



## 創新建築 現代居所

Innovative Construction for Modern Living



興建中的觀塘安泰邨

On Tai Estate in Kwun Tong — construction in progress

The Hong Kong Housing Authority (HA) has been making its best effort to supply public housing. This chapter highlights our specific construction achievements for the year, and details the technologies adopted and the planning processes that have gone into the creation of our latest batch of liveable, environmentally friendly public housing developments. Information has also been included about the steps we take to protect our workers and contractors throughout the complex and challenging construction processes.

In 2017/18, the HA completed construction of around 13 700 new flats, including around 13 400 public rental housing (PRH) flats in seven projects and around 200 subsidised sale flats (SSFs)<sup>1</sup> in one project.

We also completed construction of around 7 900 square metres of gross floor area for retail facilities, and around 540 private car and lorry parking spaces.

PRH projects completed in 2017/18:		
Anderson Road Site B (Blocks 3-5) Anderson Road Site C1	On Tai Estate	Kui Tai House, Wo Tai House, King Tai House Yung Tai House, Kam Tai House
Tuen Mun Area 54 Site 2 Phase 1 Tuen Mun Area 54 Site 2 Phase 2	Yan Tin Estate	Chun Tin House, Yat Tin House, Hei Tin House Yuet Tin House, Luk Tin House
Tung Chung Area 56	Ying Tung Estate	Ying Hei House, Ying Fook House, Ying Chui House, Ying Yuet House
Ex-Kwai Chung Police Married Quarters Lin Shing Road	Kwai Tsui Estate Lin Tsui Estate	Bik Tsui House, Luk Tsui House Lin Tsui House
SSF project completed in 2017/18:		
Hin Tin Street, Sha Tin Area 31	Ka Shun Court	

Concurrently, we worked on developing scheme designs and project budgets for several new projects over the year. Seven upcoming projects had their designs and budgets endorsed.

- 1 On Tai Estate in Kwun Tong
- 2 Ying Tung Estate in Tung Chung
- 3 A new SSF project – Ka Shun Court in Sha Tin



<sup>1</sup> Flat numbers are rounded to the nearest hundred and thus may not add up to the total due to rounding.



## Looking after our Elderly Tenants

This year, we continued to place a strong focus in our PRH design and construction on meeting the specific needs of the elderly, who make up an ever-increasing proportion of the PRH population. Our implementation of the universal design approach over the past 15 years in building new estates and in retrofitting older estates has borne much fruit. Typical features that are now standard in many of our estates include the provision of wheelchair-accessible corridors, flat entrances, and kitchen and bathroom doorways, and the incorporation of materials that are safer for and easier to use by elderly and disabled users, such as non-slip floor tiles and large-sized switches. These kinds of provisions are enabling more and more our elderly tenants to live out the full span of their lives in the familiar, user-friendly environment that they call home.

