Condition 8 : Green Roof

No development shall take place until details of the sedum roof including species, planting density, substrate and a section at a scale of 1:20 showing that adequate depth is available in terms of the construction and long term viability of the sedum roof and a programme for a scheme of maintenance have been submitted to and approved in writing by the local planning authority. Prior to the occupation of the dwelling the sedum roof shall be fully provided in accordance with the approved details and thereafter it shall be retained and maintained in accordance with those details.

Planting Species

See list below by Bauder of species contained within the sedum blanket to be used.

See list to the right of additional plug plants highlighted to be added to the sedum blanket to increase biodiversity of the green roof. There will be equal number of each, planted at a density of 5 per sqm.

BAUDER SEDUM BLANKET XF300 INDICATIVE PLANT LIST

Species
Sedum acre
Sedum album - 'bella d' Inverno
Sedum album - coral carpet
Sedum ewersie
Sedum Kamtschaticum - ellacombianum
Sedum Kamtschaticum - weinstephaner gold
Sedum montanum orientale
Sedum pulchellum
Sedum rupestri (reflexum)
Sedum sexangulare
Sedum spurium - mesemlanthemum = Delosferma
Sedum spurium - mesemlanthemum = hallii
Sedum verticillatam

Substrate

80mm deep substrate layer as recommended by Bauder for the sedum blanket and additional plug in plants.

See Bauder draft Specification for full details of the green roof make up

Section

See Drawing HG.SH.830 which shows a typical build up of the sedum roof at a scale of 1:5@A3

Maintenance

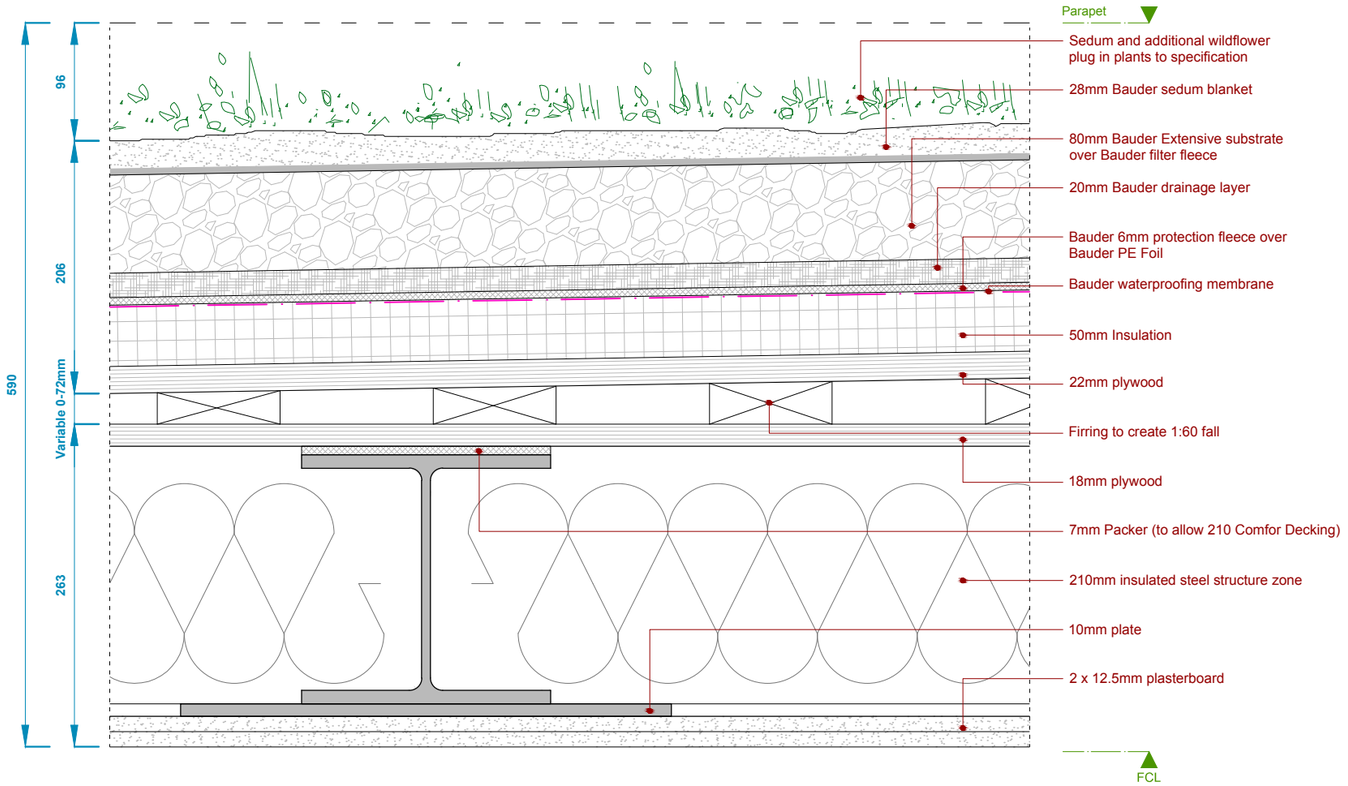
The wildflower plug in plants will require light hand weeding once or twice a year to keep out wind blown seeds.

