**For discussion**
**on 23 April 2024**

**Legislative Council Panel on Development**

**Adoption of Advanced Construction Technologies**

## PURPOSE

This paper briefs Members on the strategies and initiatives rolled out by the Government to promote adoption of advanced construction technologies (including Modular Integrated Construction (MiC)) in the construction industry.

## BACKGROUND

2. The Government of the Hong Kong Special Administrative Region has been continuously investing in capital works projects to improve people's quality of life, enhance Hong Kong's long-term competitiveness and promote economic development. In the next few years, the capital works expenditure of the Government is expected to be about $90 billion per annum on average. This figure represents an increase of about 17% over the average annual expenditure of $76 billion in the last five years, which demonstrates the Government's continued investment for capital works expenditure. However, as the construction volume continues to grow, the construction industry also encounters many challenges, including the ageing workforce, manpower shortage, high construction cost, declining productivity and site safety performance. In view of this, the Development Bureau (DEVB) has been adopting a multi-pronged approach, and has implemented "Construction 2.0" since 2018, to promote adoption of advanced construction technologies and drive industry enhancement in collaboration with the industry.

## APPLICATION OF INNOVATIVE TECHNOLOGIES

3. Over the past few years, the DEVB has rolled out a number of strategies and measures, with subsidies provided to the industry including small and medium enterprises through the Construction Innovation and Technology Fund (CITF), to encourage the industry to actively adopt advanced construction technologies such as construction digitalisation, applied research and development and MiC. Also, in order to promote and facilitate the adoption and application of advanced construction technologies in the industry, the Construction Industry Council (CIC) has been fostering close communication and

co-operation between the Government and industry stakeholders, while providing training and support to industry practitioners.

*Digitalisation of Construction Industry*

4. We are driving digitalisation of the construction industry in full swing, and have established an inter-departmental task force in the DEVB to lead and drive the application of digital technology in public works projects. Complemented by the Building Information Modelling (BIM) technology, we have developed different digital systems throughout the whole project life cycle from planning and design, construction, to operation and maintenance, an example of which is the Digital Works Supervision System (DWSS) used across the board at the construction stage. Through the established inter-departmental Integrated Capital Works Platform (iCWP), data of various projects at different stages are collected and consolidated for project management team to grasp their real-time progress and performance. More comprehensive data consolidation and analyses can then be conducted to further enhance the overall performance and management efficiency of the entire Capital Works Programme (CWP).

5. On promotion of BIM, with effect from January 2018, public works projects with project estimates exceeding $30 million are required to use BIM for their design and construction. At present, about 700 consultancy and works contracts with a total value of about $300 billion have adopted BIM. In order to continue to enhance the effectiveness of BIM application in works projects, we are now piloting to incorporate BIM models in tender documents of public works projects, forming part of the works contracts. We plan to extend such initiative to all public works projects within this year. Compared to the current practice which BIM model is only used as a reference in tender documents, this arrangement imposes more binding obligations on the contractors. In addition, to encourage private sector projects to adopt BIM technology, the Government works hand in hand with the CIC to provide various courses, set standards and organise relevant seminars for the industry, and provide subsidies to the industry through the CITF. Furthermore, we promulgated the Roadmap for the Adoption of BIM for Building Plan Preparation and Submission at the end of last year. Major directions include: (1) the public sector[1] taking lead as pioneer to extend the adoption of BIM to private sector projects of different scales on a gradual basis; (2) aligning the relevant standards and practices; (3) providing further incentives to and support to the industry; and (4) proposed mandatory full adoption of BIM by the private sector for preparation and submission of building plans by 2029.

6. On adoption of the DWSS, more than 160 public works contracts with a

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[1] Public bodies such as the Urban Renewal Authority, Hong Kong Housing Society and MTR Corporation Limited.

total value of $200 billion have adopted DWSS since its implementation in April 2020. Various stakeholders of the construction industry give positive feedback on DWSS and affirm that it can enhance construction efficiency, reduce paperwork and the risk of recording errors. We promulgated a new policy in February 2023 to enhance DWSS, and required DWSS to connect to and consolidate data from various types of smart site application, including the data from the Internet of Things (IoT), remote monitoring and artificial intelligence (AI) system, etc., with a view to uplifting the management performance of public works projects. Apart from public works projects, the Government also encourages adoption of DWSS in private sector projects and provides subsidies through the CITF.

