

Briefing for Green Roof in Schools Built/Maintained by ArchSD 17 June 2016



Architectural Services Department

The Government of the Hong Kong Special Administrative Region

Program

Introduction

Landscape Design and Plant Selection for Green Roof in School

Maintenance of Green Roof in School

Recent Preliminary Inspection to the Schools completed with Green Roof before handover to SSB but currently not maintained by ArchSD



Introduction



Architectural Services Department

The Government of the Hong Kong Special Administrative Region

Green Roof – ArchSD Role

Construct Green Roof on New School Buildings under Head 703

- 48 Schools completed since 2003
- 1 government school currently maintained by ArchSD;

Retrofit Green Roof on Existing Government School Buildings

- 28 Schools completed since 2003
- all under ArchSD maintenance;

Maintenance of the building structure for Government School Buildings



Green Roof Maintenance – General Tips

General Maintenance issues - Structural aspect to be covered later



Tree root punching through planter box – seek maintenance agent advise



Green Roof Maintenance – General Tips

Debris/ weeds blocking drain outlets - routine cleaning needed



Green Roof Maintenance – General Tips

In case there are trees in doubtful health conditions – conditions to be monitored



Landscape Design and Plant Selection for Green Roof in School



Benefits of Green Roof

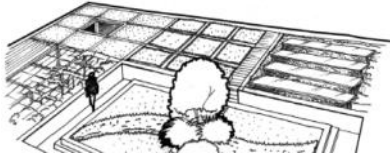
Environmental
Ecological
Economical
Aesthetic
Psychological
Educational



Image Source: Greening, Landscape and Tree Management Section, DEVB
<http://www.greening.gov.hk>



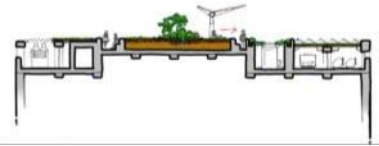
Content



Design Intention



Types of Green Roof



Typical Sections



Plant Species



Softscape Maintenance



Design Intention

INTENSIVE



EXTENSIVE



Types of Green Roof

INTENSIVE GREEN ROOFS:

密集型綠化屋頂

- **Deep soil** 厚土
- **Full plant range** 全面的植物種類
- **Wide range of uses** 廣泛適用於各工程
- **Higher capital & recurrent costs**
建設成本和經常成本較高
- **Better Green Roof Benefits**
較佳綠化屋頂效益

Growing Medium

種植層

Total depth: 30cm to 1.5m

總厚度: 30厘米至1.5米

EXTENSIVE GREEN ROOFS:

粗放型綠化屋頂

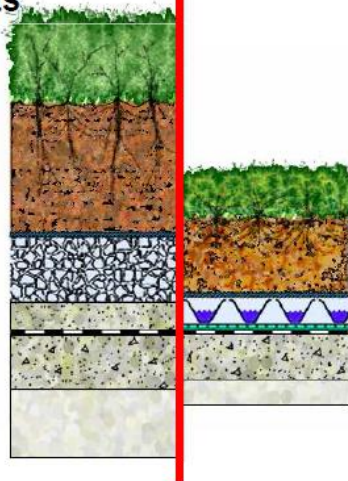
- **Shallow soil** 淺土
- **Limited plant range** 植物種類有限
- **Retrofitted** 適用於復修工程
- **Low capital & recurrent costs**
建設成本和經常成本較低