See 'Maintenance Procedure' by Bauder which outlines the scheme of maintenance of the green roof that will be followed.

MIX PERENNIAL PLUG PLANTING SELECTION

***(including wildflowers, herbs and grasses etc)* - Available as 5-6cm units. Recommended substrate depth of 80mm**

Botanical Name	Height (mm)	Blossom	Exposure (sun or shade)	Shallow Substrate Option (60mm depth)
Achillea millefolium	350	White	☼	
Achillea tomentosa	150	Yellow	✹	
Allium schoeneprasum	300	Lilac	☼	✓
Allium sphaerocephalon	400	Purple	☼	
Allium moly	250	Yellow	☼	
Alyssum saxatile	150	Yellow	☼	
Antennaria dioica	150	Reddish	☼	
Armeria maritima	150	Red	☼	
Campanula poscharskyana	150	Blue	☼	
Campanula rotundifolia	200	Blue	✹	
Cerastium tomentosum	200	White	☼	
Dianthus alpinus	100	Pink	☼	
Dianthus deltoides	150	Red	☼	✓
Dianthus carthusian	450	Red	☼	
Dianthus caesius	150	Pink	☼	
Dianthus plumarius	250	Pink	☼	
Euphorbia cyparissias	250	Yellow	✹	
Euph.myrsinitis	150	Yellow	☼	
Fragaria virids	100	Opaque	☼	
Gypsophylla repens	100	Pink	☼	
Geranium macrorrhizum	300	Pink	☼	
Geranium sanguineum	200	Lilac	☼	
Geranium x cantabrigiense	250	Pink / White	☼	
Heianthemum num.	100	Yellow	☼	
Hyssopus officinalis	400	Blue	✹	
Inula ensifolia	400	Yellow	☼	
Iris pumila	300	Blue	☼	
Jovibarba hirta	100	Yellow	☼	
Lavandula angustifolia	400	Blue	☼	
Lychnis alpina	200	Pink	☼	
Linum perenne	300	Blue	☼	
Muscari	250	Blue	☼	✓
Nepeta fasseni	250	Blue	☼	
Origanum vulgaris	150	Pink	☼	
Petrorhagia saxifraga	150	Pink	✹	✓
Potentilla aurea	150	Yellow	☼	
Potentilla verena	50	Yellow	☼	✓
Prunella vulgaris	100	Violet	✹	
Saponaria ocymoides	100	Pink	☼	
Sanguisorba minor	100	White	☼	
Scabiosa canescens	350	Blue	☼	
Satureja montana	200	Lilac	☼	
Saxifraga aizoon	100	White	☼	
Saxifraga arendsii	100	Red / Pink	☼	
Saxifraga umbrosa	100	White	☼	
Sempervivum	100	Pink	☼	✓
Silene maritima	150	White	☼	
Teucrium chamaedrys	200	Pink	✹	✓
Thymus serpyllum	150	Pink	☼	✓
Thymus vulgaris	250	Pink	☼	
Verbascum phoenicum	700	Blue	☼	
Verbascum nigrum	700	Yellow	☼	
Veronica teucrium	180	Blue	✹	



01 **Sedum Blanket**
Section

NOTES

1. No dimension to be scaled from drawings
2. All dimensions to be verified by the contractor before work is commenced

Drawing Scale: 0 50mm 250mm

Rev:	Note:	Date:

Project: 69 Highgate High Street, London
Issue/Date: 28.1.16
Drawing: Typical Roof Details
Status: Planning
Drawing No: HG.DT.830
Scale: 1:5 @ A3

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REF No: B153722 **PROJECT NAME: 69 HIGHGATE HIGH STREET**

NBS SECTION Q37 - DESCRIPTION OF WORKS

Section Q37 deals with the design and installation of the Bauder Green Roof landscaping system, including the various related elements i.e. separation, protection, and drainage layers, substrates, Bauder supplied planting and accessories such as inspection chambers, trims etc. It invokes clauses from related sections for waterproofing, insulation, landscaping and maintenance as necessary for a complete system.

