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For discussion on
27 November 2024

Subcommittee to Study the Effectiveness, Costs and Management of Public Works Projects

Measures to lower the costs of public works projects

Purpose

This paper briefs Members on the tendering mechanism and procurement models for public works contracts, the directions for measures to lower the costs of public works projects, Mainland and advanced overseas countries' experience in the application of advanced construction technologies, streamlining project design, controlling project costs, as well as their experience regarding public works management systems.

The strategic study

2. The Development Bureau (DEVB) commenced a strategic study on construction costs (the Strategic Study) in the fourth quarter last year with a view to identifying the major reasons for the high construction costs in Hong Kong, and formulating the detailed way forward for reducing the costs of public works projects. At the meetings of the Subcommittee to Study the Effectiveness, Costs and Management of Public Works Projects held on 19 July and 24 September 2024, we gave Members an overview of the construction costs in Hong Kong, and briefed them on the prevailing cost management measures and the reasons for the high construction costs in Hong Kong. For details, please refer to LC Paper No. CB(1)1062/2024(02) and CB(1)1283/2024(01).

3. The Strategic Study has made reference to different project types of Hong Kong in the past and the costs of different project types of other major more

developed cities[1] to have an in-depth understanding of the fundamentals of construction costs[2], and exchanged views with the stakeholders of the industry. Taking into account the importance and prevalence of the relevant factors, we have identified five major reasons for high construction costs in Hong Kong, including (1) labour cost; (2) contract risk premium on construction materials and equipment; (3) design standards and requirements; (4) approval process; and (5) project complexity.

4. In view of the above major reasons, the Strategic Study has reviewed the existing mechanism for delivery of public works projects in Hong Kong, including the tendering mechanism, procurement models, project design, management and approval process, etc. Having made reference to Mainland and overseas experience in the delivery of works projects, we have identified the following four major directions for measures to lower the construction costs:

- optimising the project procurement model to reduce risk premium
- reviewing the design standards and requirements to increase cost effectiveness
- applying advanced technologies and construction methods to uplift productivity
- streamlining the approval process to boost work efficiency

Tendering mechanism and procurement models of public works contracts

Tendering mechanism

5. We have been adopting the principles of "achieving best value for money" and "maintaining open and fair competition" for the procurement of public works contracts with clear guidelines and procedures set out for tender invitations and evaluations in order to select the most suitable contractors/consultants.

1 The regions for comparison under the Strategic Study include London, Singapore, Guangzhou and Shenzhen.

2 The construction costs of Hong Kong public works projects can be divided into four categories, including (1) construction labour cost (accounting for about 30% to 40%), (2) construction material and equipment cost (accounting for about 25% to 35%), (3) machinery cost (accounting for about 10% to 20%), and (4) risk premium arising from project complexity, as well as operational costs and profits of contractors, etc. (accounting for about 10% to 30%).

6. To ensure the quality and capability of the contractors and consultants undertaking public works projects and consultancy services, the Government has formulated the approved lists of contractors[3] and the lists of consultants[4]. The lists are divided into different groups according to various company sizes and works categories. To prevent vicious competition or monopoly, the Government has set tender limits for different groups such that large, medium and small contractors/consultants would tender for contracts with different levels of contract value separately. Local, Mainland or overseas contractors/consultants who meet the admission requirements may apply for inclusion in the lists.

7. Generally, a "two-envelope two-stage" tender approach is adopted by the Government. Tenderers are required to submit technical proposals and price proposals separately to the relevant departments. During tender evaluation, we will first assess tenderers' technical competence and past performance, and then consider their tender prices. Finally, a combined score for each tender will be derived. In other words, "the lowest bid wins" is not the guiding principle for the tender evaluation system. Depending on the complexity of the project, in public works tenders and consultancy tenders, the weightings of a tender's score on technical aspect against the overall score are 40 per cent to 50 per cent and 63 per cent to 72 per cent respectively. When examining the tender with the highest combined score, we will carefully consider whether its tender price is reasonable. Only after the tender price is confirmed to be reasonable will the tender concerned be accepted. To prevent tenderers from winning the bids through submitting unreasonably low bids, and as a result affecting works quality, we have put in place a mechanism to exclude tenders that are considered to be unreasonably low bids. Such tenders will not be accepted by the Government even if they have obtained the highest combined score. In the past 3 years, a total of 12 public works tenders and 7 consultancy tenders which had obtained the highest combined score were not accepted as they were considered to be unreasonably low bids.

