BAUDER

Bauder Substrate Systems - Extensive Green Roof System

Non-accessible, green roof waterproofing system with extensive or Biodiverse substrate; suitable for both new build and refurbishment applications.

Please contact Bauder Technical Services for confirmation of suitability to waterproofing system and deck type
E: technical@bauder.co.uk
T: 0845 271 8800

Vegetation, refer to the table below for available options

Bauder (FLL Compliant) Substrate

Bauder Filter Fleece

Drainage Layer (DSE 40 / DSE 20)

Protection Layer (FSM 600)

Slip Layer (PE foil)

SYSTEM OPTIONS

Product	XF300 Sedum Blanket	XF118 Wildflower Blanket	Wildflower Plugs	Flora 3, 5, 7,	Sedum Plugs
Bauder Substrate (FLL Compliant)	Extensive	Biodiverse	Biodiverse	Biodiverse	Extensive
Drainage Layer	DSE 20	DSE 40	DSE 40	DSE 40	DSE 20
Depth	Min: 60 mm Max: 80mm	Min: 80mm Max: 150mm +	Min: 100 mm Max: 150mm +	Undulating 80-150mm	Min: 80 mm Max: 100mm
System Height	108 - 128mm	148 - 218mm	143 - 193mm	123 - 193mm	103 - 123mm
Saturate Weight	Min: 122.30 Kg/m^2 Max: 146.30 Kg/m^2	Min: 157.20 Kg/m^2 Max: 241.20 Kg/m^2	Min: 139.20 Kg/m^2 Max: 199.20 Kg/m^2	Average 157.00 Kg/m^2	Min: 108.50 Kg/m^2 Max: 132.50 Kg/m^2
Edge Trim	AL80/100	AL150	AL150	AL150	AL80/100
Irrigation	Not normally required	Required	Required	Required	Not normally

Available Trims	
AL80/100 Edge Retention / Drainage Trim	
AL150 Edge Retention / Drainage Trim	

Date: 10-11-2014

TECHNICAL DATA SHEET

Bauder Filter Fleece

DESCRIPTION
Filtration layer that prevents substrate fines from washing into the drainage layer.

TECHNICAL DATA:

Composition

Material	Polypropylene fleece

Weights and sizes

Standard roll width	1 or 2 metre
Standard roll length	100 metres
Thickness:	ca. 1mm
Weight:	125g/m²
Pore size	ca. 0.13mm

Supply Form
Rolls

Colour
white

UNITED KINGDOM
Bauder Ltd
70 Landseer Road
Ipswich Suffolk England IP3 0DH
T: +44 (0)1473 257671 **E:** info@bauder.co.uk
bauder.co.uk

IRELAND
Bauder Ltd
O'Duffy Centre Cross Lane Carrickmacross
Co. Monaghan Ireland
T: +353 (0)42 9692 333 **E:** info@bauder.ie
bauder.ie

Date: 10-04-2010

TECHNICAL DATA SHEET

Bauder DSE40 Drainage and Protection Layer

DESCRIPTION:

Water storage and multi-directional drainage layer that provides a pressure resistant stable base for high loads or support for roof mounted equipment without compression to the drainage capacity.

TECHNICAL DATA:

Composition

Material	Recycled High Density Polyethylene

Weights and sizes

Size: 1.04m x 2.03m
Thickness: 40mm
Coverage: 2.1m²
Weight: 1.8kg/m²
Saturated Weight: 15.3kg water only/27kg infilled with mineral drain
Water Storage Capacity: 13.5l/m² empty/8.4l/m² infilled with mineral drain
Fill Volume (Mineral Drain): 21l/m²
Compressive Strength: 80kN/m² when empty/≥ 1000kN/m² when infilled

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Date: 10-04-2010

TECHNICAL DATA SHEET

Bauder FSM600 Protection Mat

DESCRIPTION
Protection mat to prevent mechanical damage to the underlying waterproofing

TECHNICAL DATA:
Composition

Material	polyester and polypropylene fibre mix

Weights and sizes

Standard roll width	2 metre
Standard roll length	30 metres
Thickness:	ca. 4mm
Weight:	600g/m²

Supply Form
Rolls

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Date: 10-04-2010

TECHNICAL DATA SHEET

Bauder PE Foil Separation Layer

DESCRIPTION
Separation layer and slip layer.

