

Speeding Up Construction



發展及建築處的主要職能

Key Functions of the Development and Construction Division

- 推行和監察房屋建設計劃
 - 制定和檢討有關公營房屋土地供應、發展、規劃、設計和建設的策略與政策
 - 制定、推行和探討機構採購、安全和環境管理策略
 - 就全港／區域／地區規劃研究及規劃標準與準則提供意見
 - 監察房屋資訊系統
- Implementing and monitoring the Housing Construction Programme
 - Formulating and reviewing strategies and policies with regard to public housing land supply, and the development, planning, design and construction of public housing
 - Formulating, implementing and reviewing corporate procurement, safety and environmental management strategies
 - Contributing to territorial/district/local planning studies and planning standards and guidelines
 - Monitoring the Housing Information System

「擁抱創科和環保措施，為居民構建可持續、優質和健康的居住環境。」

“To embrace innovation, technology and green initiatives with a view to building sustainable, high quality and healthy living environment for our residents”

加 快 建 設

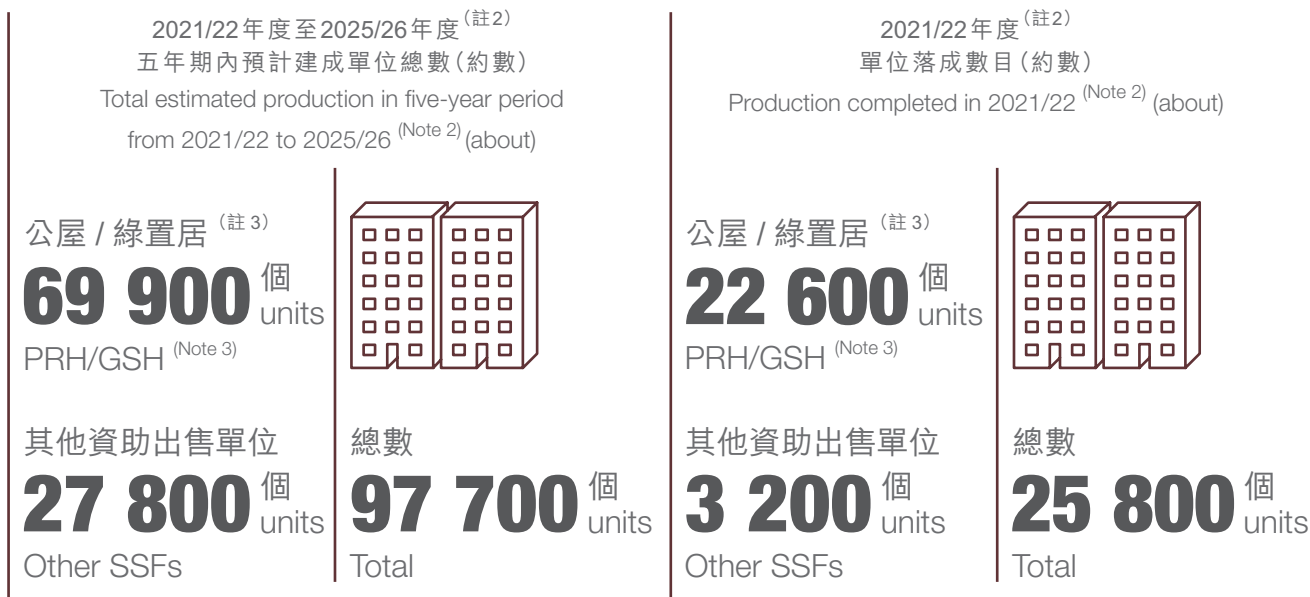
善用創科 提速建屋

Faster Public Housing Construction with Innovative Technology



公共租住房屋(公屋)/綠表置居計劃(綠置居)和其他資助出售單位的建屋量^(註1)

Production of Public Rental Housing / Green Form Subsidised Home Ownership Scheme (PRH/GSH) and other subsidised sale flats (SSFs)^(Note 1)



註 Notes :

1 數字乃根據2022年3月房委會的預測及計至最近的百位整數。由於進位原因，數字相加結果可能不等於所列總數。數字會因應房屋建設計劃而修訂。

Figures are based on the forecasts as at March 2022. Figures are rounded to the nearest hundred and may not add up to the total due to rounding. Figures are subject to changes of the programme.