*Applied research and development*

7. Applied research and development (R&D) is an integral part in the course of promoting innovation in the construction industry. We have set up a task force to steer and co-ordinate the scientific research of various works departments, and collaborate with universities and research institutions on a regular basis to identify R&D initiatives, which are highly effective in enhancing the productivity, cost performance, construction efficiency, and suitable for wide adoption in other works projects, for piloting in public works projects. This enables the application and establishment of the research results for new construction materials and innovative construction technologies. Relevant standards and guidelines are also laid down to facilitate adoption in other public and private sector projects, with a view to benefiting the entire industry. Currently, there are over ten applied R&D items being piloted in more than 50 public works projects. These include the use of Grade S690 high-strength steel[4] and the increase in allowable bearing capacity for pile foundations[5].

8. As mentioned in the 2024-25 Budget, the Building Testing and Research Institute, which is led by the Government, will be established within the year to promote wider adoption of innovative technologies across the industry. Preparatory work for the establishment of the Institute is in progress and we plan to begin its operation within this year. The Institute will conduct applied R&D activities for innovative materials, construction methods and technologies, as well as to devise standards, conduct testing and provide accreditation to spearhead innovation in the construction industry and attract R&D talent to Hong Kong.

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[4] Successful cases include: the double-arch steel design of the Cross Bay Link, Tseung Kwan O is the first project using Grade S690 high-strength steel in Hong Kong. The use of high-strength steel can reduce half of the steel required and save 30% of material cost. In addition, the off-site prefabrication of 90% of the components not only reduces carbon emission by 20%, but also greatly lowers the risk of on-site accident.

[5] The increase in the allowable bearing capacity for pile foundations from 5 000 kPa to 7 000 kPa can reduce the number of piles required effectively, thereby enhancing the cost effectiveness of foundation design.

9. As Hong Kong has years of knowledge and experience in applying international construction standards, the Building Testing and Research Institute will capitalise on our unique advantages to provide a platform for our country's standards for construction technologies and related products to align with those in the international market, facilitating these construction technologies and related products to go global. At the same time, through collaboration with government authorities in the Greater Bay Area (GBA), we will foster interconnectivity and integrated development of the GBA, and help build the "GBA Standards" brand by developing standards for different domains of construction, such as material, design and construction method, in the GBA. We will enhance the quality of construction products and services, and work together to develop the GBA into one of the regions with the most advanced construction technologies in the country.

*Modular Integrated Construction (MiC)*

10. To enhance the industry's productivity and cost effectiveness, the Government has been actively promoting the adoption of high productivity construction methods such as MiC. MiC, which is an important breakthrough, transfers the conventional on-site construction processes to factories. It adopts the concept of "factory assembly followed by on-site installation" whereby freestanding modules, including structural frames, interior fitting-outs and mechanical and electrical installations, are manufactured off-site in factories and then transported to sites for assembly upon completion. This innovative construction method improves the project quality and construction efficiency, shortens construction time, reduces construction waste, lowers demand for on-site labour, improves site safety and better protects the neighbourhood.

11. The Government has been leading by example and piloting MiC to enhance the industry's productivity and cost effectiveness, with a view to enhancing speed, quantity, efficiency and quality. According to the University of Hong Kong's study on MiC pilot projects, the adoption of MiC can reduce construction time by about 30% to 50%, uplift on-site productivity by 100% to 400%, save construction costs by at least 10% and has better performance in terms of workmanship, environmental protection and safety compared to traditional construction methods.

12. A number of public and non-governmental organisations, including the Hong Kong Housing Authority, Hong Kong Housing Society, Urban Renewal Authority and Hospital Authority, have started the adoption or trial of MiC. At present, MiC has been or will be adopted in over 70 projects in both private and public sectors. We are reviewing the requirement of adopting MiC in buildings specified under the Government's CWP, and will update the relevant technical circular to promote MiC more effectively.