Growing Media

種植層

Total depth: 8cm to 15cm

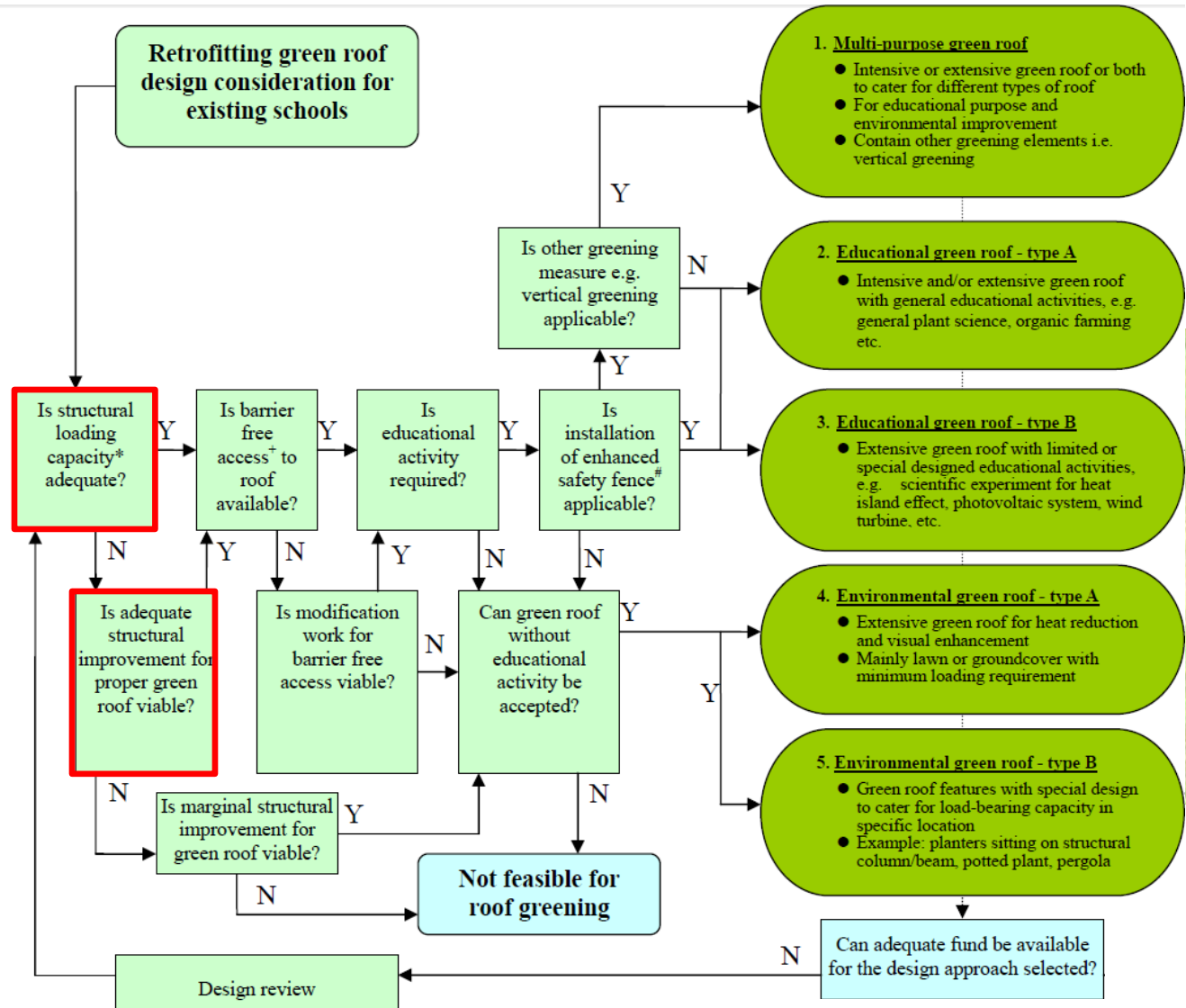