3 The approved lists of contractors include the List of Approved Contractors for Public Works and the List of Approved Suppliers of Materials and Specialist Contractors for Public Works.

4 The lists of consultants include the List of Consultants of the Engineering and Associated Consultants Selection Board (EACSB) and the List of Consultants of the Architectural and Associated Consultants Selection Board (AACSB).

Procurement models

8. There are mainly three procurement models for public works, including Design-Bid-Build (DBB), Design & Build (D&B) and Design-Build-Operate(DBO). In the implementation of public works, the Government will adopt different procurement models having regard to the specific needs and constraints of a project, so as to maximise cost-effectiveness.

9. DBB model is a more traditional project delivery approach, its characteristic is to deliver a project in the sequence of "design-tender-build", in which procurement of consultants and contractors would be conducted separately. In short, under the "design first and then build" DBB model, the project owner will discuss and finalise the detailed project requirements in collaboration with the engineering/architectural consultant responsible for the design, and then the engineering/architectural consultant will complete the detailed design according to the requirements and invite tenders afterwards. Hence, the project owner will have higher control over the project details. The DBB model is applicable to most traditional works projects, including road works, site formation works, drainage works, etc. As to D&B model, the detailed design and construction works of a project will be procured at the same time and undertaken by the contractor. The model is applicable to works projects with greater complexity and the contractor should have the expertise and experience in relevant construction technologies, provide the most effective detailed design, construction method and maintenance arrangement based on the project requirements and design parameters, etc., and undertake the construction works of the project. Examples adopting D&B model include government buildings of greater complexity, complicated cavern projects and construction of trunk roads, etc. Under the DBO model, apart from designing and constructing relevant project works, the winning bidder will also be responsible for the operation of the completed works within a specified period upon commissioning of the works. Incorporating operational requirements into the design will facilitate the smooth operation of the completed works as well as their subsequent management and maintenance. Examples adopting DBO model include landfill extension projects, refuse transfer stations and district cooling systems, etc.

Adoption of the New Engineering Contract (NEC) form

10. In 2009, the DEVB introduced the NEC form in public works contracts

with a view to advocating the spirit of collaborative partnering and bringing the project team together to tackle difficulties, which would be conducive to the smooth implementation of the project.

11. The conventional form of the contract previously adopted in public works, focusing more on the obligations and responsibilities of the two contracting parties, often put them in adversarial positions. Once problems or foreseeable risks occurred during the construction period, both parties tended to focus on identifying the responsible party, and hence more disputes arose in the process. As a result, the problem was not dealt with promptly and it might take more time or even cost to complete the works, which was not conducive to the smooth implementation of the project. In contrast, the NEC embraces a collaborative culture, through the contract terms of mutual trust and collaboration, as well as the mechanisms such as early warning and compensation events, etc. specified in the contract, thereby fostering the building of a mutual cooperation/trust partnering relationship between the contracting parties. Together with managing risk jointly by the contracting parties, the project management performance and its cost-effectiveness will be enhanced as a result. Based on statistical analysis, the actual construction period of NEC contracts is on average about 10% shorter than conventional contracts. There is also a time saving of over 30% on average for finalising the NEC contract accounts as compared with conventional contracts. As the construction period is shortened, the relevant expenditure of the works projects, including contract preliminaries, remuneration of resident site staff, administrative expenditure for contract surveillance, etc., will also be reduced accordingly.

12. At present, all public works contracts and consultancies adopt the NEC form, which is conducive to the delivery of projects and can enhance project management performance and cost-effectiveness.

