



Sky Garden Ltd
 Unit 4 Beta Orchard Industrial Estate
 Toddington
 Cheltenham, Gloucestershire
 GL54 5EB
 Tele: 01242 620905
 Fax: 01242 620739
www.sky-garden.co.uk

The UK's leading independent green roof specialist

Operations and Maintenance Manual: LEIGHTON ROAD : BIODIVERSE ROOF SYSTEM

Live material must be irrigated immediately following installation and regularly thereafter!
 We stress this irrigation must continue in the first 4 months following installation, this is especially critical during hot and dry periods.
 We accept no responsibility for failure to comply with this notice.

Please refer to our full terms and conditions for further information.

Contents

Cover Page	1
Irrigation	1
Contents Page	1
Introduction	2
System Overview	2
Product Specification	3-6
-Protection Fleece	3
-Drainage Layer	3
-Soil Stabilisation	3
-Filter Fleece	4
-Substrate	4
-Vegetation	5
-River Stone Border	5
Extras	6
-Aluminium Edge Detail	6
-Habitat Features	6
-Paving	6
-Other	6
Installation Procedure	7
Installation Notes	8
Maintenance	9
Our Maintenance Package	10

Registered Office: Allmswood House, High St, Evesham, Worcs, WR11 4DU
 Company Registration Number: 06215200

Introduction

This manual has been produced to benefit you, the owner of a Sky Garden living roof. It provides you with the documentation required to understand how your roof was installed and a breakdown of Sky Garden specifications. This manual also offers you advice regarding your warranty and how to maintain your roof.

System Overview

Component	Brief Description
Protection Fleece	300g/m ² geo-synthetic protection fleece loose laid
Drainage Layer	20mm Rigid Drainage Board, with top fleece - 0.97m x 50m x 20mm - Recycled HDPE Drainage Board
Soil Stabilisation	Not Required
Filter Fleece	Loose Laid Filter Fleece - Engineered geotextile fleece, prevents fines from blocking drainage - 1mm fine grade geo-synthetic fleece
Substrate	Extensive Sedum Substrate - specialist low nutrient, free draining substrate blend designed to allow sedums to thrive and reduce the establishment of weeds - blended virgin recycled crushed brick and organic compost (20% maximum)
Vegetation	Sedum blanket - 70-90% pre-grown 1.1m x 2m planted coir blanket – 6-8 species (13kg/m ² dry – 30kg/m ² wet)
River Stone Border	20 - 40mm riverstones to system edges at a depth of 110mm and a width of 300mm
Aluminium Edge Detail	Not Required
Habitat Features	Not Required
Paving Slabs	Not Required

Product Specifications

Protection Fleece

Sky Garden protection fleece is manufactured from high tenacity virgin polypropylene. Providing high tensile properties and improved durability. The increased drawing within the fibre manufacturing process re-orientates the molecules within the fibre making it considerably stronger. With the increased molecular orientation and associated higher density it increases mechanical properties and environmental resistance properties that are paramount for good engineering construction methods

This product has been tested and conforms with BS EN ISO Standards

Physical Properties:

Composition:	High Tenacity virgin polypropylene staple fibre
Depth:	3.5mm @ 2kPa (BS EN ISO 9863;1)
Colour:	HDPE - Black, Geo-textile Light Grey
Unit supplied:	Rolled Sheet
Unit Width:	1m
Unit Length:	50m
Roll Weight:	50 kg

Drainage Board

20mm Board with Top Fleece- Rigid drainage board manufactured from HDPE. Combined function as a water-retention, drainage and filtration layer. Rigid sheet with integrated Polypropylene filter layer. Studded HDPE sheets contains perforations to drain surplus water and high capacity dimples (height c.20mm) for water retention.

Physical properties:

Polymer	High Density Polyethylene
Cuspate Height	20mm
Compressive Strength	115kPa
Perforations per m2	49
Perforation Diameter	10mm
Water Flow Through Perforations	24l/s/m ²
Water Storage Capacity	4l/m ²
Roll Dimensions	0.97 x 50m
Approximate Roll Diameter	1.2m
Approximate Roll Weight	60kg

Soil Stabilisation

Not Required

Filter Fleece

Sky Garden filter fleece is manufactured using UV stabilised polypropylene. Providing high tensile properties and improved durability. The increased drawing within the fibre manufacturing process re-orientates the molecules within the fibre making it considerably stronger. With the increased molecular orientation and associated higher density it increases mechanical properties and environmental resistance properties that are paramount for good engineering construction methods. It is to be covered within one month after installation.