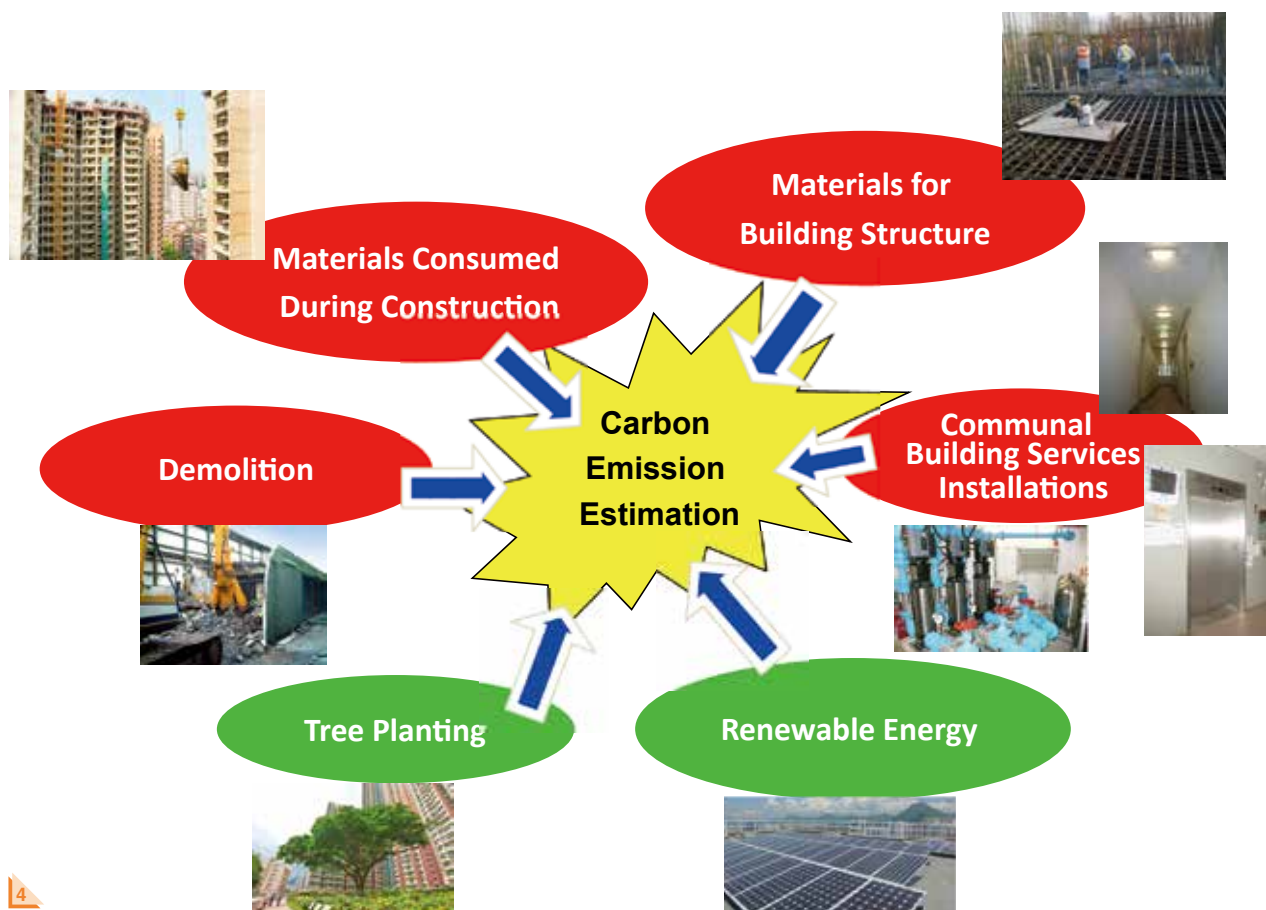
## Green Estate Living

Green living is nowadays an integral part of our basic estate design principles. One basic green tool that we have used since 2011 is Carbon Emission Estimation (CEE), which allows us to estimate the total carbon emissions from a PRH estate over its entire expected life of 100 years. CEE is important because it enables us to assess the effectiveness of the blocks and estates that we are

designing in terms of their carbon emissions throughout their entire life cycle. This means that we can, if needed, adjust their designs upfront to minimise carbon emissions. We apply CEE to many different areas, including the materials used in major construction work, the building structures, the communal building services installations, the use of renewable energy, the planting of trees, and demolition activities. Supplementing CEE is the ISO 50001 Energy Management System, a system we have applied to our new domestic blocks since 2011 which enables us to gauge the communal energy consumption associated with a building in operation. In 2017/18, we applied CEE and energy estimations to two new projects, and were consequently able to reduce the estimated communal energy consumption for the domestic blocks there by about 26% compared with the baseline figure.

“Passive design” is another feature of our green design activities, in place since 2004. This design principle looks to harness the specific characteristics of individual sites to optimise the use of certain natural resources (such as natural ventilation and daylight). Other green tools that we apply at the planning and design stage of all our new estates include micro-climate studies. These help us optimise the overall estate layout and the positioning of individual buildings so as to enhance their environmental performance.

### 4 Six areas of Carbon Emission Estimation



Green principles also underlie the construction materials we employ. Use of environmentally friendly Ground Granular Blast Furnace Slag (GGBS) has been part of our specifications for new building contracts since 2013, and we now also require that GGBS should replace 35% of the cement in concrete used for the construction of precast concrete façades and precast staircases. Currently, we are looking at further extending the use of GGBS, and are studying its viability for use in semi-precast slabs.

Our green construction processes are supplemented by a generous greening policy for planting. Our target for overall greening coverage of new estates is at least 20% of the total site area, and at least 30% for large sites (i.e. of over two hectares), and we plant at least one tree for every 15 flats built. To make the greening process more robust and efficient, the Zero Irrigation System was trialled at Lung Yat Estate in Tuen Mun, in which we successfully reduced the use of potable water for irrigation. At the same

time, we have been developing a prefabricated modular system that promises to make the planting of trees on the podiums of estate blocks much simpler and more efficient. At King Tai Court in San Po Kong, we extended the use of pre-grown vertical green panels to increase the amount of green coverage and achieve “instant greening”.

### Green Buildings, Gold Ratings

All new projects developed by the HA are designed to achieve a Gold rating standard under the Hong Kong Green Building Council's green building assessment scheme, the Building Environmental Assessment Method Plus for New Buildings (BEAM Plus NB). This scheme aims to reduce the environmental impact of new buildings by encouraging the adoption of a range of sustainable best practices throughout the life cycle of the buildings. Our 2017/18 certification results under BEAM Plus NB (Version 1.2) are summarised below:

Project	Rating
PRH Development at Choi Fook Estate Phase 3 and Sports Centre	Gold Rating, Provisional Assessment
SSF Development at Au Pui Wan Street, Fo Tan	Gold Rating, Provisional Assessment
SSF Development at Tseung Kwan O Area 65C2 Phases 1 & 2	Gold Rating, Provisional Assessment
SSF Development at Hang Kin Street, Ma On Shan Area 90B	Gold Rating, Provisional Assessment
SSF Development at Tung Chung Area 27	Gold Rating, Provisional Assessment
PRH Development at Diamond Hill Comprehensive Development Area Phases 1 & 2	Gold Rating, Provisional Assessment
PRH Development at Tung Chung Area 39	Gold Rating, Provisional Assessment

5 Close-up of GGBS (left) and GGBS used in the construction of precast concrete façades



## Keeping Workers Safe

The HA's Site Safety Strategy 2017 was applied across the year on all its New Works and Maintenance Works sites. The strategy is also mandatory for our property service agents, cleansing services contractors and security contractors. The Site Safety Strategy was important in enabling us to achieve our safety goal of not more than nine accidents per 1 000 workers, with accident rates for 2017 being recorded at 6.9 per 1 000 workers for New Works contracts and 4.2 per 1 000 workers for Maintenance Works contracts. Both sets of figures remain well below Hong Kong's average industry accident rate of 32.9 per 1 000 workers. Most regrettably however, two fatal accidents occurred under two New Works contracts in 2017.