2 財政年度由每年的4月1日起至翌年的3月31日止。 The financial year starts on 1 April of a year and ends on 31 March of the following year.

3 數字指房委會預計於每個財政年度中落成的新單位數目。除新建單位外，從現有屋邨回收的單位，亦是編配予公屋申請者的主要單位來源。

Figures refer to the estimated number of new units to be completed by the HA in each financial year. In addition to new units, units recovered from existing estates are also a major source of units for allocation to PRH applicants.

零售設施、私家車與貨車泊車位

Retail facilities, private car and lorry parking spaces



2021/22年度完成的公屋/綠置居發展項目(按時序排列)：
PRH/GSH projects completed in 2021/22 (in chronological order):

頌雅路東 Chung Nga Road East	富蝶邨(斑蝶樓) Fu Tip Estate (Ban Tip House)	1
鑽石山第一期 Diamond Hill Phase 1	啟鑽苑(啟宏閣、啟雋閣) Kai Chuen Court (Kai Wang House, Kai Chun House)	2
白田第十一期 Pak Tin Phase 11	白田邨(朗田樓、清田樓) Pak Tin Estate (Long Tin House, Ching Tin House)	3
皇后山第一期 Queen's Hill Phase 1	皇后山邨(皇頤樓、皇滙樓、皇樂樓) Queens Hill Estate (Wong Yi House, Wong Wui House, Wong Lok House)	
近荔景山路 Near Lai King Hill Road	荔景邨(恒景樓) Lai King Estate (Heng King House)	4
西北九龍填海區第6號地盤第三期 Northwest Kowloon Reclamation Site 6 Phase 3	海達邨(海盛樓) Hoi Tat Estate (Hoi Shing House)	5
皇后山第五期 Queen's Hill Phase 5	皇后山邨(皇盛樓) Queens Hill Estate (Wong Sheng House)	
皇后山第二期 Queen's Hill Phase 2	皇后山邨(皇順樓) Queens Hill Estate (Wong Shun House)	
皇后山第一期 Queen's Hill Phase 1	皇后山邨(皇溢樓、皇澄樓) Queens Hill Estate (Wong Yet House, Wong Ching House)	
柴灣道 Chai Wan Road	蝶翠苑 Dip Tsui Court	
屯門第54區第1及1A號地盤 Tuen Mun Area 54 Sites 1 & 1A	和田邨(和喜樓、和善樓、和彩樓、和麗樓) Wo Tin Estate (Wo Hei House, Wo Sin House, Wo Choi House, Wo Lai House)	
屯門第54區第3及4號(東)地盤 Tuen Mun Area 54 Sites 3 & 4 (East)	菁田邨(菁心樓、菁樂樓、菁喜樓、菁善樓) Ching Tin Estate (Ching Sum House, Ching Lok House, Ching Hay House, Ching Sin House)	6

2021/22年度完成的其他資助出售單位發展項目：
Other SSFs project completed in 2021/22:

皇后山第三期 Queen's Hill Phase 3	山麗苑(松山閣、榕山閣、杏山閣、梨山閣、楹山閣、橋山閣) Shan Lai Court (Chung Shan House, Yung Shan House, Hang Shan House, Lei Shan House, Ying Shan House, Kiu Shan House)	7
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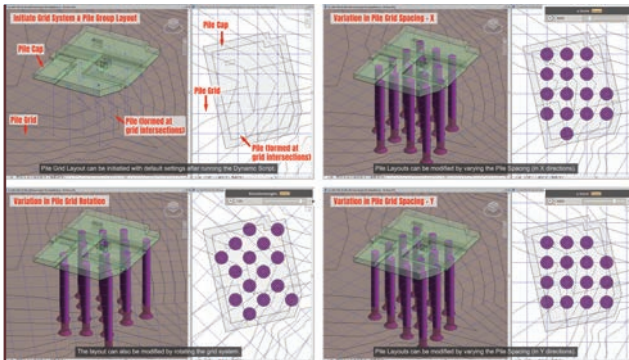