Physical Properties

Composition:	High Tenacity virgin polypropylene staple fibre
Depth:	0.8mm @ 2kPa (BS EN ISO 9863;1)
Colour:	HDPE - Black, Geo-textile White
Unit supplied:	Rolled Sheet
Unit Width:	1.13m
Unit Length:	100m
Roll Weight:	14 kg

Substrate

Sedum Substrate: A specially blended mix of free draining organic material with clean and screened aggregates, recycled from certifiable waste products from the building industry, to provide a low nutrient water retentive growing medium.

Physical Properties

Composition:	Recycled crushed brick/mineral and Organic material (Green Waste).
Depth	50mm
Brick grading:	Various grading of brick that are suitable for an extensive green
Colour:	Dark Brown
Sizes:	Bulk bags (IBC) and 25kg sacks
Weight (dry):	1000kg/m ³
Weight (saturated):	1510kg/m ³
Compaction:	Approx. 5% (+/- 3%)

Vegetation

High quality, precultivated Sedum Blanket, grown in the UK, to provide the perfect low maintenance solution for extensive green roof systems, using a carefully selected mix of 8-12 sedum species, specifically chosen for extensive green roof applications

Properties

Composition:	Base - Geo-composite polypropylene mesh / coir blanket. Growing Medium - 20mm Sedum Mix.
Plant Height:	20-50mm, depending on growing stage of sedum.
Weight (dry)	15kg/m ²
Weight (saturated):	20kg/m ²
Consignment Size:	35m ² per Pallet
Colour:	Seasonal variation

Species

Sedum acre, Sedum album, Sedum ellacombianum, Sedum floriferum, Sedum forsterianum, Sedum hybridum, Sedum kamtschaticum, Sedum montanum, Sedum reflexum, Sedum selskianum, Sedum sexangulare, Sedum spurium.

River Stone Border

The river stone is for use with in our green roof borders, providing free drainage and an aesthetically pleasing finish.

Properties:

Materials:	Mixed rounded quartzite and granites
Colour:	Greys, browns and reds
Size:	20-40mm
Delivered as:	25kg bags
Border dimensions:	Width; 300 Depth; 110

Extras

Aluminium Edge Detail

Habitat Features

Not Required

Paving

Not Required

Other

None

Installation Procedure

The Roof was initially checked to ensure that a safe working environment was in place i.e. edge protection/scaffold or mansafe system was present. Sky – Garden or the contractor ensured lifting equipment was ready to lift materials to the roof. Ensuring all other trades had finished working on the roof before work commences.

The drainage layer was placed onto the roof ensuring a continuous drainage layer was formed. Drainage was cut at perimeters of the roof leaving a neat edge. Where protruding skylights etc came through the roof the drainage layer was butted to the protrusion and in a similar method to that of the roof perimeter the drainage was cut leaving a neat edge.

If required a filter fleece was rolled onto the drainage layer to protect the layer from being blocked by fines. The fleece was overlapped by 100mm to again prevent any blockage of the drainage layer.

Riverstone borders were constructed through the use of 25kg bags placed at the green roof perimeter (1 bag per 800mm). Bags were split open and pebbles were hand places evenly along boarder at a width of 300mm and height of 80mm (site specific). Aluminium edging detail is ballasted in place using the weight of the riverstone borders.

The aluminium edge retention detail was loose laid and ballasted down by the living roof system.

Substrate is spread on to the roof via two methods:

Either 25kg substrate bags were placed onto the roof over fleece at 1.6 bags per m² (based on 50mm depth). Bags were then cut bags at and spilled evenly over fleece. The substrate is then raked to ensure an even layer over roof.

If tonne bags were used the bags were raised onto the roof using lifting equipment then shovelled from the bag onto the roof evenly ensuring the required layer.

For the live material, if blanket was used, it was laid over the substrate ensuring each piece was butted up to the previous with an overlap of 20-40mm in to allow for shrinkage. Rolls were cut at roof perimeters and extra pieces were used to cover any bare patches. If seed was used, it is generally spread at a rate of 3g/sqm onto bare substrate and then watered into the roof. Plugs are generally planted at rate of 20/m² in a neat arrangement. In some casess, plugs are planted in groups to provide an environemnt for a range of invertibrates and birds.

Sky-Garden / the roof contractor made all possible arrangements to ensure no other trades were allowed to access roof prior to installation. This cannot obviously always be the case.

Installation notes

All materials were supplied to and delivered directly to the site. The live material was unloaded immediately and installed within 48 hours of delivery to site.

The supporting build up of drainage layers, filter sheet, substrate and any hard landscaping was completed before the live material was delivered to site, minimizing the vegetation stand time.