It is intended for use on projects where the detailed design is completed by the specifier (architect or landscape architect) with technical assistance from the manufacturer as required and should be read in conjunction with any project specific drawings provided.

SCOPE OF WORKS

This section includes:

- Bauder Extensive green roof system components/ landscaping
- Related Bauder system accessories

This section does not include:

- Construction of the structural deck
- Bauder waterproofing system – refer NBS Section J41

Q37 GREEN ROOFS
To be read with Preliminaries / General Conditions.

GENERAL

130 EXTENSIVE GREEN ROOF: Main Roof

- **Landscaping finish:** Pre-cultivated Sedum vegetation blanket
- **Substrate:** New Metal Deck
- **Slope:** Level
- **Waterproofing system:** BAUDER TOTAL GREEN ROOF SYSTEM
- **Slip Layer:** Bauder PE Foil (loose laid) rolled out in single layer. Installation as clause 745.
- **Protection layer:** Bauder Eco-Mat - 6mm thick protection fleece. Installation as clause 750A.
- **Drainage layer:** Bauder DSE40 - drainage / water storage panel. Installation as clause 770E.
- **Filter membrane:** Bauder Filter Fleece. Installation as clause 780A.
- **Growing Medium:** Bauder Extensive Substrate, depth 80mm above the filter fleece. Installation as clause 790A.
- **Landscaping depth:** TBC
- **Vegetation:** Bauder Xero Flor XF300 sedum blanket, applied in standard length rolls 2m x 1 m over the growing medium. Installation as clause 800B
- **Accessories: -**

- Bauder AL150 drainage and retention trim, fitted to all open perimeters to contain a pebble vegetation barrier. Installation as clause 820I
- Bauder ALU 250 Inspection chamber, to be installed over all internal rainwater outlets within soft landscaping areas. The lid of the chamber must be level with, or higher than the surrounding landscaping. For landscaping exceeding 100mm, additional height adapter units (available in 50mm or 100mm depths) must be used to achieve the required chamber depth, with the chamber lid being at least level with the surrounding landscaping or higher.

Installation as clause 830.
- 20 - 40mm round washed pebble vegetation barrier provided around all protrusions and in conjunction with AL150, where used at perimeters, as clause 460. Installation as clause 840.
- Bauder Organic Fertiliser (slow release), applied as clause 850A.

- **Additional requirements:** As clauses 210, 710, 715A, 720, 910, 915E, 916, 920, 930.

PERFORMANCE

210 GENERAL DESIGN
- **Green roof and associated features:** Complete the detailed design.
- **Proposals:** Submit drawings, technical information, calculations and manufacturers literature.

PRODUCTS

460 PEBBLE BALLAST
- **Type:** Washed, round pebbles.
- **Size:** Graded 20-40mm and free from fines and sharps.

EXECUTION

710 INSTALLATION GENERALLY
- **Preparation:** Clear all surfaces of debris.
- **Timing:** After certification of waterproof membrane integrity.
- **Surface condition:** Visually inspect waterproof membrane, report any damage.
- **Faults in waterproof membrane:** Report.
- **Contamination**: Do not use materials detrimental to healthy plant growth.
- **Storage:** Do not overload.
- **Point loads:** Avoid.
- **Outlets:** Do not block.
- **Outlet grilles:** Installed (these can be omitted where Bauder inspection chambers are used, if the grille cap height obstructs the closing of the chamber lid).

715A GREEN ROOF RELATED REQUIREMENTS
- **The following are vital to the accurate pricing, correct installation, and ultimately the long-term life of a green roof, and must, therefore, be included within the specification and tender documents: -**
- **Loadings:** It is assumed that the architect or his advisors have satisfied themselves that the roof structure and deck are suitable to receive the dead load of the proposed green roof system and landscape both during construction and on completion of the works.
- **Additional protection:** A planned or contractual delay between the installation of the waterproofing and landscape will almost certainly necessitate additional/increased protection to the waterproofing. This protection may be temporary or permanent. The responsibility and cost of this possible extra protection should be clearly included within the tender documents.
- **Detailed drawings:** Correct detailing design and construction is essential to the long-term life of the green roof. It is essential, therefore, that detail drawings illustrating for the construction are included with the tender documents, in order to enable the contractor to tender accurately.
- **Minimum upstand height requirements**: The waterproofing should be taken up all abutment upstands, pipes, detailing protrusions etc. a minimum of 150mm above finished landscape surface level to comply with British Standards and current code of practice BS8217:2005.