TECHNICAL DATA:
Composition

Material	polyethylene foil manufactured from recycled granules

Weights and sizes

Standard roll width	4 metre
Standard roll length	50 metres
Thickness:	ca. 0.2mm
Weight:	0.19Kg/m²

Supply Form
Roll

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Habitat Management Plan

1. Landscape Management Objectives

The landscape and habitat management plan for Kingsland Road is based on the biodiversity roof specification for the roof areas. The key components of which are:

- A variety of mature British Native species
- An increasing number of flora and fora species present on the site.

The build-up is detailed in Appendix A.
To be read in conjunction with the roof plan of the green roof areas.

2. Back ground Information

Extract from London Borough BAP (Biodiversity Action Plan) 2013-2018

Green Roof Design Basics

There are many things to consider when designing and implementing a green roof:

- Whether site is overlooked and any potential privacy infringements;
- Root barriers and waterproofing and drainage capacity (*see below for design specifications*);
- Amount of external heat generated by the building and surface flooding risk;
- Weight and structural considerations;
- Ease of installation and maintenance;
- Aesthetics, access and amenity provision;
- Habitats and biodiversity.

Biodiversity design and considerations

The following outline some key principles for maximising the biodiversity benefit of living roofs. These can be most extensively be applied on green or brown roofs designed for biodiversity; however they can also be incorporated to varying degrees into intensive and semi-intensive green roofs.

Surroundings

- In built-up areas, living roofs and walls can make a significant contribution to an area's greenspace.
- Habitats in the surrounding areas should be considered e.g. if there are important brownfield sites nearby, the strategic provision of brownfield habitat on roofs could increase connectivity between sites.

Substrate

- Substrate depth should be between 80 and 150mm and vary across the roof.
- For brown biodiverse roofs, reclaimed building material can be used but should be screened to ensure that it is not contaminated*. (This is no longer recommended!)*
- Areas of bare ground can provide habitat for warmth-loving invertebrates and recreate an open mosaic habitat structure.
- Mounds and ridges can provide varying microclimates suitable for different

species and create structurally diverse vegetation

Planting

- Planting should consider the climate, microclimate, plant attributes and objectives.
- Vegetation can establish either through natural colonisation or planting
- Colonisation can produce habitat of high value but can also create problems with undesirable species.
- The sowing of annuals or plug planting combined with seeding can be beneficial as it provides a resource for species for the first few years during establishment

- **Sedum** has less biodiversity value but can still deliver drainage benefits etc. and can be combined with other plantings and substrates (on biodiverse roofs should be less than 30%).
- **Wildflowers** provide a habitat for beetles, bees, butterflies and moths. Planting density should be 15-20 species/m_2. In addition to constituting the main planting for biodiverse green roofs, they can be incorporated into extensive brown roofs and sedum roofs. Mosses, succulents and grasses can provide additional variation.
- **Shrubs and cover** can be provided depending on structural considerations and substrate depth and can provide cover for wildlife, perches and winter food for birds, and windbreaks.

Other Biodiversity Features

- *Over-wintering* vegetation allows many invertebrates to complete their lifecycle;
- *Log piles and deadwood* can provide habitat and perches for invertebrates and birds;
- *Bee banks* are mounds of sand and provide valuable nesting sites;
- *Stones and mounds of cleaned bricks* can provide insect and spider habitat;
- *Ponds and wet areas* can provide a valuable resource for many species;
- *Bug hotels and habitat walls* for nesting and overwintering invertebrates.