Enhancement measures for the tendering mechanism and procurement models in recent years

13. In recent years, to raise efficiency and lower construction costs, we have launched a series of enhancement measures for the tendering system and procurement models for public works projects. These measures include:

Adoption of the e-Tendering System

14. Starting from July and October 2024 respectively, we have fully adopted the e-Tendering System for the procurement of public works contracts and consultancies to handle the tender exercises for these contracts. Providing a one-stop platform, the system allows contractors and consultants to view the forecast of tenders, receive notices of invitation to tender, download tender documents, and submit tenders. Tender results will also be announced on the system. As the system operates round-the-clock, it allows more flexibility for submitting tenders. Also, there is no need for tenderers to print out a large number of tender documents, which will help reduce tender costs and shorten the time of preparation. In addition, the system has standardised and streamlined the tender procedures of various departments. The manpower and time required for the delivery of paper tender documents are also saved. All these will expedite the process of tender evaluation.

Putting in place a bonus score system in the tendering mechanism

15. The number of large-scale works projects has been increasing in recent years. In order to enhance market competitiveness and enable small and medium-sized companies to participate in the large-scale works projects[5], we have introduced a bonus score system in the tendering mechanism. If large contractors bid for a contract in partnership with small and medium-sized companies by way of joint venture, additional bonus score will be given to the tenders concerned; On the other hand, if large consultants bid for a contract in partnership with small and medium-sized companies by way of joint venture or subcontracting, additional bonus score will be given to the tenders concerned This can optimise the use of manpower resources in the market to meet the large manpower demand for future public works projects, and avoid market monopolisation by large contractors or consultants so as not to affect the competitiveness of the returned tender prices. Since 2023, there are 25 public works contracts that adopted the system, and 21 of which were awarded to large contractors who formed joint venture with small and medium-sized companies. On the other hand, there are 25 consultancies that adopted the system and 22 of which were awarded to large consultants who formed partnership with small and medium-sized companies by way of subcontracting. The statistics indicate that

5 For the public works projects with lump sum value more than HK$400M and consultancy agreement with lump sum value more than HK$15M.

the measure is promising.

Introducing a reward mechanism into public works projects

16. We introduce a reward mechanism into suitable public works projects[6] to encourage consultants and contractors to actively and jointly explore various cost-effective measures with a view to reducing project costs after commencement of contracts. For example, enhancing the design or construction method based on the actual site conditions. According to the mechanism, if consultants and contractors can successfully implement proposals that can effectively achieve cost saving, the consultants can receive additional bonus, and the contractor can also share the amount of cost saving with the government, thereby achieving a win-win situation for all three parties.

Introducing a new provision of "innovation and technology" into NEC contracts

17. We introduce a new provision of "X30 - Innovation and Technology" into NEC contracts. This provision establishes a comprehensive and specified contract mechanism, and also clear policy guideline, to encourage both contracting parties to actively initiate, study and implement appropriate innovative and advanced technology proposals, with a view to enhancing project performance, including site safety, supervision efficiency, energy saving and decarbonisation, etc. We hope to encourage various contracting parties to actively adopt new technologies and innovative methods through the new provision, thereby uplifting productivity and lowering project costs.

Drawing on experience of Mainland and advanced overseas countries

18. The Strategic Study has compared the costs of similar projects among Hong Kong, the Mainland and advanced overseas regions or countries[7], and made reference to their experience in the application of advanced construction technologies, streamlining of project design, project cost control and public works management system, with a view to drawing lessons from their success, thereby optimising the directions for measures to lower construction costs.

6 For the public works projects with lump sum value more than HK$400M.

7 For details, please refer to the supplementary document submitted to the Subcommittee to Study the Effectiveness, Costs and Management of Public Works Projects of Legislative Council by the Government on 25 November 2024.