總厚度: 8厘米至15厘米



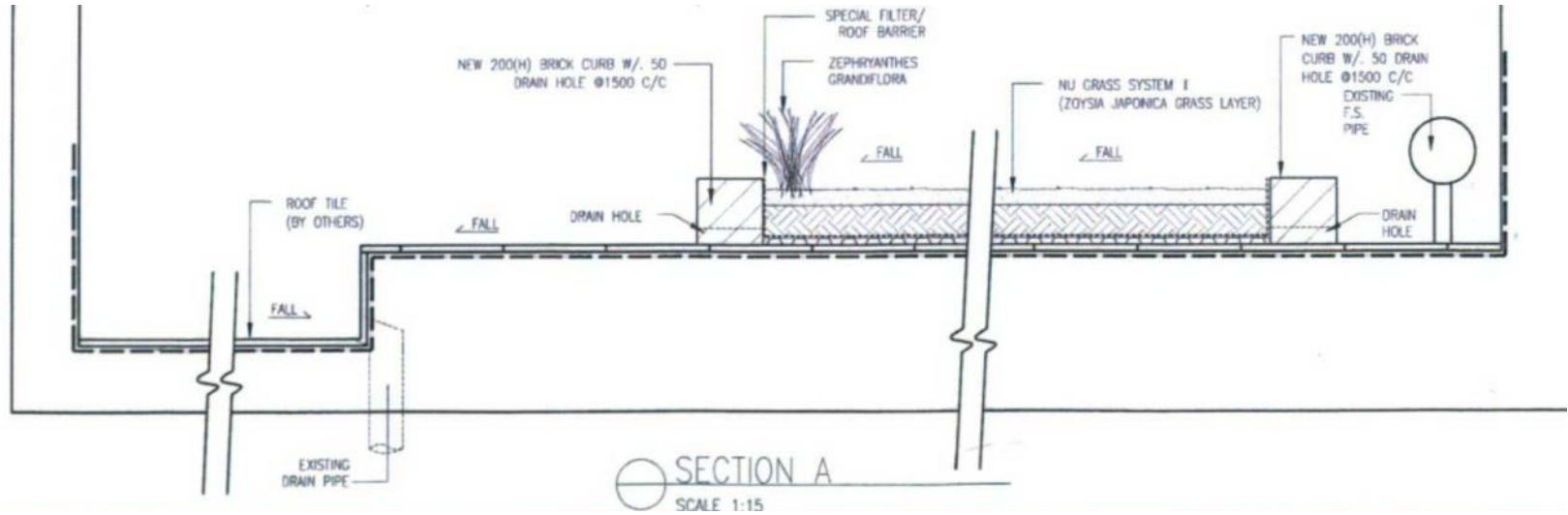
Retrofit Projects on Existing Structures