During the year, we introduced a number of new and revised specifications for the workplace including specifications for the provision of anti-heat stress construction uniforms for workers, the provision of y-type chin strap for safety helmets, the provision of fall-arresting devices (such as tool straps and waist tool belts) for handheld tools, specifications covering the requirements for temporary staircases, checks on the condition of the wire ropes of gondolas, and the provision of reflective vests for operatives and site supervisory staff involved in lifting operations, road works outside sites, and the control of vehicular traffic. New initiatives of specification

6 Site safety remains one of our top priorities

7 A worker, in proper safety gear, spraying acrylic paint on the external wall of a domestic block



enhancement have also been explored, including enhanced "Pay for Safety Scheme" and adoption of good practices on site such as safety climate index survey and work safe behaviour programme. We continued to raise safety awareness among our contractors and works staff through safety training and promotional events such as forums, seminars and workshops, while [the Housing Authority Site Safety Website](#) remained a good channel for getting safety messages across to our industry stakeholders. We also updated our Site Safety Handbook and our Pictorial Guide to Planning and Design for Safety in 2017, both of which provide HA contractors and works staff with clear safety guidance on a wide range of topics.

As for building and maintenance works carried out in our existing estates, we continued to arrange audits under the Housing Authority Safety Auditing System (M&I), along with surprise safety inspections of building maintenance and improvement works, and lift maintenance and lift modernisation works. Findings from these safety audits and inspections have been carefully reviewed with the aim of improving our safety practices further.

Since its implementation in 2016, the Housing Authority Occupational Injury and Disease Surveillance System (HAOIDSS) has enabled HA contractors to file web-based accident and incident reports. The system continues to make it easier for us to manage data of accidents and incidents effectively and to generate accident statistics for analysis. We have now begun enhancing the accident and incident reporting mechanism by replacing HAOIDSS with Safety Alert Module of Development and Construction Site Mobile System Phase 2 through adding links to mobile apps and enabling documents to be attached, with the aim of eventually making it a completely paperless online system.

## Quality Management

The HA's quality management systems enable us to measure and control our quality performance against widely accepted international standards. Supplementing these, the European Foundation for Quality Management Excellence Model is helping us improve our operations in the Development and Construction Division. All our contractors must be ISO 9001, ISO 14001 and OHSAS 18001 certified, and our building (New Works) contractors and piling contractors must operate a certified ISO 50001

energy management system. With the roll-out of ISO 45001 on 12 March 2018 targeting to replace OHSAS 18001 standard in 3 years, works contractors and service providers certified to OHSAS 18001 are alerted to gain accreditation with ISO 45001 accordingly.

The standards to which we are certified and the management systems we adopt in our operations are shown in the following tables:

Certified Standard	Scope	Certified since
<b>Development &amp; Construction Division (DCD)</b>		
ISO 9001: Quality Management	Planning, design, project management and contract administration for the construction of public housing	1993
ISO 14001: Environmental Management	Planning, design, project management, contract administration and materials testing for the construction of public housing	2009
ISO 50001: Energy Management	Planning, design, project management and contract administration for the construction of public housing	2012
OHSAS 18001: Occupational Health and Safety Management System	Materials testing for the construction of public housing	2013
<b>Estate Management Division (EMD)</b>		
ISO 9001: Quality Management	Planning, design, project management and contract administration for the maintenance and improvement of public housing	1993
ISO 14001: Environmental Management	Planning, design, project management and contract administration for the maintenance and improvement of public housing estates. Provision of property management services (including cleansing, security, landscaping and office administration) in public housing estates	2011
ISO 50001: Energy Management	Planning, design, operation, project management and contract administration for facility management and improvement works of the communal areas of PRH domestic blocks	2013
OHSAS 18001: Occupational Health and Safety Management System	Planning, design, project management and contract administration for the maintenance and improvement of public housing	2014
<b>Independent Checking Unit (ICU)</b>		
ISO 9001: Quality Management	Building Control for Public Housing	2014
ISO 14001: Environmental Management	Building Control for Public Housing	2014



Other Quality Schemes/ Standards	Scope	Adopted since	Remarks
<b>DCD</b>			
ISO 26000: Social Responsibility	Planning, design, project management and contract administration for the construction of public housing	2010	Integrated with other management systems of DCD. A non-certifiable standard, but measured through the HKQAA CSR Advocate Index. For the sixth consecutive year since 2012, DCD achieved the full score of 5.0.
ISO 31000: Risk Management	Planning, design, project management and contract administration for the construction of public housing	2010	Integrated with other management systems of DCD.
European Foundation for Quality Management (EFQM) Excellence Model	Planning, design, project management and contract administration for the construction of public housing	2010	Integrated with other management systems in DCD.
<b>EMD</b>			
ISO 19011: Auditing Management System	Internal audit for planning, design, project management and contract administration for the maintenance and improvement of public housing	2012	Integrated with other management systems of EMD. A non-certifiable standard, but verified through HKQAA with Verification Statement obtained in 2013.
ISO 26000: Social Responsibility	Planning, design, project management and contract administration for the maintenance and improvement of public housing	2012	Integrated with other management systems of EMD. A non-certifiable standard, but measured through the HKQAA CSR Advocate Index. For the fourth consecutive year since 2014, EMD achieved the full score of 5.0.
ISO 31000: Risk Management	Planning, design, project management and contract administration for the planned maintenance and improvement of public housing	2012	Integrated with other management systems of EMD. A non-certifiable standard, but verified through HKQAA with Verification Statement obtained in 2013.
HKQAA Sustainable Building Index (SBI) Scheme	Sustainability performance (environmental, social and economic) of domestic blocks in 10 estates containing all major block types	2012	A non-certifiable standard, but verified through the HKQAA SBI Scheme.  In 2012, the HA became the first organisation to obtain the HKQAA SBI Verified Mark.