Maintenance

- Maintenance will vary between roofs and it is important to understand the maintenance requirements before the roof is installed;
- Most extensive green roofs do not require extensive irrigation and fertiliser;
- Initial watering will usually be required during establishment (for around 6 weeks);
- Monitoring and removal of undesirable species may be required;
- Habitat management e.g. re-creating bare-ground areas may be required.

Suggested wildflowers

Achillea millefolium / Yarrow (BL)
Agrimonia eupatoria / Agrimony
Anthyllis vulneraria / Kidney vetch
Centaurea nigra / Common knapweed
Echium vulgare / Viper's-bugloss
Galium verum / Lady's bedstraw
Hypericum perforatum / Perforate St. Johnswort

Knautia arvensis / Field scabious
Lamium album / White dead nettle (BL)
Leontodon autumnalis / Autumn hawkbit
Leontodon hispidus / Rough hawkbit
Leucanthemum vulgare / Oxeye daisy
Linaria vulgaris / Common toadflax
Lotus corniculatus / Bird's-foot trefoil
Malva moschata / Musk mallow
Origanum vulgare / Wild marjoram
Plantago media / Hoary plantain
Primula veris / Cowslip
Prunella vulgaris / Selfheal
Sanguisorba minor / Salad burnet
Silene latifolia / White Campion
Silene noctiflora / Night flowering catch-fly
Silene uniflora / Sea campion (GRG)
Silene vulgaris / Bladder campion
Thymus ducci / Wild Thyme (GRG)
Trifolium Pratense / Red clover (BL)

3. Review of the Management Plan

The flora and fauna on the roofs is likely to evolve over time. It is therefore highly likely that the plan be required to change and along with it the maintenance requirements. To facilitate this the plan calls for monitoring in the second summer with a review of the plan and maintenance for years three to five. This process to be repeated again after five years.

4. Maintenance Programme

2 visits per year in Spring/summer and autumn for five years.
Additional monitoring visit in summer of second and fifth year.

Work to be carried out by Bauder Green Roof Maintenance.

Note: None of the green roof are designed to be trafficked in any way, the roofs should not be accessed by anyone except for repair or essential maintenance works, any damage to the surface finishes of the roofs should be reported to Bauder immediately.

Initial 10 weeks (directly after installation)

The green roofs, the wild flower roof is designed to need a minimum of maintenance. However, some intimal watering will be required during the first 10 weeks after installation if there is insufficient rain fall.

- Watering should be regular (every day) when there are periods without rainfall, this can be reduced as the planting become more established.
- Watering should be carried out with a fine mist sprinkler or rose.
- Efforts should be made to not to traffic the roof during watering.

Bird and Bat boxes: Assess the site for suitable locations for bird and bat boxes (It was felt at planning stage that there were no suitable locations)

Monitoring:
Assess the % failure of plugs 10 weeks after planting.

Establishment Period (Yrs 1-2)

Maintenance. During the first 2 years maintenance visits should be twice yearly (spring/summer and autumn)
Maintenance Works
All Areas, every visit work required:

- Pebble Border: remove all vegetation from Pebble borders
- Outlets: check outlets are clear and free from slit and detritus

Wildflower/biodiverse Roofs work required:

- Remove unwanted and invasive weeds.
- Wildflower areas: Cut and remove flower seed heads and taller grasses above 150mm. if required (during autumn visit only0.

Monitoring
Summer of year 2

- Assessment of the number of original plant species still present on site, plus additional species which may have colonised the roofs. After an initial introduction of 20 Plus plant species onto the range of roof habitats

From these assessments the management plan for the following 3 yrs can be adjusted.

Maintenance Period (Yrs 3-5)

Maintenance. During the years three to five maintenance visits should be twice yearly (spring/summer and autumn)

Maintenance works all areas every visit:

- Pebble Border: remove all vegetation from Pebble borders
- Outlets: check outlets are clear and free from slit and detritus

Wildflower/biodiverse Roofs work required:

- Remove unwanted and invasive weeds.
- Wildflower: Assess the percentage coverage of wildflowers
- Cut and remove flower seed heads and taller grasses (above 150mm) if required during Autumn visit only

Monitoring
Summer of year 5

- Assessment of the number of original plant species still present on site, plus additional species which may have colonised the roofs.