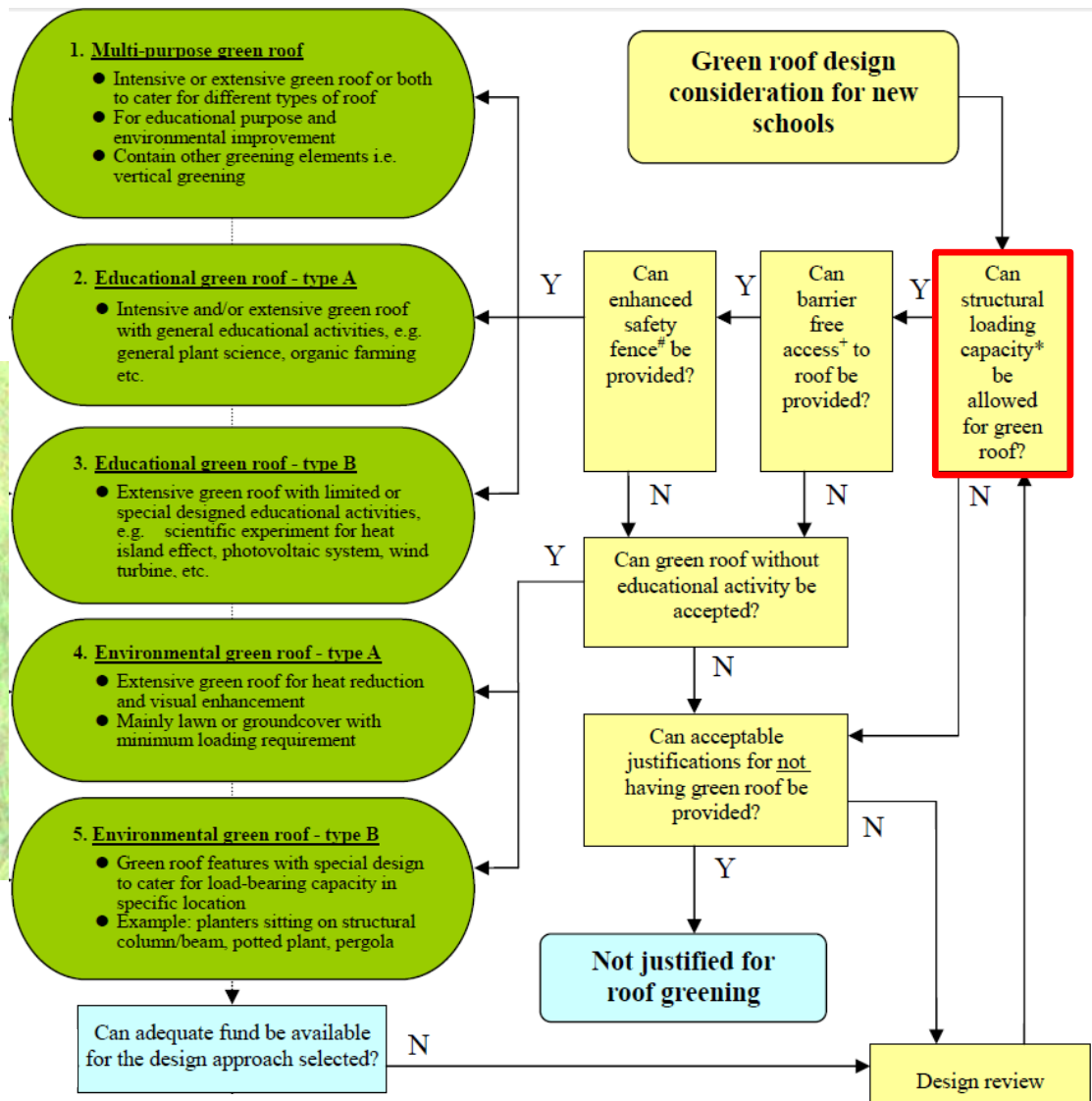
Source
 DEVB Skyrise Greenery
 Application in School
http://www.greening.gov.hk/en/green_technologies/skyrise_application.html