Each of our DCD and EMD carries out an annual performance assessment under the Hong Kong Quality Assurance Agency (HKQAA) Corporate Social Responsibility (CSR) Advocate Index. The assessment has been designed with reference to ISO 26000, and enables the divisions to measure the maturity level of their social responsibility undertakings and their contributions in areas such as organisational governance, human rights, labour practices, the environment, fair operating practices, consumer issues, and community involvement and development. In 2017, DCD achieved the full score of 5.0 in the HKQAA CSR Advocate Index for the sixth consecutive year, while EMD also achieved 5.0 for the fourth consecutive year.

### Quality Assurance for Building Materials

To maintain close control over the quality of the building products used in our construction, we rely on robust third-party certification. In addition to ISO 9001 certification, we currently impose product certification requirements on 11 building products, covering fire resistant timber doors, panel wall partitions, packed cement for architectural use, tile adhesives, ceramic tiles, repair mortar, aluminium windows, uPVC drainage pipes and fittings, close-coupled water closet suites, mesh reinforcement, and LED bulkheads. In 2017/18, this is being extended to also cover multi-layer acrylic paint.

We have also continued to strengthen our quality controls for plumbing including requiring the use of copper pipes and fittings that bear the Kitemark of the British Standards Institution, conducting audit checks of delivered soldering materials, and testing extra water samples in addition to those required by the Water Supplies Department. Also, the main contractors of all building projects are now contractually required to appoint plumbing domestic sub-contractors from the Plumbing Installation Category of the Development Bureau's List of Approved Suppliers of Materials and Specialist Contractors for Public Works. We have also set workload capping limits for approved plumbing sub-contractors and for Licensed Plumbers, and require building contractors to implement a management plan that includes close supervision of plumbing sub-contractors and Licensed Plumbers.

### Risk Management for Building Materials

Effective management of risks associated with building materials is always a matter of high priority. In 2017, we progressively implemented a series of risk treatment measures, each prioritised based on the risk levels of around 2 300 different building materials. These measures were developed as the result of a major risk assessment exercise on building materials completed by the HA in December 2016, in association with contractors and other stakeholders.

**8** and **9** We currently impose product certification requirements on 11 building materials including uPVC drainage pipes and fittings (bottom) and mesh reinforcement





From 2017, all New Works contractors have also been required to develop a project-specific materials risk assessment system for their building materials, including those supplied by their sub-contractors and suppliers. The contractors' risk assessment systems are required to make reference to the HA's own system, and are incorporated into their Quality Control System and Sub-contractor Management Plan. Contractors are now also required to appoint a third party to conduct an annual audit of their Quality Control System for each HA project they are involved in. Additionally, the frequency with which HA contractors' own in-house audit teams are required to conduct compliance audits on building materials has been increased.

### Building Controls to Underpin Building Quality

The Independent Checking Unit (ICU) operates under the Office of the Permanent Secretary for Transport and Housing (Housing), offering administrative control processes parallel with those of the Buildings Department. The ICU provides third-party checking of building plans and structural plans submitted for the HA's new development projects. It also processes submissions for Alterations & Additions works in existing HA buildings.

Under powers delegated by the Building Authority, the ICU exercises statutory building controls for buildings in the Home Ownership Scheme, Tenant Purchase Scheme estates, and commercial and car parking facilities divested to the LINK REIT or their subsequent private owners. Besides processing submissions for Alterations & Additions to these buildings, its remit includes giving advisory input on the suitability of using premises for different purposes (in relation to various licensing referrals from other government departments), overseeing the implementation of the Minor Works Control System, the Mandatory Building Inspection Scheme and the Mandatory Window Inspection Scheme, and carrying out enforcement against unauthorised building works and dilapidated buildings.

Since March 2016, the ICU has been operating the [Housing Electronic Plan Submission System \(HePlan\)](#), which enables the e-submission and e-processing of building and structural plans for both new HA development projects and existing HA buildings. Another online service provided by the ICU is the [Housing Electronic Building Records Online System \(HeBROS\)](#), which provides the public with on-line inspection and copying services for HA building records, and which was extended to the MyGovHK website in 2016.

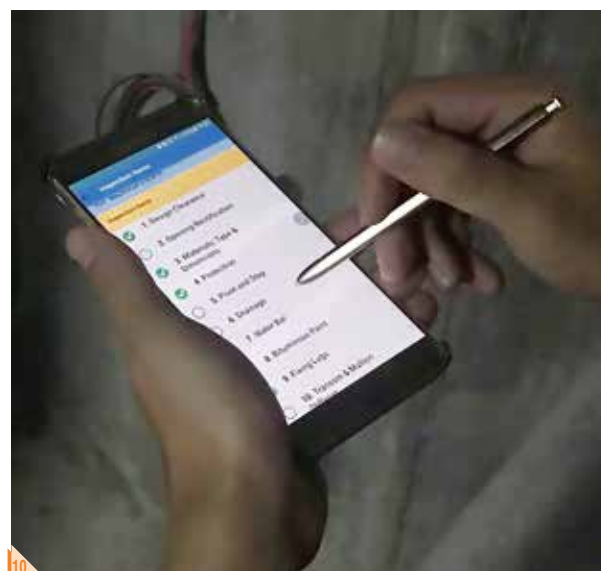
In December 2017, the ICU successfully upgraded its Quality and Environmental Management System certification to ISO 9001:2015 and ISO 14001:2015, a process which extended the scope of its coverage to include the work of its Mandatory Building Inspection Scheme Team and Minor Works Team.