13. As for private sector, MiC has been adopted in the Tonkin Street Redevelopment Project at Sham Shui Po under construction and the property development project of the Tung Chung Traction Substation under planning, etc. Although there are not many private development projects using MiC at this moment, with the successful implementation in government and public projects, we expect that more developers will be encouraged to accept and adopt MiC.

## STRENGTHENING THE MIC SUPPLY CHAIN

14. The Chief Executive's 2023 Policy Address announced further promoting MiC by formulating and implementing a series of measures to strengthen the supply chain of MiC modules, in order to enhance collaboration with the supply chain in the GBA; and by promoting the adoption of high productivity construction such as MiC by the private sector, with a view to reducing labour demand and expediting housing supply. The 2024-25 Budget also announced developing MiC as one of the industries in the GBA that enjoy clear advantages, and examining the feasibility of investing in the MiC supply chain.

15. To this end, we commenced the study of formulating measures to strengthen the supply chain of the MiC modules last year. The scope of the study covers areas such as the manufacturing, transportation, storage and accreditation of MiC modules, as well as ways to resolve challenges regarding import and export transportation, logistics, approval processes, taxation, etc. The short- and long-term measures recommended by the study are as follows:

*Short-term measures (proposed for implementation in 2024-25)*

(a) Promulgate periodically the annual overall demand

(b) Adopt direct procurement of modules

(c) Implement a Manufacturer Certification Scheme

(d) Promote wider adoption of MiC

(e) Foster collaboration with the Mainland

(f) Facilitate cross-boundary clearance of modules

(g) Further encourage technological innovation

(h) Strengthen training

*Long-term measures (proposed for implementation in the coming two to three years)*

(a) Assess the development of the ecosystem periodically

(b) Examine the feasibility of investing in the supply chain

(c) Establish a list of approved MiC suppliers for public works

(d) Reserve land for the development of MiC industry

Details of the measures are at **Annex 1**.

16. We believe that the above measures will strengthen the MiC supply chain, foster collaboration with the GBA and promote industrialisation of MiC. Leveraging its close connection with the world and experience in the application of international construction standards, Hong Kong can support the GBA in developing into a MiC technology centre, drive the innovative development of MiC in the GBA as a strategic industry and subsequently expand it to overseas markets.

## ADVICE SOUGHT

17. Members are invited to note and comment on the content of this paper.

**Development Bureau**
**April 2024**

**Annex 1**

## Measures for strengthening the MiC supply chain

*Short-term measures (proposed for implementation in 2024-25)*

(a) Promulgate periodically the annual overall demand

We will promulgate periodically the annual overall Modular Integrated Construction (MiC) demand every year to outline the upcoming MiC projects anticipated in the coming five years for the industry's reference, with a view to assisting the industry in making advance investment in the MiC production facilities and planning for manufacturing capacity to enhance productivity and meet project requirements.

(b) Adopt direct procurement of modules

In traditional contract arrangment, main contractors are responsible for procurement of MiC modules, hence they will impose a risk premium in the project, leading to an increase in project cost. To lower the risk of the main contractors, the Government will directly procure MiC modules from manufacturers for appropriate projects to enhance cost effectiveness of projects. The Architectural Services Department identified the second batch of Light Public Housing as pilot projects to invite tenders directly for procurement of MiC modules in the second quarter of this year, and is considering implementing such procurement arrangement in other public works projects such as schools, staff quarters, etc.

(c) Implement a Manufacturer Certification Scheme

We engaged the Hong Kong Quality Assurance Agency (HKQAA) to develop the MiC Manufacturer Certification Scheme to encourage MiC manufacturers to adopt quality management practices and offer quality assurance during the manufacturing and delivery processes, in order to ensure the quality of MiC production process and products. We will arrange several briefing sessions in Q3 2024, and target to fully implement the certification scheme in Q4 2024.

(d) Promote wider adoption of MiC

To encourage private developers to widely adopt high productivity

construction methods such as MiC, the Government has introduced a series of measures including granting a 10% concession for MiC floor area in the calculation of gross floor area and site coverage, and a 4% relaxation of storey height restriction for MiC floors, providing subsidies through the CITF, and setting up the Modular Integrated Construction Dedicated Section to provide technical support to the industry, strengthen communication and collaboration with relevant departments, and facilitate project approvals. These measures will further promote the adoption of MiC by the private sector.