REF No: B153722 PROJECT NAME: 69 HIGHGATE HIGH STREET

- **Provision for living products in hot weather conditions:** During hot weather conditions, living products such as plants, turf, sedum blankets etc. must be laid on the day of delivery to site. With regard to sedum blankets or turf, any rolls not installed should be laid out and kept watered prior to final installation.
- **Watering / Irrigation:** Adequate provision for watering the installed any form of planting must be in place on site before the product is installed. Irrigation systems if fitted should be operational. Initial watering should be by surface sprinklers to water in the fertiliser, where this is specified. All watering should be carried out in strict accordance with the Bauder watering requirements and guidance document.
- **Final Inspection:** No landscaping work should be installed until Bauder have carried out a final inspection to the waterproofing and have passed this as suitable for guarantee. It is the responsibility of the roofing contractor to advise and organise this inspection with Bauder. We cannot guarantee any waterproofing that has been landscaped without this inspection having been carried out and passed as acceptable.
- **Damage risk form other trades:** No landscaping should be installed while the roof area is subject to other site traffic. Bauder will carry out an inspection of the completed roof 4-6 weeks following installation and any site related damage by others will be reported to the client. Bauder accept no responsibility whatsoever for damage to the product or the installation caused by site work carried out by others after the landscaping has been installed.
- **First year maintenance:** The contractor must price into his tender the cost of post installation maintenance for a minimum period of 1 year to ensure the handover of a flourishing green roof.

720 ADVERSE WEATHER
- **Unfinished work:** Secure from damage and wind uplift.
- **Conditions:** Do not install or work with frozen materials.

LANDSCAPING INSTALLATION

745 SLIP LAYER INSTALLATION
- **Installation:** to be rolled out loose over the root resistant layer as specified (one layer for Extensive landscaping and two layers for Intensive landscaping).
- This product is only required for roofs with a fall between 0-3º (A slip layer is not necessary or advisable for slopes above 3º).
- **Joints:** Minimize.
- **Overlaps (minimum):** All laps to be 150mm with care being taken to ensure that roll sides join between layers.
- **Upstands:** Extend to top of growing medium. Sufficient foil must be allowed for to enable it to be taken up all upstand and edge details prior to installation of the protection layer.

750A PROTECTION LAYER INSTALLATION
- **Installation:** 6mm thick Protection Fleece, rolled out and laid loose.
- **Joints:** Minimize.
- **Overlaps (minimum):** Laps to be 150mm.
- **Upstands:** Sufficient protection fleece must be allowed for so that it may be installed to all abutment upstands and edge details, in accordance with the manufacturer's instructions. Extend to full height of the upstand and secure in place by using a lead or fabricated metal counter-flashing.
- **Openings in landscape restraint kerbs:** Where these kerbs are present (roof slopes above 5º), the protection layer should be cut away from the openings/ gaps to avoid impeding drainage.

770E DRAINAGE / WATER STORAGE LAYER INSTALLATION

- **Extent:** Continuous over entire designated roof area.
- **Fitting:** Loose laid over the protection layer. Boards to overlap and interlock by one cup profile at sides and ends and each row be laid staggered. The 'X' stamped impression on the highpoint of the cup moulding indicates where boards overlap.
- **Upstands:** Carefully cut to fit closely around penetrations and outlets.
- **Construction of planter walls:** The drainage/water storage board provides a suitable base surface for building concrete or brick kerbs/walls. The specified infill haunching should be installed over the board to required depth of cover, poured directly into the cells of board. These should be constructed to provide an adequate support for the raised masonry planters
  For the specification of the type of infill and all kerb/wall construction elements – please refer to the structural engineer's plans and the specification. An internal surface of the planter wall may be primed using bituminous primer and then lined with single layer of torch applied root resistant Bauder Plant-E. The bright green slate finish may be considered undesirable, but the slate is necessary for long-term UV protection of the bitumen. To disguise and blacken the slate colour, paint exposed areas above anticipated soil level with a light coat of bituminous primer.