Typical Section



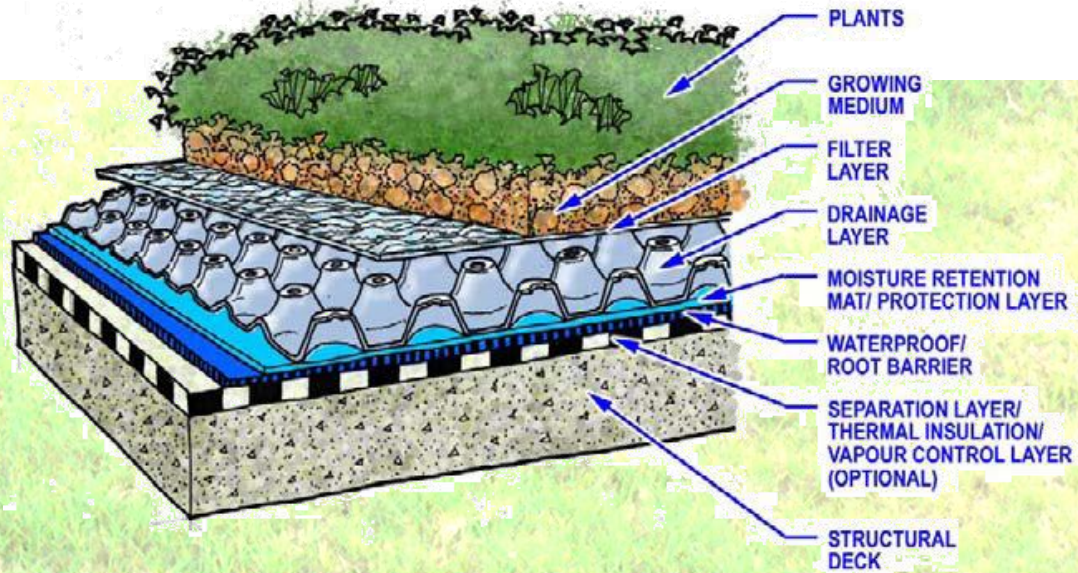
Green Roofs on New Buildings



Source
 DEVB Skyrise Greenery Application
 in School

http://www.greening.gov.hk/en/green_technologies/skyrise_application.html

Typical Section





1. Clean up rooftop surface



2. Install root barrier



3. Install drainage composite layer



4. Install water retention mat



5. Placing planting soil



6. Place plant materials

Typical Section

Typical soil depth for extensive green roof:

- 150mm for ground cover/turf planting for **new roof**;

Typical soil depth for raised up planters on structures/roofs:

- 300mm for ground cover / grass
- 600mm for ground shrubs
- 1200mm for tree planting



Plant Species

http://www.greening.gov.hk/en/green_technologies/skyrise_guide.html

Skyrise Greenery - Pictorial Guide to Plant Resources for Skyrise Greenery in Hong Kong

Preface



[Objective](#) (PDF)

[How to use this Pictorial Guide](#) (PDF)

[Reference](#) (PDF)

[Plant Search](#)

Please click the plant type for more details

Tree



Palm & Palm like plant



Conifer



Shrub



Ground cover



Climber



Succulent



Grass



Fern



Right Plant at the Right Place !!!



怎樣使用本圖鑑

How to use this Pictorial Guide

基本的植物鑑定資料 Basic plant information for Plant identification



科 Family: 蓼科 Polygonaceae
學名 Scientific Name: *Antigonon leptopus*
英文名 Common Name: Honolulu Vine
中文名 Chinese Name: 珊瑚藤

可忍受的生長環境 Tolerance:


植物以不同顏色分類的快速索引
Quick index of plant types, colour-tagged for easy reference

攀緣植物 Climber

生物和天然特性
Biological and physical properties

常綠 Evergreen
落葉 Deciduous

應用於本地環境的 實際例子 Practical examples and integration of skyrise greenery in the local context

應用例子 Applications



金屬網圍欄上的垂直綠化
Vertical greening on mesh fencing



自設棚架
Planting on a shelter



提供良好綠色覆蓋並在夏天綻放大量色彩鮮艷的花朵
Proville good green coverage and full bloom in summer

技術資料 Technical information

建議泥土深度
Recommended Soil depth

觀賞季節 In Season

建議泥土深度 (mm)	1	2	3	4	5	6	7	8	9	10	11	12
100-150												
150-200												
200-250												
250-300												
300-350												
350-400												
400-450												
450-500												
500-550												
550-600												
600-650												
650-700												
700-750												
750-800												
800-850												
850-900												
900-950												
950-1000												

灌溉需求 Irrigation Demand

垂直綠化的支撐方法
Support for Vertical Greening

肥料需求 Fertilising Demand

修剪要求 Pruning Demand

支撐方法 (只限垂直綠化)
Modes of support (for vertical greening only)

特點/Features



需要金屬網作支撐
Support with wire mesh



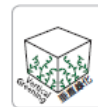
一簇簇和亮色的花朵
Clusters of pink flowers

植物具觀賞性的特點
Features and point of interest for plant appraisal and selection

護理需求的考慮
Maintenance demand considerations

符號註釋: Explanatory Notes to Symbols:

垂直綠化:
- 植物種植於建築物的外牆上或構築物的立面上



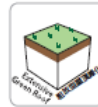
Vertical greening:
- Planting works on the vertical surfaces of buildings and wall-like structures

