

**Memorandum the Building Committee of
the Hong Kong Housing Authority**

QUALITY HOUSING: PARTNERING FOR CHANGE

**Mechanised Construction in Public Housing Developments and Innovative
Construction Technology**

PURPOSE

This paper informs Members the use of mechanised construction in the Housing Authority (HA) and innovative construction technology in the industry.

**MECHANISED CONSTRUCTION IN PUBLIC HOUSING
DEVELOPMENTS**

2. Mechanised construction is the use of advanced constructional plant or prefabrication technology to reduce the reliance on labour for construction activities while enhancing productivity and also safety on site. Mechanised construction in public housing developments comprises the use of large panel metal formwork, precast concrete components and fabric mesh with tower crane for lifting. The comparatively large scale and extensively repetitive nature of public housing developments permits the use of highly mechanised construction method involving standardised precast concrete components (PCCs) in the past few decades. With such characteristics, HA has developed various PCCs which not only enhance construction quality, site safety and working environment but also expedite the construction programme and increase productivity.

3. The history of using PCCs in public housing developments could be traced back to the 1960's in which 16-storey public housing blocks were constructed by precast concrete panels. Thereafter, HA has been continuously developing and applying precast concrete technology in construction works such as precast façades, staircases and semi-precast slabs. In the 1990's, the average precast concrete volume adopted in HA's projects was about 18 %.

4. In 2008, Modular Flat Design ^{Note 1} was adopted to optimise site potential under the principle of “Functional and Cost Effective” design. The volume of precast concrete with the basic PCCs was about 20% and would be increased to 35% if volumetric precast bathroom ^{Note 2} was adopted. Subsequently, we adopted precast ground floor water tank, precast roof water tank and precast roof parapet where applicable to suit different project requirements to enhance the quality, safety and expedite the construction programme since 2011. Precast acoustic balcony was also adopted as a mitigation measure to severe noise impact since the pilot project in 2013. (Use of PCCs in public housing developments is illustrated in **Annex A**.)

5. With experience accumulated over more than 25 years’ application in HA’s projects, practitioners in the construction industry hold the general view that mechanised construction is a reliable ^{Note 3}, quality and safe ^{Note 4} means of construction. The productivity of public housing construction is currently maintained at a high level with 6-day construction cycle for typical floor and the worker per flat ratio at around 0.12. The overall construction cost of public housing projects is about 40% lower than those of comparable residential developments in the private sector ^{Note 5}. HA is committed to devote continuous efforts for enhancement of its housing production including the development and promotion of PCCs.

Note 1 HA developed a library of Modular Flat Design making reference to a series of non-standard flat designs evolved over the years to strive for greater efficiency and productivity through wider use of mechanised construction.

Note 2 Volumetric Precast Bathroom is mandatory for public housing developments of which the site storage area and delivery logistic are available.

Note 3 With the advancement in precast concrete technology, the traditional labour-intensive site works could be reformed to a better working environment by using automated technology and innovation in factory condition.

Note 4 Through the use of mechanised construction and PCCs, considerable amount of on-site construction works at height are migrated to the prefabrication yard such that the risk of construction accident has been reduced.

Note 5 Comparable residential developments in the private sectors means the nature of development scale, flat unit size and building provisions are of similar standard to HA public housing developments.

INNOVATIVE CONSTRUCTION TECHNOLOGY

6. The construction industry in Hong Kong has been facing the challenges of pricey construction cost, shortage and ageing of workers and declining productivity. The Government is proactively promoting innovative construction method and advanced technology to enhance productivity and cost-effectiveness. In the 2017 Policy Address, the Chief Executive promulgated a new initiative to “promote and lead the adoption of Modular Integrated Construction (MiC) ^{Note 6} in the construction industry. By adopting the concept of ‘factory assembly followed by on-site installation’ and the mode of manufacturing, labour intensive processes can be accomplished in off-site prefabrication yard with a view to enhancing productivity and cost effectiveness”.

7. MiC has recently been sprouted and applied in some overseas projects, notably in Singapore and the United Kingdom. It can potentially improve productivity depending on the development type and complexity of the projects. However, there are issues to be resolved for MiC technologies in particular for high-rise and high density public housing developments in Hong Kong’s context. They include statutory requirement, technical viability, site constraints, cost effectiveness, productivity enhancement and availability of temporary storage area. Unlike hostel or hotel developments which have a lot of architectural finishes and building services installations, the edge over for productivity enhancement may be limited in public housing developments since we have already adopted modular flat design with no-frills finishes, no-frills fittings and installations.

WAY FORWARD

8. HA is open and receptive to new initiatives as always if it could enhance quality, safety, productivity and environmental performance. In light of the above challenges, we are conducting a viability study on whether it is appropriate to adopt MiC for public housing development projects with consideration of the above mentioned issues. The final report would be completed tentatively by the end of 2018 and we will then seek Members’ approval for the way forward. For current HA projects, we have been exploring to extend the use of

Note 6 MiC means a construction method whereby free-standing volumetric modules (complete with finishes for walls, floors and ceilings) are manufactured and assembled in an accredited fabrication facility, in accordance with accredited fabrication method, and then installed in a building.