19. On the application of advanced construction technologies, according to the Strategic Study, promoting digitialisation of the public works projects to enhance management efficiency of works projects can effectively uplift productivity. At present, various innovative construction materials, technologies, machinery, etc. are used in the Mainland and advanced overseas countries to uplift productivity, cost effectiveness and site safety performance. For example, the Infrastructure and Projects Authority (IPA) of the United Kingdom (UK) has analysed works performance using big data, which enables timely intervention of potential problems by senior project management and enhances project performance. Meanwhile, with mature technological development in the Mainland, works projects also make use of advanced technologies and construction methods[8] to optimise project design, reduce paperwork, thereby improving construction efficiency.

20. On public works contracts, the Government has adopted the Digital Works Supervision System (DWSS) across the board at the construction stage. An inter-departmental Integrated Capital Works Platform (iCWP) has been established to consolidate data of all public works projects. Artificial intelligence technology is further applied to conduct big data analysis to review project performance in terms of cost and progress, so as to enhance management efficiency and uplift productivity. We also work with the newly established Building Technology Research Institute (BTRi) to strengthen the application of advanced construction technologies. For example, the BTRi is working with the Architectural Services Department to introduce the use of "remote tower crane system" developed by the Mainland in a public works project for the first time, after taking into account the Labour Department's advice regarding the legislation on occupational health and safety. As the time required for operators to climb up and down can be reduced by controlling the tower crane remotely from the ground, efficiency and productivity can be increased. Also, the working environment can be improved and site safety enhanced.

21. On streamlining project design, coupled with modular construction method, standard design is adopted in the new hospital project of the UK[9] to expedite construction. The public housing flats of Singapore also adopt such

8 In recent years, the Mainland has actively adopted technologies such as artificial intelligence and big data in the construction sector to optimise project designs and scrutinise works plans.

9 The new hospital project of the UK covers up to 40 major hospitals with the project cost estimated at 20 billion pounds.

standard and modular construction method to enhance construction efficiency and productivity effectively. In Hong Kong, public works projects encourage optimisation of project design in accordance with the principle of "fitness-for-purpose and no frills" at the design stage. In recent years, we have proactively promoted Modular Integrated Construction and Multi-trade Integrated Mechanical, Electrical and Plumbing. Such methods adopt standard design, complemented by the mode of modern manufacturing, to complete labour-intensive processes in off-site prefabrication yards before transporting the modules for on-site assembly, with a view to enhancing overall productivity and cost effectiveness.

22. On public works management system and cost control, according to the Strategic Study, many advanced countries have put in place a robust approval mechanism to monitor public works management. These countries have also established an independent approval authority for third-party review. For example, the Centre for Public Project Management (CP2M) in Singapore, the Infrastructure and Projects Authority (IPA) in the UK and the Office of Projects Victoria (OPV) in Australia[10] have been established to uphold the performance of public works projects and enhance project cost control, thereby making more effective use of public resources.

23. In Hong Kong, the Project Strategy and Governance Office (PSGO) is responsible for project cost surveillance and uplifting of performance of public works projects through implementing comprehensive strategic initiatives, providing training and enhancing the cost management mindset and capability of project teams. The PSGO has also signed Memoranda of Understanding (MOU) with CP2M and IPA to uplift project performance and project delivery capability through joint government effort and inter-government exchange.

Industry stakeholders' suggestions

24. We have consulted various stakeholders of the construction industry (including consultants, contractors, subcontractors, labour unions, trade associations and institutions, as well as public organisations and various government departments) on measures related to the four directions mentioned in

10 In February 2023, the Office of Projects Victoria (OPV) in Australia was upgraded as a dedicated office under the Department of Treasury and Finance (Victoria).

paragraph 4 above. By having an in-depth understanding of the challenges and difficulties faced by the industry at different stages, we can explore measures to reduce construction costs.

Direction for enhancing the procurement models

25. Under the Strategic Study, the experiences of the Mainland and advanced overseas countries regarding the tendering mechanism and procurement models for public works contracts, have been consolidated. We have also exchanged views with the industry to look into the adoption of innovative project procurement model in suitable public works contracts. We have launched pilot plans for individual innovative procurement models, and will evaluate the effectiveness and enhancement measures with the approach of launching initiatives once they are ready.