The Lift Inspection Focus Team has continued to operate an audit inspection system for lifts and escalators managed by the HA that is improving safety and reducing the risk of accidents.

### IT Enhancements

Important IT resources and systems used by the HA include Building Information Modelling (BIM), the Geographic Information System (GIS), the Housing Construction Management Enterprise System (HOMES), and Radio Frequency Identification (RFID).

 Mobile devices and the DCSMS app streamline the management of safety and enhance quality and productivity at our building sites



Throughout the year, the HA has been working on extending the use of its Development and Construction Site Mobile System (DCSMS) from HA staff to include contractors, a move which is targeted for roll-out later in 2018. When Phase 1 of DCSMS was rolled out in 2015, it enabled users to utilise mobile devices and applications (app) when carrying out site inspections of building works and building services work, and to raise alerts about accidents or site safety incidents. The extensions to DCSMS mean that contractors will be able to submit inspection requests via DCSMS once they have completed a construction job. Site staff will then be able to schedule the inspection or report the inspection results through the DCSMS app while at the construction site; contractors will also be able to check the status of a request through the DCSMS app. DCSMS is proving very valuable in streamlining the management of safety and improving quality and productivity at our building sites.

We are now proceeding with the development of Phases 2 and 3 of DCSMS. Phase 2 involves widening the application of the app so that it covers inspections in other areas (such as structural work), provides easy access to documents such as approved method statements and

samples, and better integrates the Occupational Injury and Disease Surveillance System. Phase 3 of DCSMS will include a revamp of the existing HOMES Mobile Site Inspection (HMSI) system and the Construction Mobile Inspection System (CMIS). The revamped HMSI will support the final flat-to-flat inspection of building work and building services work, and the enhanced CMIS will support the end-to-end foundation inspection processes of the three most frequently used pile types – large diameter bored piles, socketed H-piles, and mini-piles (a new addition to the CMIS). Inspection of the remaining pile types, such as driven H-piles, will be implemented in a later phase of the DCSMS. The HMSI and CMIS currently use offline data synchronisation technologies in conjunction with industrial grade PDAs with 3.5-inch displays (HMSI), or Windows tablets (CMIS). The new developments will adopt mobile and web technologies, incorporating smartphones, mobile apps and web applications for example.

11 Acoustic balcony under construction (left) and its precast component



## Innovative Solutions for Design and Planning

The process of constructing new estates and redeveloping old ones starts with extensive planning and design to ensure that the actual work done achieves very well-defined goals and standards. Nowadays, our designers rely on advanced and highly sophisticated computerised tools to optimise their work. At the HA, one of the most important of these is BIM. Put simply, BIM is an intelligent 3D model-based process that enables architectural, engineering, and construction professionals to plan, design, construct, and manage buildings and infrastructure more efficiently.

The HA first adopted BIM in 2006, and today all new HA development projects utilise BIM as part of the planning and design process. It is applied at many different stages of projects, from conducting feasibility studies through to developing the scheme design. During construction, it is also used as a cost management and design optimisation tool. To move further, the HA has made a trial of the application of 4-D (Time) and 5-D (Cost) BIM for progress and cost management (see our feature story on the application of 5D BIM at Anderson Road Sites A & B).

## Innovative Approaches to Problem of Traffic Noise

Traffic noise can pose serious problems to tenants in estates near busy roads in Hong Kong. We do our best to plan for this by, for example, aligning domestic blocks away from major roads with site-specific designs, to create a “self-screening” effect. To address noise at sites where this is not possible, or when we are redeveloping existing estates, we have applied our research and development resources to further refine our acoustic windows and balconies, featured in last year’s Annual Report. Two new series of modular flats with these acoustic features have been added to the HA’s Modular Flat Design 2018 Version.

12

Project teams working together for building liveable, environmentally friendly public housing



12



## Shui Chuen O Estate – Homes Linking Two Country Parks

Situated between Ma On Shan Country Park and Lion Rock Country Park, Shui Chuen O (SCO) Estate is made up of 18 domestic blocks whose names reflect the links with nature that make this site so unique. Inspired by words by Jin Dynasty writer and calligrapher Wang Xizhi in his *Preface to the Poems Composed at the Orchid Pavilion* (“overlooking us are lofty mountains and steep peaks, around us are dense woods and slender bamboos”), the building blocks’ names reference the estate’s stunning natural setting.

The site is a significant and high-density one, with its 18 domestic blocks housing around 30 000 residents. From the outset, though, the Hong Kong Housing Authority (HA) design team recognised the importance of integrating this substantial development into the pristine natural environment surrounding it. Three core planning principles guided them along: *Links with nature*, *Links with environment for sustainability*, and *Links for people*.

