

Legislative Council Panel on Housing

Green roof in the Fu Shan Estate market

Purpose

This paper informs Members about the progress of the implementation of roof greening measures in public rental housing estates, and the recently completed green roof in the Fu Shan Estate market.

Background

2. In early November 2008, we briefed the Legislative Council Panel on Housing on the environment-friendly designs and green measures implemented by the Housing Authority (HA) in 2007/08 in general. Roof greening is one of the environmental initiatives for providing a healthy and sustainable living environment in PRH estates. It would enhance environmental benefits by improving thermal insulation, reducing glare and heat radiation so as to counteract heat island effects in the urban area, as well as enhancing biodiversity, visual and aesthetic values. With the recent completion of a number of greening projects by HA, we wish to brief Members on the successful case of the green roof of the Fu Shan Estate market and other roof greening initiatives planned.

Green Roof in Fu Shan Estate Market

3. When we embarked on the re-roofing works for the Fu Shan Estate market block in September 2007, having discussed with the local District Council Members and some local tenants' representatives, we proposed greening the roof with a total area of 914 square metres. We carried out a series of technical and feasibility studies to ensure that the existing single-storey market block was suitable for the green roof installation. These included structural inspection of its capability to take on the extra loading and that the draining system could cope with the greening installation. Since the roof will be re-roofed, and apart from installing a few water points for irrigation, there was no substantial additional plumbing works, therefore the water-proof condition of the roof did not require further inspection.

4. Comprehensive consultation with the Estate Management Advisory Committee (EMAC) was conducted from April to June 2008. Implementation of the project was finally confirmed in June 2008, followed by the invitation for tender. The whole project was completed in November 2008.

5. We have taken great care in choosing plant species. Those chosen are mainly sedum plants requiring only minimal maintenance. We arrange the plants of different colours in an artistic array to achieve the best visual effect. Since this green roof is centrally located in Fu Shan Estate, it could offer a pleasant view to a large number of tenants from domestic flats surrounding it, benefiting the estate as a whole. Detailed design of the roofing greening pattern, choice of plant species and photos showing the actual views are at **Annex 1**.

The Way Forward

6. Modeling on this successful case, HA intends to retrofit more green roofs of low-rise buildings in existing estates if further opportunities arise and the constraints in structural loading, drainage and waterproofing could be overcome. Accordingly, we have identified the lower blocks at Ping Shek Estate for implementing our next roof greening project as part of the Estate Improvement Programme¹. On the other hand, for new housing developments designed since 2004, HA is committed to providing green roofs in low-rise structures wherever feasible. We have completed about 420 square meters of extensive green roof in two new estates in 2007/08, and will complete about 3 500 square meters in six new estates in 2008/09. Detailed implementation of the projects is set out at **Annex 2**.

7. Members are invited to note the green roof in Fu Shan Estate market and the way forward of the roof greening projects of the HA.

Transport and Housing Bureau
February 2009

¹ Estate Improvement Programme focuses on rejuvenating aged estates and upgrading their basic facilities so as to reach the standard of the more recently completed estates.

Green Roof in the Fu Shan Estate Market

Project Information

The Design Concept

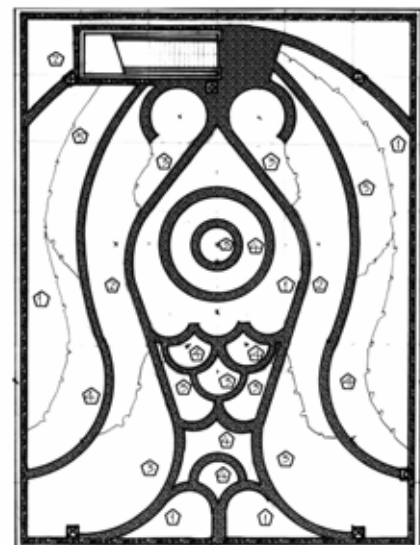
A landscape pattern carrying good wishes for residents and of strong visual effect was developed. We made use of plants of different types and colours to organise them into the form of a fish symbolising Wealth and Abundance.