From these assessments and reference to the Camden BAP (2013-2018) the management plan for the following 5 yrs can be adjusted.

GENERAL MAINTENANCE PROCEDURE

BAUDER BIO-DIVERSITY GREEN ROOF SYSTEMS

The following is a guide to the maintenance necessary to keep a biodiverse green roof in a condition broadly similar to that in which it was first installed. The information relates to installations that have been completed for one full growing season and where establishment maintenance has been effective. For clarity, establishment maintenance relates to tasks continuing on after installation, where a defined period of regular watering and minor maintenance is required until the planting has rooted into the growing medium, adapted to its location and can be considered established.

What to Expect from Your Bio-diverse Green Roof System

A Bio-diverse green roof can offer many variations, combined with the wide range of flora and fauna that can either be incorporated into or encouraged onto the finished installation. This makes it impractical to offer a general description of how a Bauder Bio-diverse extensive green installation might look and perform. Some are designed for the specific number of native species present within the plant community to meet planning or building code requirements, whilst others are intended to meet specific aesthetic design criteria.

A Bauder Bio-diverse landscaped extensive green roof is designed to meet the specific client requirement for any project and to provide a viable, long-term ecology at roof level that with some basic maintenance will continue to deliver the environmental benefits for which it was intended.

General Maintenance

The level of maintenance of the horticultural element of this type of green roof will vary significantly, dependent upon the various species of vegetation incorporated and the purpose for which it was initially installed. Whilst the original intent may have been to allow the green roof to grow wild, the problems that this can create with the build-up of dead or unwanted vegetation and the impact that this has to the appearance and type of vegetation on the roof will often dictate the need for basic maintenance to be carried out.

The Bauder biodiversity green roofs which are currently being installed to meet either BREEAM or Sustainable Homes codes will include a species mix selected to provide a balanced plant community on the roof and will require basic maintenance if this is to be sustained in the long term.

Maintenance is best carried out annually, during springtime and additionally in late autumn should the particular roof location be affected by local trees that produce surface leaf litter. Some deposited leaf litter may be considered as contributory to the bio-diverse environment, which is acceptable so long as provision is made to ensure that this has no negative effect on other plants and the roof drainage performance.

The following procedures should be carried out in order to ensure the roof is maintained in good condition and to protect the validity of the waterproofing system guarantee.

UK OFFICE
Bauder Limited
70 Landseer Road, Ipswich, Suffolk IP3 0DH, England
T: +44 (0)1473 257671 F: +44 (0)1473 230761 E:technical@bauder.co.uk
Bauder.co.uk

IRELAND OFFICE
Bauder Limited
O'Duffy Centre, Cross Lane, Carrickmacross, Co Monaghan, Ireland
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Note!

Specifically designated biodiversity areas should be disturbed as little as possible during maintenance so as not to upset any micro-habitats that may have colonised.