用創新科技是加快設計和建屋程序的一個重要方法。近年，我們積極探索和應用各種創新科技，以提升設計與建造工作的速度、效率和精準度。

採用衍生式設計以提升效率

在規劃、設計和建造階段，我們把衍生式設計技術與建築信息模擬技術結合使用。此舉證實對提升工作效率十分奏效，例子之一是為大廈地基自動製作樁柱布局圖則，以便工程師從多款經優化的樁柱布局圖則中選擇。這個做法對我們為地基設計作最後定稿時，在質素保證和效率提升方面確實是向前跨進了一大步。

園境師在設計和建造階段也運用衍生式設計技術。舉例來說，他們依據預定的規則，以達到最合適重量、剛度和最合乎成本效益為目的，利用衍生式設計技術為發展項目自動製作設計獨特的蝴蝶式指示牌。在同一個發展項目中，又在建造階段利用衍生式設計技術自動製作多種鋪磚布局選項，以期把需要切割的磚塊數目減至最少，並減省人手和減少浪費物料。



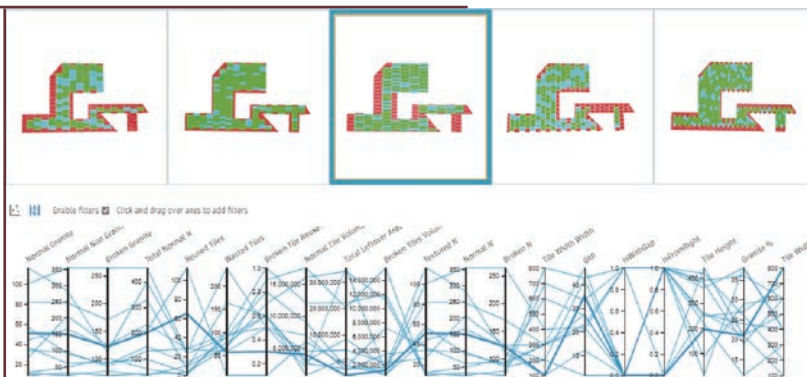
衍生式設計技術為樁柱地基的布局自動製作多個方案
GD technology can automatically generate pile-supported foundation layout options

New and innovative technology is an important way to speed up the processes of design and construction. In recent years, we have actively explored and applied a range of innovative technology to enhance the speed, efficiency and accuracy of design and construction work.

Generative Design (GD) enhancing efficiencies

Integrating GD with Building Information Modelling (BIM) at the planning, design and construction stages has proved to be very effective in enhancing our work efficiency. An example is the automatic generation of pile-supported foundation layout plans. This allows our engineers to choose from multiple options of optimised pile layout plans. This is a big step forward in terms of guaranteeing the quality and efficiency of our final foundation designs.

GD is also being used by our landscape architects at the design and construction stages. In one project, for example, special butterfly-themed signage design was automatically generated by GD based on a set of pre-defined rules which aimed at achieving optimum weight, rigidity and cost efficiency. In the same project, GD was also used at the construction stage to automatically generate tile paving layout options, minimising the number of tiles needing cutting, and reducing labour resources and wastage of materials.



利用衍生式設計技術製作鋪磚布局，減少需要切割磚塊的數量
Using GD to generate a paving layout to minimise the number of cut tiles

發展及建築工地流動系統

我們駐工地人員和承建商利用「發展及建築工地流動系統」以加強管理工地的活動，例如建築工程、屋宇裝備工程、結構工程，以及進行最後逐戶驗收的檢查。現時，該流動系統備有11個不同的應用程式處理上述不同工作。



2021年，我們在該系統內新增「地基工程檢查應用程式」，以便人員利用流動電話協助檢查三種最常用的樁柱。其後，我們推出「參考文件應用程式」，讓駐工地人員利用流動電話下載所需文件，以便進行日常的督導工作。

我們現正開發該系統第四階段的「物料測試申請應用程式」，以支援駐工地人員與承建商提交物料測試要求；房委會直接聘用的檢測承辦商收集樣本；以及署方轄下的材料試驗管理小組檢索和貯存物料檢查工作的數據與測試結果。過去一年，相關工作進展良好，我們的目標是在2022年推出該應用程式。我們也正研究能否擴大該系統的應用範圍，例如與房委會其他資訊科技系統和承建商的資訊科技系統整合，以及利用這系統為工程項目製作建築信息模型。