780A FILTER MEMBRANE INSTALLATION

- **Joints:** Minimize.
- **Overlaps (minimum):** 150mm
- **Fitting:** Loose laid over drainage layer in accordance with manufacturer's recommendation.
- **Upstands (soft landscaping):** Extend up, between vegetation barrier and growing medium and trim flush with finished surface level.
- **Upstands (Hard landscaping):** Extend to top of perimeter abutments and trim flush just below finished surface level.

790A GROWING MEDIUM INSTALLATION

- **Handling:** Minimize.
- **Conditions:** Handle in the driest condition possible. Do not handle or install when wet or frozen.
- **Layers:** Start by applying two equal layers, building up to required maximum depth.
- **Sequence:** Gently firm each layer before spreading the next. Allowance should be made for any settlement that may occur. It is recommended that measuring stick markers of the required depth be used around the roof area to ensure that a minimum acceptable thickness of growing medium is achieved.
- **Supply:** Depending on size and access of the project the 'substrate' can be supplied by various methods i.e. Tipper, Silo lorry (pumping directly onto the roof area), Big bags, or sacks. Prior to costing this element of the installation the 'Approved Contractor' must contact Bauder Ltd so that they may advise on the best solution on any specific contract.
- ***Important note regarding alternative substrates:*** If alternative substrates are required (e.g. topsoil…etc.), Bauder does not take any responsibility for the performance of such substrates supplied from an alternative source. We recommend that alternative substrates should be covered by a technical data sheet and certified in writing as suitable to support the system and plants specified. Saturated weight loadings must be provided directly from the supplier of the substrate and should be the subject to a structural engineer's approval.

800B VEGETATION BLANKET INSTALLATION
Handling blankets:

- **Timing:** Lay within 36 hours of lifting from growing position.
- **Method:** laid manually – two-man operation
- **Excessive stacking:** Not permitted.
- **Material loss (maximum):** 3% of total surface area.

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Growing medium condition: Thoroughly watered
Laying blankets:
Dry, damaged, frosty or waterlogged blankets: Do not lay.

- **Orientation:** Diagonal or perpendicular to slope of roof.
- **Joints:** Stagger. Butt together or slightly overlap to prevent gaps. Do not stretch blankets. All excess vegetation should be removed from the overlap and the opposite leading edge of the blanket to ensure that the joints butt together tightly (as per the Bauder installation guideline).
- **Edges:** Finish with whole blankets.
- **Consolidation:** N/A
- **Dressing:** Bauder Xero Flor substrate.
- **Application:** Brush in to fill joints.
- **Watering:** Thoroughly water using surface sprinklers immediately after installation and substrate dressing, ensuring that the blankets and substrate are fully saturated before moving on to the next area.
- **Roll size:** 2m x 1m

820I EDGE RETAINING PROFILE INSTALLATION

- **Cutting:** Neat, accurate and without spalling.
- **Junctions:** Use the supplied connection pieces to reinforce and support the abutment of trim sections.
- **Corners:** The trim is cut to the length required. The supplied aluminium connection pieces have a perforated vertical line in the centre of the component to enable folding the unit through 90° to form the corner reinforcement.
- **Position:** True to line and level. Smooth continuous lines.
- **Fixing:** The AL150 retaining trim is to be secured in place by separate pieces of torch applied Bauder Plant-E capping sheet cut into strips 500mm x 200mm, these retention flashings should be torched through the holes in the trim to the waterproofing surface and set at intervals of 400mm between each flashing piece, bonding onto the main capping sheet by a minimum 100mm.
- **Location:** To contain soft landscaping at abutments and open perimeters, used in conjunction with the vegetation barrier.
- **Precautionary note:** When cutting metal, please ensure that appropriate tools and personal protection equipment are used.

830 INSPECTION CHAMBER INSTALLATION

- **Location:** Install centrally over rainwater outlets.
- **Orientation:** Align parallel with adjacent features.
- **Surround:** Using 20/40mm grade washed pebbles; the inspection chamber must be surrounded by a 500mm vegetation barrier surround to prevent unwanted growth obstructing the drainage system.
- **Positioning:** Never place directly on the waterproofing membrane – see options below-
  Intensive / extensive soft landscaping: Placed directly on to the drainage / water storage layer.
  Inverted roof with pebble ballast: Placed directly on the vapour permeable membrane or filter layer.
  Decorative aggregate finishes: Placed directly on the protection layer or vapour permeable membrane / filter layer
  Important Note: Ensure that a suitably sized hole has been cut out of the underlying drainage board / protection layer to allow water to flow freely into the outlet.
- **Chamber Height:** The contractor should also allow for the installation of additional Bauder height adapter units as required, in order to bring the inspection chamber up to at least the height of the surrounding landscaping. These are available in either 50mm or 100mm units.
- **Box gutters and gullies:** Where a box gutter is to be constructed, provision should be made

to accommodate the 250mm diameter of the inspection chamber. The front support leg of the chamber will need to be removed (see installation guide) for the unit to fit inside a box gutter /gully. We recommend that all box gutters are constructed to a minimum finished width of 500mm to ensure that the support feet of the inspection chamber sufficiently clears the angle fillets within the gutter sole and leaves space to dress the pebble vegetation barrier around the main body of the chamber.