Design concept



Rooftop of market before greening



Roof greening plan

The Site Works

2. On top of the inorganic growing substrate and drainage layer, maintenance pebble paths and greening materials of mainly sedum plants were installed according to the design pattern.






Completed green roof – side view






Completed green roof – front view and planting layout

The Plants

3. A majority of the plants used in the project are sedum plants, commonly known as stonecrop and mostly found in the Northern Hemisphere. They are hardy succulents that can survive in extreme drought and climatic conditions. Sedums are usually slow-growing spreading groundcovers with pink, white or yellow flowers. They exist as annuals to perennials, and even herbaceous. The characteristics of the plant materials used in the Fu Shan Estate roof greening works are described below:

 <p>1. Sedum nagasakianum</p>	<p>Perennial evergreen succulent</p> <p>Height: 10-15 cm Spread: 20-35 cm Sunlight: Full sun Flowering: - Flower: - Foliage: Dark Green Characteristics: Drought tolerant, prefers full sun and well drained substrate. Growing substrate: 80-100 mm of crushed brick Irrigation: Low, once a month during dry season (Oct-Feb) in average</p>
 <p>2. Sedum kamtschaticum</p>	<p>Perennial succulent</p> <p>Height: 10-20 cm Spread: 25-30 cm Sunlight: Full sun Flowering: May - July Flower: Yellow / white Foliage: Green Characteristics: Drought tolerant, prefers full sun and well drained substrate. Leaves fell when temperature drops to below 15C, new foliage comes back in spring Growing substrate: 80-100 mm of crushed brick Irrigation: Low, once a month during dry season (Oct-Feb) in average</p>
 <p>3. Sedum lineare</p>	<p>Perennial evergreen succulent</p> <p>Height: 10-20 cm Spread: 25-30 cm Sunlight: Full sun Flowering: May - July Flower: Yellow Foliage: Green Characteristics: Drought tolerant, prefers full sun and well drained substrate. Growing substrate: 80-100 mm crushed brick Irrigation: Low, once a month during dry season (Oct-Feb) in average</p>

 <p>4. Sedum mexicanum</p>	<p>Perennial evergreen succulent</p> <table border="1"> <tr> <td>Height:</td> <td>10-20 cm</td> </tr> <tr> <td>Spread:</td> <td>25-30 cm</td> </tr> <tr> <td>Sunlight:</td> <td>Full sun</td> </tr> <tr> <td>Flowering:</td> <td>May - July</td> </tr> <tr> <td>Flower:</td> <td>Yellow</td> </tr> <tr> <td>Foliage:</td> <td>Golden green</td> </tr> <tr> <td>Characteristics:</td> <td>Drought tolerant, prefers full sun and well drained substrate.</td> </tr> <tr> <td>Growing substrate:</td> <td>80-100 mm crushed brick</td> </tr> <tr> <td>Irrigation:</td> <td>Low, once a month during dry season (Oct-Feb) in average</td> </tr> </table>	Height:	10-20 cm	Spread:	25-30 cm	Sunlight:	Full sun	Flowering:	May - July	Flower:	Yellow	Foliage:	Golden green	Characteristics:	Drought tolerant, prefers full sun and well drained substrate.	Growing substrate:	80-100 mm crushed brick	Irrigation:	Low, once a month during dry season (Oct-Feb) in average
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 <p>5. Alternanthera bettzickiana</p>	<p>Perennial evergreen herbaceous</p> <table border="1"> <tr> <td>Height:</td> <td>10-15 cm</td> </tr> <tr> <td>Spread:</td> <td>10-15 cm</td> </tr> <tr> <td>Sunlight:</td> <td>Full sun</td> </tr> <tr> <td>Flowering:</td> <td>-</td> </tr> <tr> <td>Flower:</td> <td>White / yellow</td> </tr> <tr> <td>Foliage:</td> <td>Red</td> </tr> <tr> <td>Characteristics:</td> <td>Drought tolerant, prefers full sun and well drained substrate.</td> </tr> <tr> <td>Growing substrate:</td> <td>80-100 mm crushed brick</td> </tr> <tr> <td>Irrigation:</td> <td>Low, twice a month during dry season (Oct-Feb) in average</td> </tr> </table>	Height:	10-15 cm	Spread:	10-15 cm	Sunlight:	Full sun	Flowering:	-	Flower:	White / yellow	Foliage:	Red	Characteristics:	Drought tolerant, prefers full sun and well drained substrate.	Growing substrate:	80-100 mm crushed brick	Irrigation:	Low, twice a month during dry season (Oct-Feb) in average
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 <p>6. Gaura lindheimeri</p>	<p>Perennial evergreen succulent</p> <table border="1"> <tr> <td>Height:</td> <td>5-10 cm</td> </tr> <tr> <td>Spread:</td> <td>10-15 cm</td> </tr> <tr> <td>Sunlight:</td> <td>Full sun</td> </tr> <tr> <td>Flowering:</td> <td>Apr - Aug</td> </tr> <tr> <td>Flower:</td> <td>Red</td> </tr> <tr> <td>Foliage:</td> <td>Green</td> </tr> <tr> <td>Characteristics:</td> <td>Drought tolerant, prefers full sun and well drained substrate.</td> </tr> <tr> <td>Growing substrate:</td> <td>80-100 mm crushed brick</td> </tr> <tr> <td>Irrigation:</td> <td>Low, twice a month during dry season (Oct-Feb) in average</td> </tr> </table>	Height:	5-10 cm	Spread:	10-15 cm	Sunlight:	Full sun	Flowering:	Apr - Aug	Flower:	Red	Foliage:	Green	Characteristics:	Drought tolerant, prefers full sun and well drained substrate.	Growing substrate:	80-100 mm crushed brick	Irrigation:	Low, twice a month during dry season (Oct-Feb) in average
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Green Roof in new public rental housing estates