The optimum period to install most vegetation is late September/early October, and late March/early April. Extra care must be taken during the months of June, July and August to ensure live material does not overheat – refrigerated delivery vehicles and off-loading within 24 hours are recommended. Extra irrigation may be required during summer months, these are discussed below.

In high wind conditions it may be necessary to temporarily pin the vegetation down through to the drainage board or wire tie each blanket.

As per your quotation

Live product must be unloaded and watered immediately upon installation. If watering is not implemented immediately and for the first 12 weeks in situ, Sky-Garden cannot take responsibility for the growth and success of the vegetation. This is especially important during the period 01/05 - 30/09 each year. For pitched roofs over 7.5 degrees we would recommend the installation of a permanent irrigation system.

Irrigation should take the form of complete system saturation at least once a week, in the first 12 weeks following installation. These same steps should be taken during prolonged periods of hot and dry weather.

Should temporary irrigation be in place we recommend the following:

- ∅ Regularly check that the sprinklers are correctly positioned, prevailing wind may affect coverage.
- ∅ Regularly check that the tank water is suitable for the roof irrigation.
- ∅ In the event that the water becomes contaminated, turn off the irrigation immediately and drain the system.
- ∅ Regularly check that the submersible pump remains submerged in the tank
- ∅ Do not operate the pump out of the tank, this will cause the pump to fail

- ∅ With the onset of winter, the system will need to be drained and decommissioned

Maintenance

Following the installation of your Sky-Garden living roof, a maintenance schedule should be organised to ensure you're getting the best from your roof. It is important to recognise that although our systems are generally low maintenance; this does not mean they require no maintenance. We recommend some basic care and attention should be paid to your roof once or twice per year and particularly in the following few months after initial installation.

The Vegetation

Please note that plants will not be 'green' all year around. It is quite common for the plants to change colour at different times of the year, particularly when under stress from lack of water or in frosty conditions. In the spring and summer the plants will flower and it is quite common for some of the varieties of plant in the blanket to die back in the winter. Maintenance of the vegetation should concentrate on the removal of weeds and to insure healthy growth, in the unlikely event the live vegetation appears to be of low coverage or struggling then fertiliser should be applied to aid long-term growth.

Irrigation

During the first two months following installation the vegetation recovers from being moved and agitated during the transportation and installation. Should the weather be particularly dry during this period then watering is essential to ensure the green roof establishes itself as quickly as possible. This should be administered once every two to three days via hose or sprinkler system until system is at full saturation. If you want it to remain 'green and luscious' in dry conditions, you should consider the installation of an irrigation system.

Weather

Regular checks should be undertaken to ensure that high winds or heavy rainfall have not moved or dislodged any of the materials. This is essential during the first few months as the plants will not have fully rooted into the underlying layers and will be more vulnerable. The movement of products is unlikely but possible in extremes of weather. Should it move, providing it has not been damaged, simply move it back and water in well.

Drainage

Open drains should be checked for build up of dead vegetative material and cleaned as appropriate at each 6 month/annual inspection. This also applies to covered drainage outlets.

Fertilising

Sky garden recommend that sedum fertiliser be applied twice annually for long-term healthy growth of the sedum. Customers can purchase and apply our fertiliser by hand.

Our Maintenance Package

Sky-Gardens do offer maintenance packages should you wish preserve the diversity and aesthetic performance of your green roof. Our package includes bi-annual visits: one in the spring / early summer and one autumnal visit, we also offer general roof inspections and assessments. All visits are carried out by our own registered living roof maintenance teams who are experienced with our systems and understand the key elements of long-term living roof success.

Any fertiliser and/or weed control treatments are included as part of the package and will be undertaken by certified employees only. Our fertiliser or weed killer applications come from a range of products developed specifically for Sky-Garden roof systems and are natural organic or naturally derived. Herbicides are species specific, low impact and used only as a last resort to tackle invasive or widespread weed problems.

The standard maintenance package will run over a 12 month period from the date of contract and will contain two remedial visits to inspect and carry out the required works as detailed below. Costs of maintenance are based on our daily rate for our maintenance team, on the number of visits per year, the location, the accessibility of the roof area and provisions of man safe systems. We cannot access any roofs without a suitable man safe system in place.

For more information please contact:

Simon Smith
07787278480
Simon.Smith@sky-garden.co.uk
Business Development Manager South West



The UK's leading independent green roof specialist

Sky Garden Ltd
Unit 4 Beta Orchard Industrial Estate
Toddington
Cheltenham, Gloucestershire
GL54 5EB
Tele: 01242 620905
Fax: 01242 620739
www.sky-garden.co.uk

Registered Office: Allmswood House, High St, Evesham, Worcs, WR11 4DU
Company Registration Number: 06215200