- **Precautionary note:** When cutting metal, please ensure that appropriate tools and personal protection equipment are used.

840 VEGETATION BARRIER / DRAINAGE BARRIER

- A minimum 500mm pebble vegetation barrier must be provided to all perimeters and roof penetrations and protrusions i.e. surrounds to roof light or plant upstand kerbs, rainwater outlets, soil vent pipes, man-safe posts etc. as specified.
- Every 40m, there is a 30mm high barrier constructed of non-flammable materials or a one metre wide strip of solid paving, gravel or pebbles.
- We recommend 20/40mm rounded river washed pebbles. Stones or aggregates with sharp edges must not be used i.e. flint. Other materials may be used, but only after consultation and agreement with Bauder Ltd.
- At all open drainage perimeters, drainage trim must be used to contain the vegetation barrier.
- For extensive green roofs where sedum blanket is specified, the vegetation barrier must cover the edges of the blanket by a minimum of 100mm in order to protect the exposed edge of the blanket against wind uplift and substrate erosion.
- **Vegetation barriers removal or reduction of the recommended width:** Pebble vegetation barriers function as a fire break between potentially flammable dry vegetation and abutting construction materials that are also potentially flammable, to prevent fire spreading. These can be seen as an aesthetic issue for smaller green roof areas and for this reason some clients/designers choose to reduce this width or otherwise remove the barrier altogether.
  The current barrier width of 500mm is set by the GRO codes of practice and FLL industry guidelines, which Bauder follows and promotes. These are guidelines and not currently a legal requirement under British Standards or Building Regulations. However, not following these guidelines may affect an insurance claim in the unlikely event of a fire. Consequently, Bauder Ltd cannot accept liability for issues arising from non-compliance with the current GRO/ FLL guidelines.

850A FERTILISER

- Bauder Organic Fertiliser slow release must be applied at a rate of 80g/m² onto the installed planting.
- This product is to be supplied by Bauder Ltd.
- Care must be taken to distribute the fertiliser evenly, through use of an approved applicator.
- The vegetation / vegetation blankets should then be thoroughly saturated by the use of sprinklers so as to promote rapid establishment. It is the responsibility of the roofing contractor to liaise with the main contractor/ building owner to provide water to ensure that the growing medium/ blanket does not dry out within the first month – refer document 'Watering Requirement Guidelines for Extensive and Bio-diverse green roof installations'.

COMPLETION

910 INSPECTION

- **Timing:** Before handover.
- **Give notice (minimum):** 3 days.

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915B ESTABLISHMENT WATERING REQUIREMENTS

- Surface watering for the first 4 weeks following installation (to ensure the substrate remains moist). It is the responsibility of the roofing contractor to liaise with the main contractor/ building owner to provide water and ensure that the planted and fertilised growing medium is thoroughly irrigated immediately after installation.
- An adequate mains water supply of sufficient pressure must be available and operational prior to the plants being delivered and installed. Initial watering must be by surface mounted sprinklers.
- See the Bauder Watering Guide document for detailed information on watering requirements.
- Bauder Ltd accepts no responsibility whatsoever for the condition of installed planting that is not properly watered or irrigated following landscaping works.

916 POST INSTALLATION MAINTENANCE

- The installing contractor should price into the tender, the cost of carrying out post-installation maintenance for a contract period to be agreed with the client's representative. Following completion of the landscaping installation and handover, the responsibility for future on-going maintenance of the green roof planting becomes the responsibility of the building owner or the Main Contractor, where this element forms part of the contract.
- **Maintenance services:** Bauder Ltd offers a professional maintenance service using experienced green roof technicians and would be pleased to provide an estimate for carrying out on-going maintenance. Please contact our green roof maintenance team on Tel: 01473 257671. Alternatively, the work can be contracted to experienced landscape contractors of your choice.
- **Period of maintenance contract:** *Insert requirement i.e. one year, two years etc.*
- **Scope of maintenance procedure:** as per manufacturer's recommendations.