密集型屋頂綠化:
- 需要較厚土壤層
- 有較多植物種類可選用
- 較高護理和灌溉需要
- 若提供遮蔭可作休憩用途
- 例子：平台花園，屋頂綠化，空中花園



Intensive green roof:
- Consists of deeper soil depths
- Supports a greater diversity and wider plant range
- Requires higher maintenance and irrigation input
- Provides access for active use
- e.g. podium gardens, green roof and sky gardens

粗放型屋頂綠化:
- 需要較薄土壤層
- 植物種類選擇較少
- 較低護理和灌溉需要
- 提供的遮蔭只作護理工作用途



Extensive green roof:
- Consists of shallower soil depths
- A narrower plant range
- Requires minimal maintenance and irrigation
- Provides access for maintenance purpose only

護理需求 Demands and Maintenance

澆水次數
Irrigation frequency



Low: 每週一次
Once a week

Medium: 每週兩次
Twice a week

High: 每天至隔天
Everyday to every alternate day

施肥次數
Fertilising frequency



Low: 每年一次
Once a year

Medium: 每半年一次
Once every 6 months

High: 每六個月最少一次
More than once per 6 months

修剪次數
Pruning frequency



Low: 每年一次
Once a year

Medium: 每半年一次
Once every 6 months

High: 每六個月最少一次
More than once per 6 months

Example – *Zephyranthes candida*



本土 Native

外來 Exotic

常綠 Evergreen

落葉 Deciduous

科 Family:

百合科 Liliaceae

學名 Scientific Name:

Zephyranthes candida

英文名 Common Name:

Autumn Zephyr-lily

中文名 Chinese Name:

蔥蓮 (玉簫)

可忍受的生長環境 Tolerance:



強風 Wind



鹽霧 Salt Spray



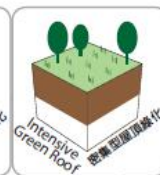
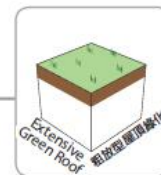
乾旱 Drought



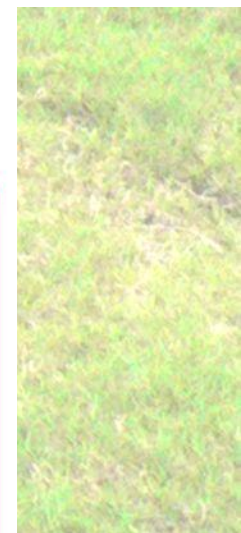
污染 Pollution



陰暗 Shade



地被植物 Ground Cover



應用例子 Applications



位於添馬公園的平台花園
Podium planting at Tamar Park



位於添馬公園的平台花園
Podium planting at Tamar Park



位於沙田污水處理廠的屋頂綠化
Green roof at Sha Tin Sewage Treatment Works

技術資料 Technical Information

建議泥土深度 (mm)

Recommended Soil Depth

100 - 200
200 - 300
300 - 450
450 - 600
1200 - 1400

觀賞季節 In Season

月份 Month	1	2	3	4	5	6	7	8	9	10	11	12
花 Flower							✪	✪	✪			
葉 Leaf												
果 Fruit												

灌溉要求 Irrigation Demand



肥料要求 Fertilising Demand



修剪要求 Pruning Demand



特點 Features



白色的花朵和黃色的花蕊
White flower with yellow
stamens



細緻柔滑的的葉子
Fine textured leaves



Softscape Maintenance



Plant
Conditions

Drainage

Irrigation

Pest &
Diseases

Weeding

Fertilizing



Maintenance Requirements





科 Family: 禾本科 Poaceae

學名 Scientific Name: *Axonopus compressus*

英文名 Common Name: Carpet Grass

中文名 Chinese Name: 地毯草

本土 Native

外來 Exotic

常綠 Evergreen

落葉 Deciduous

可忍受的生長環境 Tolerance:







強風 Wind 鹽霧 Salt Spray 乾旱 Drought 污染 Pollution 陰暗 Shade

草本植物 Grass

灌溉要求 Irrigation Demand



肥料要求 Fertilising Demand



修剪要求 Pruning Demand



灌溉要求 Irrigation Demand



肥料要求 Fertilising Demand



修剪要求 Pruning Demand






科 Family: 龍舌蘭科 Agavaceae

學名 Scientific Name: *Sansevieria trifasciata* 'Laurentii'

英文名 Common Name: Mother-in-Law's Tongue

中文名 Chinese Name: 金邊虎尾蘭

本土 Native

外來 Exotic

常綠 Evergreen

落葉 Deciduous

可忍受的生長環境 Tolerance:







強風 Wind 鹽霧 Salt Spray 乾旱 Drought 污染 Pollution 陰暗 Shade

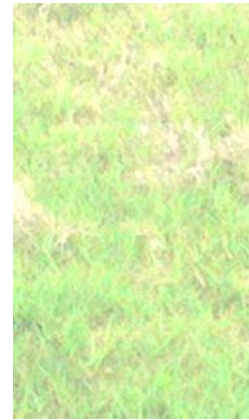
灌木 Shrub



Plant Condition



Weeding



Irrigation Point



Edge Condition



Drainage



More Information: <https://www.greening.gov.hk>

GREENING, LANDSCAPE & TREE MANAGEMENT SECTION,
DEVELOPMENT BUREAU,
The Government of the Hong Kong Special Administrative Region
of the People's Republic of China

ENG 繁體 简体 / A A A / 16 / 16 / 16 / 16 / 16 / 16

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People, Trees,
Harmony

Departments'
Greening Efforts

Tree Care

Community
Outreach

Green Technologies

Knowledge Database



綠化樹共融
greening

Skip Animation

What's new

- Seminar on 'Tree Life Cycle' & 'Urban Forest Management and Biodiversity' **NEW!**
- Seminar on Brown Root Rot Disease & Tree Failure Cases in Hong Kong **NEW!**
- Handbook on Tree Management **NEW!**
- Educational Video on Brown Root Rot Disease **NEW!**
- Greening Newsletter - Winter **NEW!**

Report
Problematic
Trees

1823

Information About
Tree Maintenance For
Private Properties

Maintenance of Green Roof in School

校舍綠化天台的保養



General Observation

- no observable maintenance deficiency related to the green roof projects completed by ArchSD
- as long as the green roof is properly designed and constructed, there should be no specific building maintenance issue compared with similar structures without green roof.



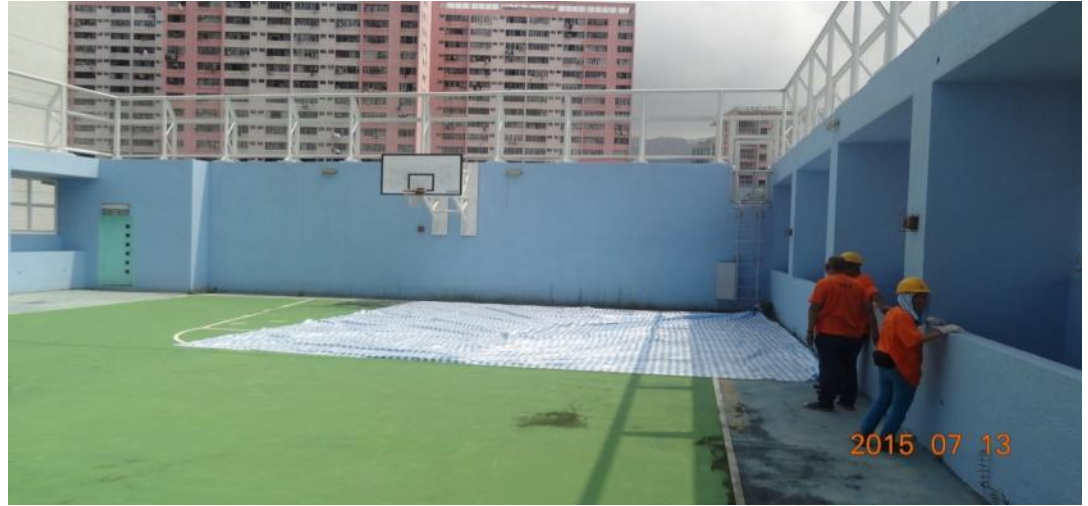
Water Tightness

- Green roof should be properly attended to prevent any potential damage to the existing water proofing layer.
- No evidence that the greening facilities will adversely affect the water-tightness of roof structure so far.