Preliminary Maintenance Procedures

- Ensure safe access can be gained to the roof and that relevant Health and Safety procedures are followed when working at roof level. It is advised that the contractor should always seek proof of current maintenance for any man-safe roof access systems prior to proceeding with the work on site.
- In order to avoid a build-up of bio-mass on the roof it is recommended that all dead vegetation is removed with a strimmer and provision made for the debris to be safely lowered to the ground and disposed of.
- We recommend removing unwanted leaf litter that has fallen onto the roof surface from overhanging trees both in the spring and autumn, to ensure that this does not smother the vegetation beneath.
- Open the lids of all Inspection chambers, to inspect and ensure that all rainwater outlets and downpipes are free from any blockages and that water can flow away freely.
- Ensure that any protective metal flashings and termination bars remain securely fixed in place. Advise the client of the need to repair or renew as necessary.
- Examine all mastic sealant and mortar pointing for signs of degradation. Advise the client of the need to repair or renew as necessary.
- Check that all promenade tiles and paving slabs are securely fixed to the roof surface and in good condition.
- Ensure that any new items of plant/equipment on the roof are mounted on suitable isolated slabs and that any fixings used to secure the plant/equipment in place do not penetrate the waterproofing. If in doubt, please contact Bauder for further advice.
- The Building owner should keep a record of all inspections and maintenance carried out on the roof. Any signs of damage or degradation to the waterproofing should be reported to Bauder immediately, in order that arrangements can be made for remedial work to be carried out if necessary.
- Damage to the landscaping should be reported to the building owner. If this damage includes Bauder components, then Bauder may be contacted for remedial advice.
- Works to adjoining areas - When carrying out any maintenance to adjoining roof areas, care must be taken not to damage either the green roof landscaping or the waterproofing system. If it is considered that either element has been affected, then Bauder should be contacted for advice. Any waterproofing damage caused after completion of the original installation may invalidate the guarantee.
- Alterations - Any unauthorised alterations to the waterproofing system will invalidate the guarantee. If such a situation should arise, then Bauder should be contacted so that we may advise on the alteration and how it should be incorporated without affecting the guarantee.

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Plant related maintenance tasks required

1. Plant encroachment.

Any vegetation which has encroached into drainage outlets, Inspection chambers, walkways and the vegetation barriers (pebbles) should be removed. If movement/settlement of the pebble vegetation barrier has occurred, additional washed stone pebbles similar to the existing are to be added.

2. Plant Maintenance.

In the absence of specific instructions from the building owner or their designated consultant, advice should be sought from both the project landscape designer and the plant supplier and any maintenance carried out according to their specific recommendations.

3. Maintenance of the Bauder XF118 Wild Flower Blanket.

If the Bauder XF118 Wild Flower Blanket has been installed the **minimum** recommended maintenance of the vegetation is as follows:

In the late autumn the vegetation is to be strimmed back to a 50-70mm height and the unwanted waste matter removed and lowered to ground level for composting/disposal.

In late March/April apply an 80g/m2 dressing of Bauder slow release organic fertiliser to the vegetated surface.

Note!

Should it be decided that the XF118 Wild Flower Blanket is to be left unmaintained to naturalise it, we would advise that this will lead to a substantial build-up of dead vegetation on the roof that will over time significantly reduce the number of vegetation species within the blanket.

4. Weeding.

With the exception of saplings, which should always be removed, weeds in a bio-diverse green roof should be considered as a problem only of aesthetics, unless they are particularly invasive. If considered undesirable, they can be removed.

5. Fertiliser.

Where the vegetation has been provided by Bauder, our organic slow release fertilizer should be applied at a rate of 80g/m2 in the early spring. For all other vegetation it is recommended that advice be sought from the landscape designer and plant supplier and that any fertiliser required is to be applied according to their specific recommendations.

6. Irrigation.

The need for irrigation in a biodiverse green roof system is dependent upon the client requirement for the visual appearance of the vegetation. If it is intended that the roof should have colour and interest for the longest period through the growing season, then irrigation will significantly aid in achieving this. Should the requirement be only to deliver biodiversity, then the provision of sufficient watering points at roof level to allow for only occasional watering in periods of prolonged drought can be considered sufficient.

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Support

Modern bio-diversity green roof installations will normally require only minimal maintenance. Bauder is happy to offer advice on any issues concerning your green roof and enquiries should be forwarded to our Technical Department at the address below. We believe our products and systems are of the highest standard and are always prepared to discuss any queries or concerns that may arise. Providing photographs or drawings to accompany your queries will help speed our response.

Please note: In the event of any query arising which it is thought may affect the condition of the system, then Bauder should be contacted at the address below. We cannot accept responsibility for any problem or failure due to use outside those parameters for which the system was designed or 'acts of god' beyond our control e.g. extreme weather conditions or damage through pests.

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