920 COMPLETION

- **General:** Leave the works in a clean, tidy condition.
- **Surfaces:** Clean immediately before handover.
- **Outlets:** Clean and clear of obstructions.
- **Completed green roof:** Protect from adjacent or high level working.

930 DOCUMENTATION

- **Timing:** Submit at handover.
- **Contents:**
- Manufacturer's guarantees and warranties.
- Procedures for maintenance of the green roof.
- Record drawings showing the location of planting and associated features.
- **Number of copies:** as required by client.

Rev 6 dated 4.10.11

MAINTENANCE PROCEDURE

BAUDER EXTENSIVE GREEN ROOF SYSTEMS

What to Expect From a Bauder Extensive Green Roof System

There is a common misconception that extensive green roofs, and sedum plants in particular, are always green and that from ground level they resemble grass. This is misleading, as they consist mainly of low growing, drought tolerant sedum plants and may also include other species such as Saxifrage, wild flowers, grasses, moss and herbs.

The appearance of the vegetation within an extensive green roof will change year on year, dependent upon fluctuations in the seasonal weather throughout the period. It should also be expected that more grass and moss will be present during the wetter months, because the conditions will be ideal for these species to exist, although they will tend to die off during the dry summer months, as free-draining extensive substrates will not hold sufficient moisture for them to survive.

It is another misconception that extensive green roofs are maintenance free, this is wrong and they are best described as 'low maintenance' rather than 'no maintenance'. As an example, the Xero Flor Sedum Blanket contains little in the way of natural nutrient, so fertiliser must be applied annually to ensure that the plants become resistant to extremes of weather and temperature.

The Bauder XF301 Sedum Blanket contains approximately 8-10 different plant species, some very similar in appearance to others but being more drought tolerant. Not every species incorporated will survive and the more dominant will be expected to prevail over time because they will adapt better to a particular location. Regardless of this, we would anticipate that at least 50% of the species will flourish.

Extensive green roofs that have a deeper substrate growing medium, where the vegetation is provided either by selected plug plant species, vegetation cuttings or seeds, will generally support a broader species mix, which can include wild flowers, grasses and herbs. An increased amount of dead vegetation will arise from this type of species mix following flowering, which will need to be cut back and removed, both to reduce the bio-mass on the roof and to encourage seed drop from the dead flower heads.

In the early spring the first signs of life returning to the vegetation within an extensive green roof are lead by any grasses present, quickly followed by a general "colouring up" of the sedum foliage, with other species following suit shortly thereafter. The growth and flowering of the individual species within the vegetation mix through the late spring and summer will be dependent upon the weather prevailing at the time, which will also determine which species will be most prominent in any given year.

In the winter, sedum plants will appear to shrink back, the leaves will become smaller and turn red/brown in colour as they prepare themselves to withstand the coming winter frosts. This gives extensive vegetation mixes a generally red/brown hue in the late autumn and winter months, which is sometimes mistaken for the plants being distressed, when in fact they are in optimum condition for the time of year.

General Maintenance

General maintenance is normally carried out annually during springtime. However, certain tasks which will be dependent upon the location of the roof, such as the removal of weeds, seedlings and accumulated leaf litter from overhanging trees may also need to be done during the autumn.

The following procedures should be carried out as indicated below, in order to ensure that the roof is maintained in good condition and to protect the validity of the guarantee.

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.

- Remove all dead vegetation and debris from the roof surface, taking particular care to ensure that all chute outlets, gutters and downpipes are clear. Where the species mix incorporates wild flowers and grasses it is recommended that all dead vegetation is strimmed off and the waste lowered to the ground and carted away.

  Please note! Roofs in the vicinity of taller trees will need more frequent maintenance. We recommend removing dead leaves during the spring and again in the autumn, to ensure that they to not damage the roof vegetation.

- Remove the lids of all Inspection chambers, ensure that all rainwater outlets and downpipes are free from blockages and that water can flow freely away.

- 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 maintenance to these areas, care must be taken not to damage either the landscaping or the waterproofing system. If it is considered that either 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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VEGETATION MAINTENANCE TASKS REQUIRED

The following tasks should be carried out annually: -

1 Plant encroachment.

Any vegetation which has encroached into drainage outlets, walkways and the vegetation barriers (pebbles) should be removed. The vegetation removed may be set aside and used to repair any bare patches if required (see below). If movement/settlement of the pebble vegetation barrier has occurred, additional washed stone pebbles similar to the existing are to be added.