### Links with Nature

A key objective when designing this estate was to maximise its connections with the surrounding country parks so that the natural and man-made environments merged seamlessly. To do this, the HA embraced the idea of “green fingers”, a design concept that involved extending the greenery of the surrounding country parks into the estate through corridors of intensive planting and greening. Despite living in a high-rise urban setting, the “green fingers” concept gives residents a sense of being intimately linked with the impressive natural environment around them.

To further enhance residents’ connections to the natural surroundings, the team created a unique and green “eco-trail” through the estate. The eco-trail connects

the estate with various existing trails in the adjoining country parks, making it easy for residents to take off for a hike into the countryside whenever they feel like it. Linking up the east and west platforms of the estate together with the commercial centre, the eco-trail also connects directly with the Tsz Sha Ancient Trail, once a major link between Sha Tin and Kowloon back in the Qing Dynasty. All this means that ambitious hikers are able to walk from Tsz Wan Shan to Sha Tin Pass and then on to Shui Chuen O Estate via the Wilson Trail. As the eco-trail is linked to the estate’s commercial centre, hikers can stock up on supplies or enjoy a sustaining meal before setting off, or on the way back home.

### Links with Environment for Sustainability

The team placed great attention on ensuring the estate had strong connections with the larger surrounding environment. For example, three major view corridors were developed to provide pleasing visual connections between the Sha Tin town below and the mountains around and above. The buildings were also designed and grouped in a stepped profile to match and blend with the profile of the mountains behind, in line with Visual Impact Assessment Studies.



- 1 Weather-protected connections between different platforms
- 2 The three view corridors
- 3 Lift tower and mega footbridge
- 4 The atrium at Shui Chuen O Plaza
- 5 Children play area at one of the “activity nodes”

## Links for People

Links for people are crucial on this hilly site, and this has led to the creation of a “tapestry” of weather-protected walkways, footbridges, lift towers, escalators and access ramps to facilitate the hassle-free movement of pedestrians. To achieve this, the team had to address one of the major challenges of the site; namely, the substantial difference in levels between platforms of over 90 m. This involved building nine footbridges and six shuttle lift towers to ensure convenient and weather-protected connections for tenants, both within the development and to nearby public transport and other facilities. A mega footbridge (approximately 78 m long, with lift tower) straddles Sha Tin Road to serve the heavy pedestrian traffic from Sha Tin Wai Station and nearby housing developments to the estate entrance in Shui Chuen Au Street.

The pedestrian network is punctuated with “activity nodes”, including an open plaza for functions and festive events, intimate and cosy sitting areas, scenic routes for walking and jogging, and play areas for all ages. The network converges on major activity hubs such as the commercial centre, the civic plaza, the public transport interchange and the community and welfare facilities block. These spaces have been further enhanced by thoughtful landscaping, designed to add seasonal colours and attract birds and butterflies.

**Nature, environment, and people:** the residents of the estate are part of a community that is harmoniously integrated with the natural surroundings, local amenities and infrastructure, as well as the wider community of the area.

## SCO Estate Fact Sheet

No. of domestic blocks	18
No. of storeys	25 to 30
No. of flats	11 123
Level difference from upper platform to lower platform	Approximately 90 metres
No. of footbridges & shuttle lift towers	9 footbridges and 6 shuttle lift towers
Length of mega footbridge	Approximately 78 metres
Walking time from Sha Tin Wai MTR station to SCO Plaza	8.5 minutes
Open space provision	Approximately 33 500 square metres, including <ul style="list-style-type: none"> <li>– community play area</li> <li>– 4 badminton courts</li> <li>– 3 basketball courts</li> <li>– 1 five-a-side soccer pitch</li> <li>– 7 table tennis tables</li> </ul>
SCO Commercial Centre	Total internal floor area of approximately 7 000 square metres, including <ul style="list-style-type: none"> <li>– a wet market</li> <li>– 59 shops (supermarkets, bakery shops, convenience stores, household products, pharmacies, medical clinics)</li> <li>– restaurants, such as Chinese restaurants, fast food shops, restaurants with special cuisine</li> </ul>
Construction period	Commenced in 2011 and completed in four phases from 2015 to 2016





## So Uk Estate – Nostalgia Meets Contemporary Planning

When it was first completed in 1960, the old So Uk Estate became famous as one of the earliest and largest public rental housing (PRH) developments in Asia. Built on a steep hillside and incorporating some distinctive architectural features, So Uk Estate posed a number of challenges for the Hong Kong Housing Authority (HA) in its redevelopment efforts. We endeavoured to redevelop this unique public housing site into a harmonious contemporary living environment, while retaining some of its distinctive original characteristics. The project mainly comprises 14 domestic blocks ranging from 21 to 41 storeys, with 6 985 rental flats. Some retail and social welfare facilities are spread among the podiums, with others located in the community facilities block.

The main themes of the design were “care for the community” and “revitalisation for a sustainable and healthy living environment”. The strategically phased redevelopment plan meant that residents of the old estate could be rehoused in newly completed estates nearby, and thus stay connected with their familiar neighbourhood and social networks.

The disposition of buildings was carefully considered from a passive design perspective, and arranged to create open breezeways and view corridors running through the estate. Microclimate studies were carried out, which assisted with planning and design in terms of improving the permeability of the air flow, forming better sun paths, and creating effective shading. Building blocks were

also aligned with the existing urban fabric, with stepped heights to echo the rising topography of the terrain, and lower blocks placed at the street level to improve the visual impression and enhance the movement of breezes through the estate.