Adoption of framework contract procurement model in suitable public works contracts

26. Framework contract procurement model has been widely adopted in countries such as the UK and the United States of America. Under such model, the Government can enter into a framework contract with various service providers (such as contractors, consultants and suppliers) to facilitate the issue of instructions for procuring relevant works projects, services or goods in the future. Unlike fixed-term contracts, where a single contractor is responsible for specific projects within a defined period, the framework contract allows the Government to establish framework agreements with multiple contractors. Before issuing instructions, the Government can request technical proposals and quotations from each contractor, enabling the selection of the most suitable contractor for the works projects. Furthermore, the contractual period of a framework contract is about three to five years. With steady construction volume, service providers can make work plans in a more effective manner. Such procurement method can also streamline procurement processes and reduce procurement costs and time required so as to enhance work efficiency and reduce construction costs. We have taken the lead to pilot framework contract procurement model in ground investigation works with plans to evaluate its effectiveness by 2025 and consider its adoption for additional projects.

Adoption of Early Contractor Involvement procurement model in suitable public works contracts

27. In some works projects with greater complexity and stringent construction technical requirements, the design may have a direct implication on the construction methods to be adopted by contractors or the duration of the project. As regards the procurement arrangements for such works projects, we have started piloting Early Contractor Involvement (ECI) model in suitable public works contracts in recent years in addition to conventional models adopted in the past. In general, ECI model is to introduce contractors to early participate in the design work at an appropriate time during the design process, so as to utilize the contractors' construction experience on design and select the most cost-effective construction methods for the critical parts of the project. Though ECI model is similar to D&B model, ECI model enables the project owner to have higher control over the project details. Under the framework of ECI model, the contract will be divided into two stages, namely detailed design stage and construction stage. The contractor is required to complete the detailed design work within the time limit specified in the first stage before proceeding to the next stage. During detailed design stage, the entire project team (including project owner, consultant and contractor) will identify and propose potential risks of the project as early as possible so as to formulate the most cost-effective design and construction method, and reduce the risk of design modifications during construction stage, thereby achieving a better risk management. Subsequently, the contractor will be responsible for the construction works. Under ECI model, the contractor can select the most suitable design option and construction method for the project based on his expertise. This will help enhance the cost effectiveness and shorten the construction time of the project.

Adoption of direct procurement or central procurement model

28. The traditional subcontracting model of works with labour and materials inclusive, which has been practised in Hong Kong's construction sector for years, has led to high risk premium in construction material and equipment contracts. Drawing on Mainland and international experience, the Strategic Study reveals that the Mainland and overseas countries will actively manage the relevant supply chains when taking forward large-scale projects. It is of great importance to ensure the timely supply of construction materials and equipment in order to avoid shifting the risks to manufacturers/suppliers due to the

uncertainty on project implementation timetable. In view of this, the Strategic Study recommends that public works projects adopt direct procurement model, that is, the Government procures suitable major construction materials and equipment from manufacturers/ suppliers directly. With such model, the risk premium and transaction costs caused by "subcontracting with labour and materials inclusive", and the increase in procurement cost due to delay in the supply of construction materials and equipment as well as delay payment problems in the industry can be reduced.

29. The Government has piloted direct procurement model for suitable public works contracts. The integrated modules of Modular Integrated Construction (MiC) method in light public housing projects and the large mechanical and electrical equipment for wastewater treatment plant projects are examples of direct procurement. This approach reduces the risk premiums for construction components and equipment associated with general contractors or subcontractors. When using the direct procurement model, the Government will reserve the necessary amount for purchasing these components and equipment in the project estimate.

30. For suitable construction materials and components, we are actively exploring the adoption of a central procurement model. This procurement model can take advantage of bulk purchasing to enhance cost-effectiveness. At the same time, as the Government will have a good grasp of the timing of project implementation, it can manage the supply chain more efficiently and more directly. As such, manufacturers/suppliers can make planning according to the timing of demand for construction materials and equipment to ensure their timely supply.

