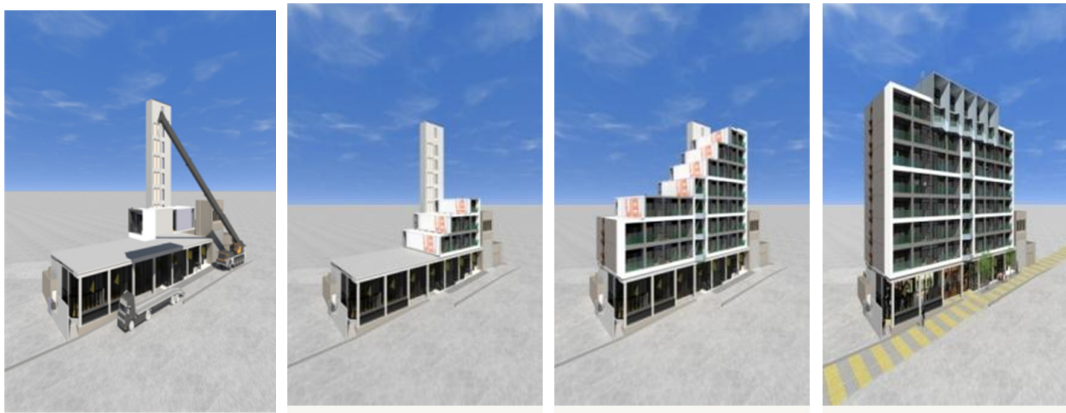


Annex B

PREFABRICATED PRE-FINISHED VOLUMETRIC CONSTRUCTION (PPVC)

In Prefabricated Pre-finished Volumetric Construction (PPVC), complete flats or modules made of multiple units complete with internal finishes, fixtures and fittings are manufactured in factories, and are then transported to site for installation in a Lego-like manner.

PPVC can be considered for residential and mixed (residential and commercial) developments, institutional and other projects as well as other accommodation type of developments such as hotels, hostels and nursing homes.



Assembly of PPVC modules on site

Benefits of PPVC

- PPVC can help to significantly speed up construction. It can potentially achieve a productivity improvement of up to 50% in terms of manpower and time savings, depending on the complexity of the projects.
- Furthermore, dust and noise pollution can be minimised as more activities are done off-site.
- With the bulk of the installation activities and manpower moved off-site to a factory controlled environment, site safety will also improve.

PPVC in Singapore

In terms of regulatory clearance, PPVC has already obtained In-Principle Acceptance from all the technical agencies for use in Singapore.

There are currently five suppliers (Swee Hong / Unitised Building Australia, Moderna Homes, Sembcorp EOSM, Unitised Building Australia / UB RUSH and Teambuild) for PPVC in Singapore.

- Nanyang Technological University had awarded the tender to construct their upcoming student hostel project using PPVC to Singapore Piling & Civil Engineering Pte Ltd (part of BBR Holdings (S) Ltd).
- Separately, OUE has awarded the tender to develop the extension of the Crowne Plaza Hotel at Changi Airport to Dragages Singapore Pte Ltd. Dragages will be working with Unitised Building who will be prefabricating the modules for the Crowne Plaza extension in their Shanghai factory before they are shipped to Singapore for installation next year.
- CDL will be the first developer in Asia to adopt PPVC for an unprecedented, large-scale residential project - an Executive Condominium (EC) at Canberra Drive. The development which comprises eight 10 to 12-storey blocks with an estimated 636 apartments will be constructed using some 3,300 building modules - likely the largest application of PPVC in the world
- MOH Holdings has also announced that their new nursing home in Woodlands Crescent will be constructed using PPVC.

OUE Crowne Plaza Hotel Extension	NTU North Hill Hostel
	
CDL's Executive Condominium (EC) at Canberra Drive	
	

PREFABRICATED BATHROOM UNIT (PBU)

The construction of conventional bathrooms requires numerous workers to do more than 13 trades on site. These include waterproofing and tiling as well as sanitary, plumbing and electrical works. On the other hand, Prefabricated Bathroom Units (PBUs) are pre-assembled in factories before they are delivered to site for installation. This enables the construction of the entire bathroom to be streamlined and done efficiently in the controlled environment of the factory, minimising the disturbance to surrounding residents as well as ensuring higher quality finishing.

PBUs can bring about manpower and time savings of about 60%, depending on the design and materials used. This is not a new technology and has been used in Singapore in the last ten years or more.

PBU designs have also evolved and improved tremendously both in Singapore and overseas as innovative materials and more advanced technologies create possibilities for PBUs to be of better quality and yet not compromised by challenges in handling and transportation. One example is the evolution of volumetric concrete PBU to lightweight concrete PBU.



PBU in factory



Lifting PBU in place



Finished PBU

Ensuring PBUs meet minimum standards

As BCA is mandating the use of PBUs for non-landed residential GLS sites, it will be critical to ensure that the different PBU systems coming into the market are reliable and durable systems which will not result in future maintenance problems for the home owners.

PBU suppliers are required to apply and go through the Building Innovation Panel (BIP), which consists of both BCA as well as other relevant authorities/agencies.

Firstly, a PBU Screening Panel chaired by BCA and other industry representatives will look into the PBU system's design and materials used. The main objective of the panel is to ensure that each PBU system is both flexible and robust enough in terms of their design, to cater to both developers and home owners' needs. In addition, the materials used should be both safe and durable as well.

Next, the other agencies on the BIP would also look into areas under their jurisdiction, e.g. SCDF will be focusing on fire safety-related issues.

One-stop Building Innovation Panel (BIP)

New construction technologies or methods often take a longer time to obtain approvals by the various regulatory agencies. Such a process might deter potential innovative products or methods which help to boost construction productivity to be introduced in Singapore. In May 2011, the inter-agency BIP was established to facilitate expedient multiple agency evaluation and approval of innovative construction products and methods that help improve construction productivity by at least 20%.

Led by MND and BCA, the panel includes other agencies such as HDB, JTC, NEA, LTA, URA, SCDF, PUB and MOM.

For applications that have been approved by the Panel, the regulatory agencies issue an in-principle acceptance (IPA) letter for the innovative product or method. For subsequent project submission involving the products or methods issued with IPA, the submission will be accorded fast-track status. Through the BIP, new productive technologies such as PPVC and CLT can now be used in Singapore.