利用小型無人機檢查建築物

我們在2020年首次試用小型無人機檢查兩個公營房屋項目（錦暉苑和漁進樓）的建築物外牆。其後，我們使用和計劃使用小型無人機，檢查另外四個公營房屋項目（海達邨、蝶翠苑、和田邨、青富苑）的樓宇外牆。



無人機在海達邨檢測外牆
SUAs camera inspects
external wall in Hoi Tat Estate

Development and Construction Site Mobile System (DCSMS)

DCSMS is a system used by our site staff and contractors to enhance the management of on-site activities such as architectural works inspections, building services works inspections, structural works inspections, and final flats inspections. DCSMS currently bundles 11 different apps to perform these different functions.

In 2021, we added the Foundation Works Inspection App to DCSMS, allowing for inspections of the three most commonly-used pile types using a mobile phone. Subsequently, we launched the Reference Document App, which facilitates routine supervision work by enabling site staff to download essential documents with their mobile phones.

The latest DCSMS app being developed is Phase 4 of the Materials Testing Request App which supports on-site requests for materials testing by site staff and contractors, sample collection by our Direct Testing contractors, and the retrieval and storage of materials inspection data and test results by our Materials Testing Management Unit. With good progress having been made during the past year, we aim to launch the app in 2022. We are also looking at extending the scope of DCSMS, for instance, by integrating it with other HA and contractor IT systems, and utilising it for project BIM models.

Small Unmanned Aircraft (SUAs) for building inspections

We first used SUAs in 2020 for inspecting the exterior surface of buildings in two public housing projects (i.e. Kam Fai Court and Yue Chun House) on a pilot basis. Since then, we have used and scheduled to use SUAs to inspect the external walls of four further public housing projects (i.e. Hoi Tat Estate, Dip Tsui Court, Wo Tin Estate, Ching Fu Court).

我們利用小型無人機的攝影機拍攝建築物外牆的高解像度數碼影像，然後透過攝影製圖法和數據模型處理這些影像，製作立體實景網格模型，以便利用人工智能技術輕易找出裂紋和其他建築瑕疵的位置。相比傳統的檢查方法，利用小型無人機進行檢查證實更精準、安全、快捷和有效，大大縮減檢查和處理數據的時間。此外，這些航攝影像更可與建築信息模型結合，有助我們把檢查報告製作成可視化立體網格模型，讓驗樓督察和承建商在充分掌握資訊的情況下更易作出決定，糾正欠妥情況。

更廣泛應用「組裝合成」建築法

房委會正致力採用「組裝合成」建築法和利用創新建築科技，以加快建造公營房屋。在建造過程中使用預製組件是「組裝合成」建築法的重要一環。現時，在一些房委會公營房屋項目使用預製組件的比率約為九成，能夠在六個工作天內建成一個有20多個公營房屋單位的標準樓層。在發展項目中採用「組裝合成」建築法，我們得考慮多個因素，例如區內運輸網絡、工地的限制，以及附近有否地方可供儲存組件。依據上述因素，房委會先後在東涌、觀塘德田街和安達臣道石礦場等用地的公營房屋項目中選出數幢大廈，以「組裝合成」建築法建造約2 000個單位。我們又另外物色了一些適合採用「組裝合成」建築法的項目，而這些項目大多位於新發展區（例如東涌、北部都會新發展區）。根據初步估算，這些採用「組裝合成」建築法的用地可提供約20 000個新單位。



「組裝合成」建築法

With SUA's camera, we capture high-resolution digital images of the building envelope, which can then be processed by photogrammetry and data modelling to produce a 3D reality mesh model that enables cracks and other defects to be easily located and identified with support of artificial intelligence technology. Compared with traditional inspection methods, SUA inspections are more accurate, safe, efficient and productive, and greatly reduce inspection and data processing time. In addition, these aerial images can be integrated into BIM model. This allows inspection reports to be generated as visualised 3D mesh models, making it easier for building inspectors and contractors to make informed decisions about defect management.

