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Forum on Transitional Pre-fabricated Modular Housing
Jointly organized by the Hong Kong Polytechnic University and Transport and Housing Bureau
2017.11.03

The Forum was jointly organized by the Hong Kong Polytechnic University and the Transport and Housing Bureau of the Government of Hong Kong SAR. It was organized to provide a platform to explore possibility of wide adoption of transitional pre-fabricated modular housing in Hong Kong. Under the leadership of Professor Alex Wai, Vice President (Research and Development) and Chairman of the Organizing Committee of the Forum, a total of 9 academic and researchers of the Faculty of Construction and Environment, a famous architect and a director of a social realty company presented on various issues about policies on land use, engineering and technical challenges as well as social developments associated with modular housing. The Forum was also hosted by Professor Alex Wai.

During the Opening Ceremony of the Forum, Professor Timothy Tong, President of the Hong Kong Polytechnic University, welcomed about 100 delegates attending the event. Then, Dr. Raymond So, Under Secretary of the Transport and Housing Bureau gave an Opening Speech, and he emphasized various imminent needs of Hong Kong to find ways to ease social problems related to shortage of housing.

Dr. Raymond So addressing to delegates during the Opening Ceremony of the Forum.

Prof. Tong explained to the delegates about fundamental functions of modular housing.

Programme of the Forum:

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Date:	3 November 2017 (Friday)
Time:	8:30am – 12:30pm
Venue:	Senate Room, 16/F, Li Ka Shing Tower, the Hong Kong Polytechnic University

Programme

8:30am	Registration
8:45am	Welcome Prof. Timothy W. Tong *The Hong Kong Polytechnic University*
8:50am	Opening Remarks Mr. Frank Chan (represented by Dr. Raymond So) *Transport and Housing Bureau, HKSARG*
8:55am	Policy, Planning and Management Prof. Eddie Hui, Prof. Edwin Chan & Prof. Geoffrey Shen *The Hong Kong Polytechnic University*
9:25am	Structural, Fire Resistance and Foundation Designs Prof. K F Chung, Prof. Asif Usmani & Dr. Andy Leung *The Hong Kong Polytechnic University*
9:55am	Q&A
10:15am	Networking Session
10:45am	Built Environment, Transport and Underground Utility Prof. C M Mak, Dr. Lilian Pun & Ir. Dr. Wallace Lai *The Hong Kong Polytechnic University*
11:15am	Adaptable City Mr. James Law *James Law Cybertecture*
11:30am	Q&A
11:50am	Pioneer New Housing Models for Different Low-income Groups: Light Be's Experience Mr. Ricky Yu *Light Be (Social Realty) Co. Ltd.*

12:05pm	HKCSS's Transitional Pre-fabricated Modular Housing Project Mr. H W Chua *The Hong Kong Council of Social Service*
12:10pm	Q&A
12:30pm	End of Seminar

Key messages of the presentations were summarized as follows:

- **Presentation 1**
  Government policy needed for modular housing
  Professor Eddie Hui, BRE

  Modular building structures have been successfully deployed in countries such as the UK, US, Netherlands, Singapore and Mainland China in the past ten years, and recently, it was suggested as a possible solution to the current housing crisis in Hong Kong. Nevertheless, several hurdles, such as availability of suitable land sites and potential conflicts with existing laws and building regulations, need to be addressed. There are also concerns with cost-benefit considerations of land use, impacts on infrastructure and environment. It is suggested to conduct a holistic review on existing regulations (e.g. Town Planning Ordinance, Buildings Ordinances). It is also necessary to establish regulations that apply specifically to transitional pre-fabricated modular housing in Hong Kong.

- **Presentation 2**
  Planning and regulations for modular housing
  Professor Edwin Chan, BRE

  With advance of pre-fabrication and modular design techniques, the construction process of modular housing is highly efficient. However, stringent planning and building regulations remain the main hurdle for these developments. The role of these transitional structures, i.e. whether they will be classified as temporary or permanent buildings, should be carefully considered, as this can have implications to possible exemptions of certain regulations, which facilitate their construction in Hong Kong. For fast provision of modular housing, many building regulations need to be revised to accommodate their construction, e.g. Building laws for temporary buildings (BP Reg 50) or contractor sheds (BPReg53) impose very stringent requirements.

- **Presentation 3**
  Construction management of modular housing
  Professor Geoffrey Shen, BRE

  The supply chain management of modular housing is essential to its feasibility in Hong Kong. It is proposed to use smart objects and advanced information and communication technologies to support smart decision-making in the whole life cycle of modular housing units, from design, through production and construction, to use and demolition. These include Building Information Modelling (BIM) Platform enhanced with Radio-frequency Identification (RFID) techniques for various pre-fabrication and construction procedures. Such technologies enable real-time monitoring of logistics and construction processes, improving communication among various stakeholders.