HA will complete about 3 500 square metres of extensive green roof in six new estates in 2008/09 as shown below:

Project	Area (sq.m.)	Location	Types	Progress
Tin Shui Wai Area 103 Phase 2	1 250	Roof of commercial centre	Turf	Completed
Choi Wan Site 1 Phase 1, 2 & 3	500	Roof of: carpark, commercial centre, refuse collection compound	Turf, Small shrubs and groundcovers	Completed
Fanling Area 36 Phase 1 & 2	370	Roof of refuse collection compound	Sedum plants	Completed
Un Chau Estate Phase 2 & 4	350	Roof of refuse collection compound	Small shrubs and groundcovers	Completed
Eastern Harbour Crossing Site Phase 3	510	Roof of refuse collection compound	Small shrubs and groundcovers	Under construction
Upper Ngau Tau Kok Estate Phase 2 & 3	530	Roof of refuse collection compound	Small shrubs and groundcovers	Under construction

Generally, three different types of planting are adopted for extensive green roofs in public rental housing estates:

(i) Turf

Turfed green roofs were installed for two projects, where larger roof areas are available, which are the rooftops of the commercial centres at Tin Shui Wai Area 103 Phase 2 and Choi Wan Road Site 1 Phase 3. The turf has substantially softened the hard roof surface and reduced glare and heat radiation from these buildings.



Tin Shui Wai Area 103 Phase 2



Choi Wan Road Site 1 Phase 3

(ii) Sedum Plants

We had installed the roof of the refuse collection compound of Fanling Area 36 Phase 1 & 2 with sedums in pattern and observing the long term performance of these plants. Sedum plants require the least maintenance in comparison with the other two plant types, but the choice of sedum for selection is still limited comparing to general shrubs and groundcover plants.



Fanling Area 36 Phase 1 & 2



Sedum plants

(iii) Small Shrubs and Groundcovers

We have planted shrubs and groundcovers in the roofs of low-rise structures in four estates. In order to carry out the greening project, we have enhanced the loading of the roofs. These plants require more maintenance, such as watering and pruning. However, they allow a wider choice which includes some native species (i.e. species which are available in Hong Kong).



Choi Wan Road Site 1 Phase 1



Un Chau Estate Phase 2 & 4