As regards projects in the public sector, we will update the technical circular on MiC to promote wider adoption of this technology in projects under the CWP, such as using MiC in more building categories such as data centres. Also, we will facilitate adoption of MiC by the industry through design optimisation and standardisation.

(e) Promote collaboration with the Mainland

The DEVB is proactively carrying out exchanges and collaboration with the Guangdong Provincial Government to strengthen mutual co-operation in the areas of implementation and regulations, formulate conducive strategies for the MiC supply chain, with a view to establishing a comprehensive ecosystem for the industry.

On 26 March 2024, the DEVB signed a letter of intent with the Department of Housing and Urban-Rural Development of Guangdong Province (DHURDGP) to deepen the co-operation and exchanges in the areas of construction and related engineering services, including promoting the collaborative development of MiC in the Guangdong-Hong Kong-Macau GBA, providing steer to the industry to build a Guangdong-Hong Kong MiC industry chain, fostering the complementarities between the construction sector in Guangdong and Hong Kong and upgrading of the industry. We will further discuss the relevant details with the DHURDGP, determine the content of co-operation and draw up the implementation timetable for relevant measures.

In addition, the DEVB, with the support from the DHURDGP and the People's Government of Huizhou Municipality, held the MiC Supply

Chain Conference in Huizhou on 23 January 2024, attracting some 300 participants from the construction sector in Guangdong, Hong Kong and Macao. The event aimed to promote the adoption of MiC among the GBA cities. We will continue to organise regular MiC-related activities to foster communication and co-operation with manufacturers in the GBA, with a view to establishing a reliable MiC supply chain to support MiC development in Hong Kong.

(f) Facilitate cross-boundary clearance of modules

The current processing trade and export tax rebate mechanisms are beneficial for the MiC manufacturing in the GBA. In addition, MiC manufacturers enrolled with the Mainland/ Hong Kong Authorized Economic Operator Programme could enjoy the benefits on custom clearance, including prioritized customs clearance and reduced customs inspection. The Government will provide the industry with relevant information and guidelines to enable them to have a better understanding on taxation and cross-boundary delivery of MiC modules.

(g) Further encourage technological innovation

We will review the CITF funding framework and examine the funding scope of consultants and contractors of MiC projects to further encourage them to innovate in MiC technologies, including innovative design, application in high-rise buildings, productivity enhancement, built quality enhancement, site safety improvement and environmental performance enhancement.

(h) Strengthen training

We will closely collaborate with the CIC to assess the local resources related to MiC, including professionals, construction workers and equipment, etc., in order to timely arrange necessary actions. At the same time, we will also cooperate with the Hong Kong Institute of Construction and relevant institutions to develop appropriate training programme in driving the professionalisation of MiC, with a view to uplifting the professional standards and efficiency of the industry.

**Annex 1**

*Long-term measures (proposed for implementation in the coming two to three years)*

(a) Assess the development of the ecosystem periodically

We will regularly assess (every three years as currently proposed) the latest development of MiC and the situations of related resources. The scope of assessment includes the demand for MiC modules, production capacity of the MiC manufacturing base in the GBA.

(b) Examine the feasibility of investing in the supply chain

We will engage consultants and universities to commence study on investing in the MiC supply chain and expect to finish the work within this year. The scope of the study includes exploring investment opportunities in the MiC supply chain, studying investment risks and returns, and the benefits that the form and scale of investment would bring to MiC industry development and the economy as a whole.

(c) Establish a list of approved MiC suppliers for public works

After the implementation of MiC Manufacturer Certification Scheme, we will establish a list of MiC suppliers under the lists of public works contractors to streamline the MiC module procurement process of public works and ensure the quality standards for modules.

(d) Reserve land for the development of MiC industry

We will reserve 15 hectares of lands at Northern Metropolis and explore further land development at Lung Kwu Tan Reclamation mainly for testing and certifications, technical research and developments, production and storage of MiC. These will support the export of MiC modules to overseas, facilitating the national Belt and Road development, and developing MiC as one of the industries in the Hong Kong that enjoy clear advantages.