The new community also enjoys strong links internally within the site and to nearby facilities, through a network of covered pedestrian walkways, lift towers, footbridges and escalators. Together, they provide safe, convenient and barrier-free links between the upper platforms of So Uk Estate and the major entrance hubs in Po On Road and Cheung Fat Street. In an effort to recreate the intimate social spaces of the old So Uk Estate, “pocket” spaces for sitting and leisure have been provided along the pedestrian paths. The buildings along Po On Road is set back from the road, creating a wide pedestrian zone incorporating retail, amenity and green features that enhance the streetscape.

As part of the overall design and planning process, we conducted a community engagement exercise with residents of the old estate and other locals. We were particularly interested in obtaining some consensus on which of the structures of the old So Uk Estate should be retained, due to their distinctive architectural style or because of the powerful collective memories they had generated over 50 years. At the top of this list was the “Three Treasures” of So Uk.

- **The Little White Shed** – This small white building next to the new Willow House was originally a store selling kerosene, widely used as cooking fuel back in the 1960s. It has been preserved and will be let out for retail or eatery outlets. It will also be integrated with the new deck and plaza to form a civic open space for residents, following completion of the Phase 2 redevelopment later in 2018.

**1** The hilly terraced site is arranged with taller buildings in the centre and lower blocks on the periphery, to optimise the views and natural ventilation

**2** The Little White Shed





- **The Swallow Pavilions** – Next to Cherry House are two pavilions with curving roofs. In the early 1980s, a mural was painted on the soffit of one the pavilions: it depicts a view of the sky with doves from the estate open space, and captures the estate's distinctive architectural characteristics. The original artist, Mr Mak Wing, was commissioned to revive and reinstate the old mural. The pavilions will continue to provide sheltered spaces for residents in the open and unique spaces for hosting community events.
- **The former estate entrance portal** – With “So Uk Estate” painted in gold Chinese characters against a black background, this portal was a landmark of the old estate. The portal will be relocated to the Phase 2 open space.

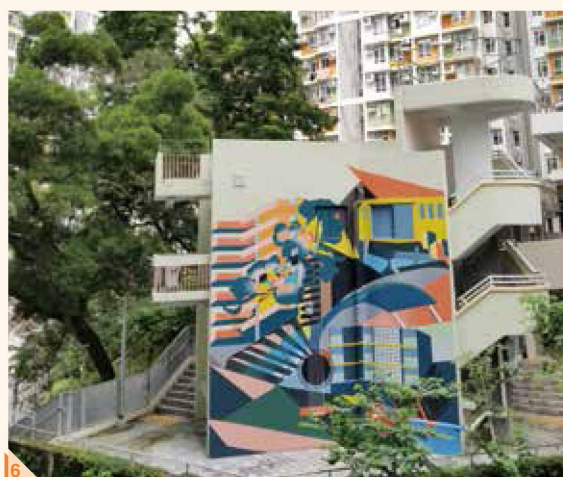
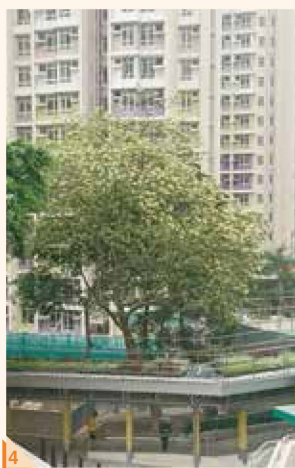
Apart from the “Three Treasures”, the following features were also retained:

- **Maple House** – Part of the ground and the first floor of the old Maple House has been retained and restored for exhibition purposes, with displays showing how PRH units were decorated in the 1960s and 1970s.

- **The former estate management office** – Featuring a scanty granite stone exterior wall, this old building has been restored and is now functioning as a post office.
- **The Princess Tree** – Next to the old estate management office stands one of the oldest trees in the estate. Known locally as the Princess Tree, it was planted by the British Princess Alexandra when she visited the then newly completed So Uk Estate back in November 1961.

These old structures were all structurally appraised; some had their roof or floor slabs recast or their spalled concrete repaired, and all were redecorated. Together, these retained features combine to form a pleasant “heritage trail” giving visitors nostalgic glimpses of old times as they walk around the new estate. The new residential blocks bear the old block names but exist in a completely contemporary estate setting, except for the occasional old retaining wall that sits seamlessly alongside new ones.

For more than 50 years, So Uk Estate has served thousands of families and bore witness to growth stories of a few generations before its redevelopment. The name of So Uk represents not only the home of many Hong Kong people, but also their beautiful collective memories. Through contemporary planning strategies, we hope to retain something that are precious to generations of people growing up there and also provide a canvas for people painting their new life stories in the new estate.