Wider application of Modular Integrated Construction (MiC)

The HA has been making efforts to adopt MiC and utilise innovative construction technology to speed up the construction of public housing. The use of precast components in construction is an important part of MiC. Currently, the HA's precast rate in some public housing projects stands at around 90%, enabling a typical floor with over 20 units to be constructed in six working days. Adopting MiC for projects require us to take into account factors such as the local transportation network, site constraints, and the availability of storage areas nearby. On this basis, the HA has adopted MiC for a few blocks under the public housing projects in Tung Chung, Kwun Tong Tak Tin Street and Anderson Road Quarry Sites, involving a total of about 2 000 units. We have also identified some other projects suitable for MiC, mostly in new development areas such as Tung Chung and the Northern Metropolitan New Development Area. Our preliminary estimate is that around 20 000 new units can be provided at these sites using MiC.



採用「組裝合成」建築法的項目—安達臣道石礦場R2-6及R2-7 (左) 和東涌第99區
MiC used in the public housing projects in Anderson Road Quarry Sites R2-6 and R2-7 (left) and Tung Chung Area 99

為使「組裝合成」建築法在公營房屋發展項目更廣泛應用，我們擬訂工程規格、確保運輸網絡充足，以及穩定上游供應鏈。為達致這個目標，我們在2022年1月舉辦業界參與工作坊，討論未來如何應用「組裝合成」建築法，逾百名業內人士（包括商會成員、承建商），以及房委會委員和發展局代表出席。

「設計及建造」採購模式

我們一直探討不同方法，以期在2022/23至2031/32年度的十年期內，提供約330 000個公營房屋單位。在眾多可行方案中，「設計及建造」採購模式可提升工程項目進度。承建商可運用其專業知識包辦設計和建造的工作，讓我們可以重新調配資源，應付新發展項目作施工前的規劃工作。

該採購模式要求承建商按照指定的規格進行設計，然後就發展項目的設計與建造兩部分提交標書。承建商在單一合約內包辦設計和建造的工作，從而或會取得多項好處，包括縮減動員時間、資源調配更為得宜、物料採購更具彈性，以及建造工作的流程更為順暢。

為促使承建商進一步提高生產力，房委會為「設計及建造」標書引入新的評審項目，鼓勵承建商在標書中提出廣泛採用「組裝合成」建築法、「機電裝備合成法」及其他嶄新科技，從而提高生產力，並在可行的情況下縮短施工期。

房委會轄下首個採用「設計及建造」採購模式的發展項目是古洞北第19區第二期，共建約4 330個單位，並於2022年6月招標。第二個採用「設計及建造」採購模式的發展項目位於屯門第54區第4A(南)號地盤和第5號地盤，共建約2 350個單位，預計於2022年12月招標。

To apply MiC more widely in our public housing developments, we draw up works specifications, ensure the transportation network is adequate, and secure a stable upstream supply chain. As a first step, we conducted an engagement workshop in January 2022 on the future application of MiC. Over 100 industry participants (including trade associations and contractors), as well as HA Members and representatives from the Development Bureau attended the workshop.

Design-and-Build (D&B) procurement model

We have been exploring ways to cope with the public housing supply of around 330 000 units for the 10-year period from 2022/23 to 2031/32. Amongst various feasible options, the D&B procurement model can enhance project delivery. This model requires contractors to be responsible for both design and construction work, hence enabling the HA to redirect its resources to pre-construction planning for new projects.

The D&B model requires contractors to develop a design in accordance with a set of specified requirements, and submit a tender for both the design and construction elements of the project. With the contractor bundling design and construction into a single contract, various benefits are likely to follow. These include a reduction in mobilisation time, enhanced coordination of resources, greater flexibility in the procurement of materials, and improved construction workflows.

To encourage contractors to further enhance their productivity, the HA also introduced new tender assessment items for D&B tenders. These will encourage tenderers to submit proposals that involve the wider use of MiC, Multi-trade Integrated Mechanical, Electrical and Plumbing, and other innovations and technologies that boost productivity and where possible, shortening the construction period.

The HA's first D&B project is at Kwu Tung North Area 19 Phase 2, involving around 4 330 flats, and the tender for this project was invited in June 2022. The second D&B project is at Tuen Mun Area 54 Site 4A (South) and Site 5 with about 2 350 flats, and the tender is scheduled to be invited in December 2022.