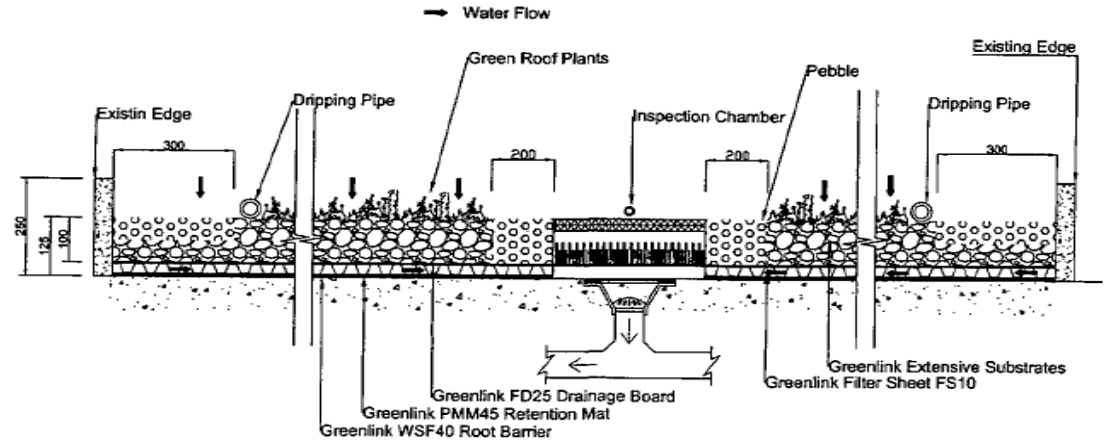
Structure

- Before installation of green roof, conduct structural assessment by Registered Structural Engineer
- Maintenance check for any structural defect where necessary, e.g. cracks, spalling concrete, water leakage, etc.



Routine Management Attendance & Inspection

- Attendance to clear surface channels
- Check Subsoil drainage and any movement joints under greening facilities
- Regular watering & fertilizing.
- Regular weeding , plant cutting & monitoring plant growth



**Recent Preliminary Inspection to the Schools completed with Green Roof before handover to SSB but currently not maintained by ArchSD
(Observations in respect of Structural Safety)**



- Government Schools : maintained by ArchSD
- Non – government Schools : maintained by school/EDB



- Preliminary Inspection in early June 2016 to 48 new Schools built by ArchSD
- Loading of original greening – already taken account in building design
- During this inspection, subsequent alteration & addition of greening was found in some schools.
- Sign of immediate danger at the time of inspection was not found, however follow up action is required



Addition of large area of greening :

Large additional planters -> Increase in loading



Extensive addition of pot planters - -> Increase in loading



Addition of large planters concentrated at small area -> Increase in loading



Change of use of the roof -> Change of loading



Minor cracks found at some RC beams under green roof – require further inspection and investigation to determine whether the cracks are structural cracks caused by overloading



Leakage problems found at some schools -
may lead to deterioration of the structure in
the long term – remedial works asap



Suggested Follow Up Action

- Schools not maintained by ArchSD is subject to Buildings Ordinance under which BD submission and statutory compliance checking is needed
- Seek professional advice from AP/RSE
- Proper maintenance and repairs to the green roof, including drainage system, and the supporting structure roof



Thank You



Architectural Services Department
The Government of the Hong Kong Special Administrative Region