PCCs where practicable such as precast structural wall and corridor slab to further enhance the buildability and productivity.

INFORMATION

9. This paper is issued for Members' information.

Miss Angie AU YEUNG
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LIST OF ANNEX

Annex A – Use of Precast Concrete Components in Public Housing Developments

Use of Precast Concrete Components in Public Housing Developments (Domestic Block)

- Insitu Concrete
- Precast Concrete Components (inside domestic flat)
- Precast Concrete Components (common area)



Precast Tie Beams



Precast Façade

Volumetric Precast Bathroom (VPB)



Precast Water Tank



Precast Parapet

At the Main Roof



Precast Drywall (Building Component)



Precast Partition Wall



Semi-Precast Slab



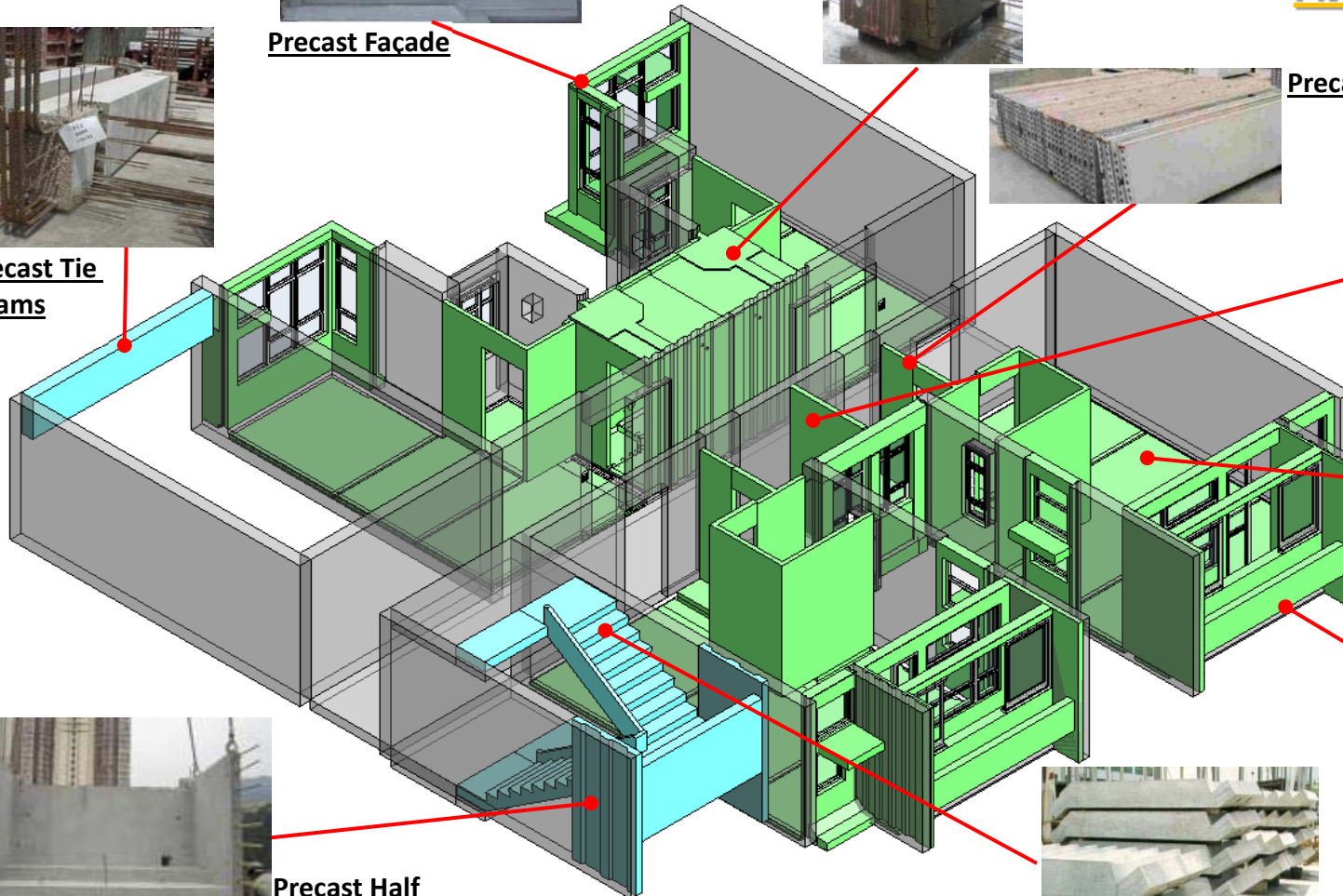
Precast Balcony



Precast Half Landing



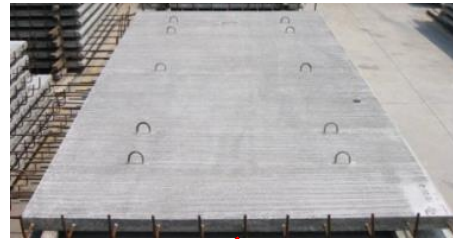
Precast Staircase



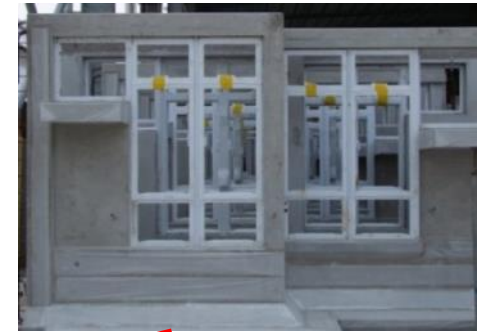
Use of Precast Concrete Components in Public Housing Developments (Within Domestic Flat)



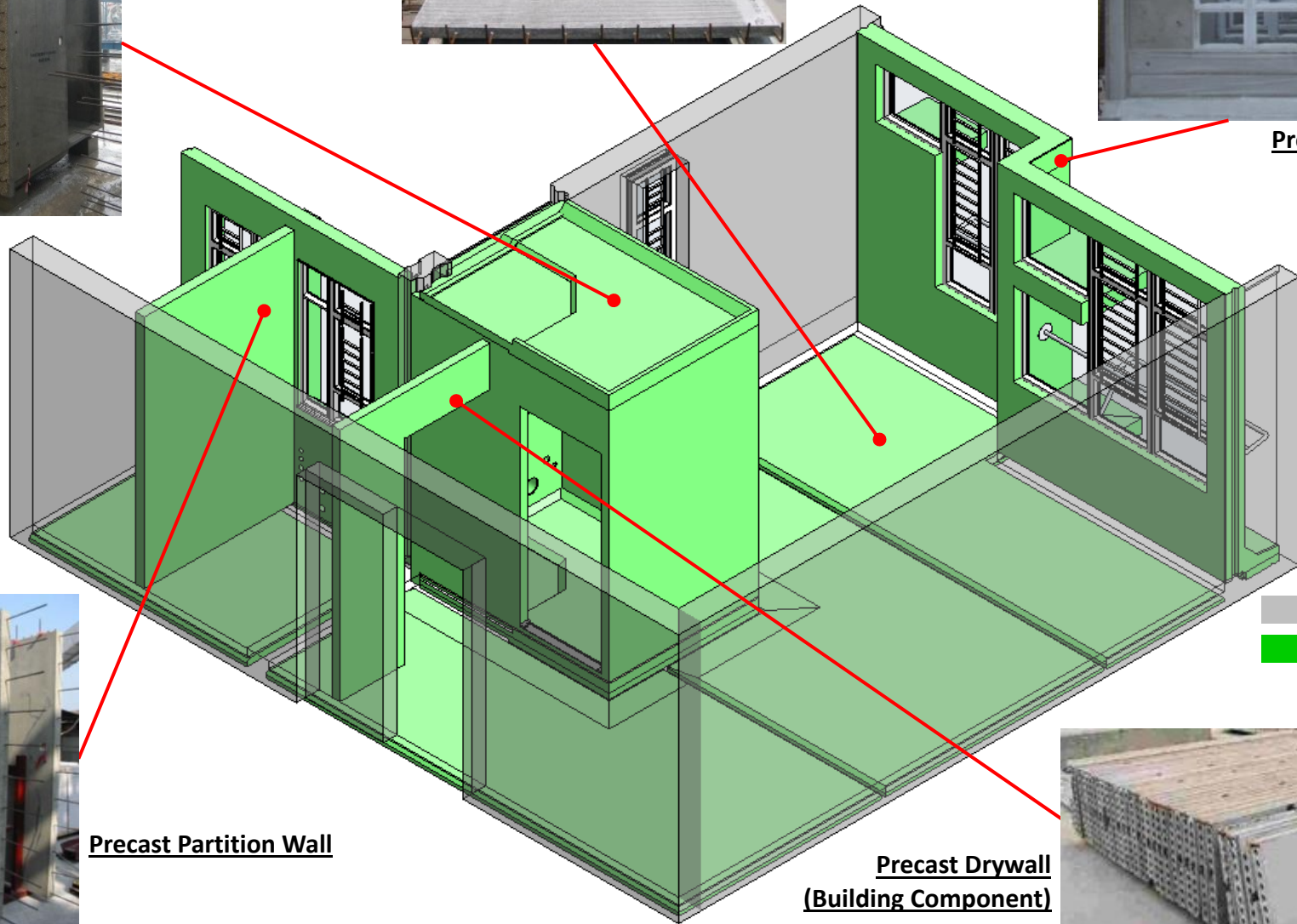
Volumetric Precast Bathroom (VPB)



Semi-precast Slab



Precast Façade



■ In-situ Concrete
■ Precast Concrete Components (inside domestic flat)



Precast Partition Wall



Precast Drywall (Building Component)