31. The DEVB plans to study in detail the feasibility of purchasing suitable major construction materials and equipment through direct procurement or central procurement in 2025, such as integrated modules of MiC method and steel reinforcement. This will involve commencing the relevant studies, including the impact of procurement models on the market, the mode of operation, and its cost-effectiveness. Industry stakeholders will also be consulted to develop appropriate measures.

Review of directions of design standards and requirements

32. The design standards and requirements in Hong Kong have been developed with reference to international standards such as the British and European standards, and are tailored to local conditions. Considering the data in hand, our understanding of the objective environment, advances in construction technologies and the quality enhancement in materials and construction works, the Strategic Study points out that, without compromising construction quality, there is room to review and optimise design standards and requirements, with a view to reducing the demand for construction materials and shortening construction processes, thereby enhancing cost effectiveness.

Review of design standards and requirements

33. We have engaged the BTRi to review design standards and requirements. The BTRi will collaborate with local universities and make reference to Mainland and overseas building standards to formulate the work plan of reviewing and optimizing the building standards, starting from design loading requirements of buildings, without compromising overall building safety. The BTRi will also prioritize the review based on the prevalence and impact of different design standards. Additionally, the BTRi will review the specifications and standards for construction products and equipment to provide more cost-effective options for local projects. Subsequently, the BTRi will further review the design and requirements across various Government departments for similar projects, updating and standardising them as necessary.

Establishing a construction materials library

34. In addition, the BTRi will explore the establishment of a construction materials library. It aims to actively reconcile and address discrepancies in standard testing and certification requirements, thereby streamlining the approval process for innovative materials used in projects and reducing the time required for material testing. This will promote the use of high-quality, cost-effective construction materials from both domestic and international sources, helping to lower construction costs while maintaining works quality.

Work plan of the BTRi

35. The BTRi will develop its business in areas such as driving applied

research and development, uplifting standards, providing accreditation, certification and testing, etc., and will gradually build a professional team to promote innovation in the construction industry. On the other hand, the BTRi will strengthen co-operation with relevant local and overseas institutions to enhance the applied research capabilities of the BTRi and establish its leading position in the GBA and even internationally.

Other directions for construction cost reduction measures

36. In addition, we currently continue to exchange views on and explore other directions for construction cost reduction measures, including application of advanced technologies and construction methods, streamlining the approval process and reviewing the design standards and requirements, with the industry, and to optimise the recommendations.

Application of advanced technologies and construction methods

37. The Strategic Study indicates that the ageing problem of workers affects the overall productivity of the construction industry. The construction industry in Hong Kong often relies heavily on manual labour, which exacerbates the effect of workforce aging on productivity.

38. The Strategic Study suggests that efforts should be made to attract more young people to join the industry through promotion and improvement of work environment, etc. Also, apart from providing support under the Construction Innovation and Technology Fund, the Government will encourage the industry to apply more advanced technologies and construction methods through polices and initiatives in order to reduce manpower demand and uplift productivity.

Streamlining the approval process

39. The substantial amount of paperwork generated by excessive approval processes will affect work efficiency and require the industry to hire additional personnel to handle these tasks, thereby increasing construction costs. The Strategic Study recommends streamlining the approval process and adopting more innovative technologies to improve the efficiency of inter-departmental circulation of approval documents and reduce paperwork requiring manual

handling, with a view to enabling project teams to spare more time to further optimise project design and enhance work efficiency.

40. In 2018, the DEVB set up a Steering Group on Streamlining Development Control, which has introduced a number of measures that are gradually yielding positive results and receiving broad support from the industry. To further respond to industry expectations and reduce project costs, we will expand our review to include the approval processes and related regulations for the design and construction of public works projects. This aims to accelerate project timelines and minimise unnecessary costs.

41. We will later discuss in detail and exchange views with Members on relevant measures in respect of application of advanced technologies and construction methods, streamlining approval process and review of design standards and requirements at the subcommittee meeting.

42. Members are invited to note the content of this paper as a reference for detailed discussion in the coming meetings of the sub-committee.

Development Bureau
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