- **Presentation 4**
  Structural design of modular steel framed housing
  Professor K.F. Chung, CEE

  Modular construction using cold-formed steel technology has been developed for 20 years in the U.K. and the European Communities. From the structural engineering perspective, construction of 20 to 30-storey modular housing structures is readily achievable without any major issues. As a leading institute for sustainable infrastructure development and modern steel construction, the Chinese National Engineering Research Centre (CNERC) for Steel Construction (Hong Kong Branch) at PolyU is well positioned to develop and support prototypes as well as final products for modular housing in Hong Kong. It is also necessary to have expandable and demountable pre-fabricated pre-installed volumetric housing units with advanced jointing, and to integrate various constructional elements to satisfy building regulations for structural adequacy, fire safety, energy efficiency and acoustic insulation.

- **Presentation 5**
  Fire resistance design for modular housing blocks
  Professor Asif Usmani, BSE

  Although tools for computer simulations and experimental studies are well developed for fire resistance in buildings, such research is limited for modular housing units. Physical fire tests on prototype modular units will be very useful in establishing performance-based criteria for fire safety assessments pertaining to the local needs and conditions. The following fire safety assessment should be carried out for prototype housing units in order to facilitate approval from regulatory agents in Hong Kong:
  a) an estimation of a likely fire hazard intensity;
  b) a CFD based fire scenario simulation followed by full scale fire tests;
  c) post-test simulations of fire and structural responses; and
  d) optimization of passive and active fire safety measures.

- **Presentation 6**
  Foundation design of modular housing blocks
  Dr. Andy Leung, CEE

  Modular steel framed housing units are significantly lighter than those conventional reinforced concrete structures. This reduces foundation requirements, and opens up opportunities to better utilize areas where conventional housing developments are not feasible to be built. For example, adverse geologic conditions prevail in a number of Scheduled Areas (e.g. Northwest New Territories) or Designated Areas (e.g. Tung Chung) in Hong Kong. The lightness of modular units makes them possible solutions for these sites.

- **Presentation 7**
  Built environment of modular housing systems
  Professor C.M. Mak, BSE

  Owing to the characteristics of being small in sizes and light in self-weights, and the requirement of air conditioning, the built environment in potential modular housing blocks in Hong Kong should focus on acoustic comfort, thermal insulation and ventilation. Existing design methodology and installation techniques should be optimized to cater for specific conditions of these modular housing units, such as luminous comfort, sound insulation using lightweight materials, and air-conditioning during hot and humid summers.

- **Presentation 8**
  Transport for modular housing blocks
  Dr. Lilian Pun, LSGI

  Pre-fabricated modular housing provides a potential solution to ease housing problems in Hong Kong, and a well-established, easily-accessible public transportation system is essential to integration of these housing blocks to the society. Informatics technologies also help enhance accessibility to transportation system. Research on public transport and the HKeTransport system can assist determination of a suitable site for building these housing blocks, particularly with regard to nearby public transport stops, and connections to different parts of Hong Kong.

- **Presentation 9**
  Underground utility for modular housing blocks
  Dr. Wallace Lai, LSGI

  Design, construction, operation and maintenance (O&M) of common ducts and pipelines for utilities (e.g. power, telecommunication, water, sewer and gases) should be standardized amongst various utility stakeholders. A Building Information Model and O&M menu should be specifically developed for modular housing blocks. Latest sensing technologies also allow continuous health monitoring of these ducts and pipelines to minimize risks of hazards or disruption of service.

- **Presentation 10**
  Adaptable City
  Mr James Law, James Law Cybertecture

  Transitional pre-fabricated modular housing is essential an element of an ‘adaptable city’ as these modular housing units can be assembled and dismantled at various sites efficiently, depending on the needs of the society at different times. A unique innovation for modular housing in Hong Kong is the ongoing ‘O-POD’ project, where concrete pipe sections of 3 m diameter are converted into modular living spaces, turning redundant construction materials into reusable and adaptable housing units. A similar concept had been demonstrated through the award-winning ‘AL-POD’ project, where lightweight aluminium pod houses are fitted with interiors for self-sustainable use. These modular units

can be easily transported and readily set up on typical sites, and they may also be stacked up to become high-rise structures.

- **Presentation 11**
  Foreseeable Challenges in using Pre-fabricated Modular Housing as Transitional Housing
  Mr Ricky Yu, Light Be (Social Realty) Co. Ltd.

  Two recent projects of *Light Be (Social Realty) Co. Ltd.* are introduced.

  The first project is the 'Light Home' project which aims to cater for transitional housing needs of responsible tenants. By matching these tenants with landlords who, with a sense of social responsibility, are willing to compromise parts of their rental income for a period of 2 to 3 years, these tenants are able to restore their family lives, and make good progress to their livelihood.

  The second project is the 'Empowerment Housing' project which involves revitalizing a 50-year old, abandoned textile factory staff quarter building in Sham Tseng into a modern residential block in less than 2 years. The residential block provides more than 40 units to needy families.