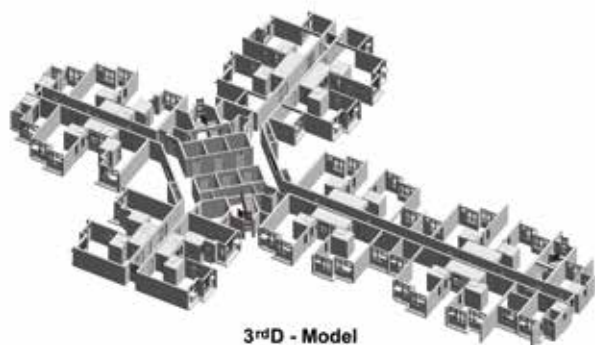


- 3 The old mural of the Swallow Pavilions was revived and reinstated by the original artist, Mr Mak Wing
- 4 The Princess Tree is one of the oldest trees in the estate
- 5 The former estate entrance portal with “So Uk Estate” painted in gold Chinese characters will be reset in the new estate
- 6 The old Maple House has been restored as an exhibition space

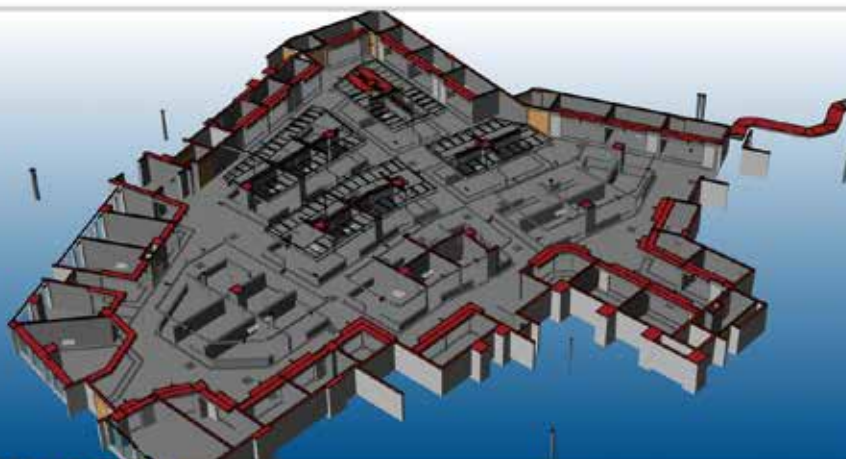
BIM is a modelling process that enables 3D (3-dimension) representation of the physical and functional characteristics of projects at the planning stage. In recent years, two new dimensions have been added to BIM, to capture the fact that time (4D) and cost (5D) are also factors that can have a major impact on design and construction management, and this has led to the version known as 5D BIM.

5D BIM technology enables contractors both to track the progress of a project and to predict its production rate and completion time. Delays can be easily identified, and immediate action can be taken to prevent similar delays. Indeed, 5D BIM emerges as the way forward for the construction industry, enabling architects, engineers, contractors and clients to significantly improve their operational efficiency and reduce risk in construction projects.

- ### 3rd D-Model



Info	Code	Name	Type	Cost M.
		Non Structure Wall, 45/00, 120mm		Yes
		Non Structure Wall, 45/00, 200mm		Yes
		Non Structure Wall, 45/00, 250mm		Yes
		Non Structure Wall, 45/00, 300mm		Yes
		Wall, 45/00, 200mm		Yes
		Non Structure Wall, 45/00, 25mm		Yes
		Back Wall, 120mm		Yes
		Back Wall, 200mm		Yes
		Non Structure Wall, 45/00, 175mm		Yes
		Non Structure Wall, 45/00, 220mm		Yes
		Wall, 45/00, 400mm		Yes
		Non Structure Wall, 45/00, 200mm		Yes
		Wall, 45/00, 150mm		Yes
		Curtain Wall		Yes
		Sheep Pile, 200mm/200mm		Yes
		Sheep Pile, 1125mm/200mm		Yes
		Sheep Pile, 200mm/200mm		Yes
		Sheep Pile, 200mm/240mm		Yes
		Sheep Pile, 200mm/200mm		Yes
		Sheep Pile, 200mm/200mm		Yes
		Sheep Pile, 1125mm/200mm		Yes
		Sheep Pile, 200mm/200mm		Yes
		Perimeter Deduction, Cavity, 45/00		Yes
		Perimeter Deduction, Non Structural Wall, 45/00		Yes
		Perimeter Deduction, Non Structural Wall, 45/00		Yes
		Perimeter Deduction, Non Structural Wall, 45/00		Yes
		Perimeter Deduction, Non Structural Wall, 45/00		Yes





## Application of 5D BIM at Anderson Road Sites A & B

At the HA, we have piloted 5D BIM to one of our most complex and challenging project, namely the Integrated Procurement Approach Contract for the public rental housing development at Anderson Road sites A & B, Phases 1 & 2, since 2013, where it has enhanced productivity and improved the quality of work done at the design and construction stages, including site planning and work sequencing.

## 5D BIM Applied to Wet Market at Anderson Road Site B

The benefits of 5D BIM are somehow abstract and hard to conceptualise. It is therefore worth taking a look at how 5D BIM delivered some very concrete benefits in the HA's development of a wet market on the lower ground floor of Anderson Road Site B.

Construction work of the wet market was scheduled to commence in April 2017 and complete in September 2017, an unforeseen site issue obstructed the site access and incurred potential

delay for about three months. To mitigate the potential delay, 5D BIM came into play. It enables designers to visualise the progress of construction activities and its related costs over time. By taking into consideration the revised time and cost factors, 5D BIM assisted designers to decide the best remedial options for the project and optimise the planned work schedule. Once construction work started, 5D BIM generates frequent and very precise progress records for management team, while its forecasting functions also allowed for better allocation of resources. The application of 5D BIM was instrumental in enabling the HA to meet the target completion date, despite the unforeseen delay in starting the project.

The HA is continuing to review its use of 5D BIM technology and look for ways of extending and improving its usage. It is also exploring whether this technology can be applied on a more regular basis, potentially allowing for better management of the entire project life cycle of our future public housing developments.

3 Animation of Anderson Road Sites A & B