2 Monitor the colour and rate of growth.

The colour and rate of growth of the vegetation should be reviewed to establish the health of the plants. It should be noted that many factors can affect the growth and colour of the vegetation and that plants tend to be greener in wetter, mild conditions (springtime) and where the roof pitch is shallow.

Notes!

- During May, June and July, sedum plants flower and you will see a mixture of colours – predominantly whites, pinks and yellows with some purple. The foliage of some species of sedum, such as Sedum Album "Coral Carpet", blush red naturally during the summer and autumn, and so the vegetation can take on a more 'red/brown appearance. This becomes more noticeable once plants have flowered, leaving remnants of dry brown seed heads. The best visible indication of the health of a plant is if the leaves are fleshy and contain plenty of water.

- When exposed to extreme conditions, sedum plants have a tendency to turn a deep red colour. This is a natural phenomenon and is important to help the plant to acclimatize, ready to survive a cold winter or hot summer. This will usually occur during extreme cold weather as well as periods of prolonged drought, in very exposed locations or when the plants are in distress through lack of nutrient (fertiliser).

- If an irrigation system is fitted, it is best to run it only during prolonged dry weather and for limited periods – see 'Irrigation' information below,

- If sedums are showing signs of distress, but have received regular rainfall, then the most likely problem is a lack of nutrient and a fertiliser should be applied.

- Only a relatively few species of sedum and other plants suitable for an extensive green roof installation will persist in partial and full shade, and they will generally be greener in colour and grow "leggier" in these locations. There will be a significant variance in the growth and colour between the plants growing in full or partial shade and those in full sun and this should be recognised as a feature of the living nature of each individual roof.

- If problems with the vegetation are suspected, Bauder may be contacted for advice and, if necessary, a suggested course of action.

3 Weeding.

With the exception of saplings, which should always be removed, weeds in an extensive green roof should be considered as a problem only of aesthetics. If considered excessive, they can be removed either manually or by using a 'spot weed wipe', ensuring that care is

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taken to follow specific instructions regarding the use of any proprietary products. After the removal of weeds and saplings, treat the affected area as if it were a bare patch (see below). All extensive green roof installations will at times include some moss and grass.

4 Repairing Bare Patches.

Bare patches can be easily repaired and this is best done during the main growing seasons of March/April or from late August until the end of September. Take vegetation cuttings from surrounding areas of abundant growth and place on bare patches, pressing gently into the soil. A light sprinkling of sand mixed with compost should then be dressed over the affected area to improve the uptake of the cuttings. The best results will be achieved if this work is carried out during spring maintenance and the affected area is kept moist for a short period afterwards. Please contact Bauder for further project-specific advice.

Please note: In areas of extreme exposure or where localised wind-swirl is caused by adjacent structures, it is possible that both the vegetation and substrate will be disturbed by periods of high wind. Should this occur, consideration should be given to how best to secure the installation against similar conditions in the future prior to re-instatement. If a problem of this type is suspected, Bauder may be contacted for advice and, if necessary, a suggested course of action.

5 Fertiliser for Bauder XF301 sedum blankets

Bauder Sedum Blankets are grown in a shallow growing medium which contains very little nutrient, so the annual application of fertiliser is crucial to ensure that the plants remain healthy. Fertiliser should ideally be applied during March/April, as it helps the plants to prepare for extreme weather conditions and flowering whilst also allowing the different species to gain sufficient nutrients without competing against each other.

Organic fertilizer can be obtained direct from Bauder in 25kg bags, which is sufficient for an area of 312.5m2 when applied at the recommended rate of 80gm/m². Areas of up to 30m² may be applied using either a hand held spreader or strewn by hand from a bucket. Larger roofs should always be done using a trolley applicator, which can be purchased direct from Bauder. Always apply the fertiliser at the given rate written on bag.

It is recommended that the fertiliser is lightly 'watered in' immediately after application, to avoid "burning" of the foliage, which may occur if fertilizer pellets settle on the leaves. Dung-based organic fertilizers should be avoided.

6 Fertiliser for either plug planted or hydro-planted extensive green roofs

Use a 6-month slow release chemical fertiliser with an NPK ratio of 15, 9, 14. Areas of up to 30m² may be applied using either a hand held spreader or strewn by hand from a bucket. Larger roofs should always be done using a trolley applicator, which can be purchased direct from Bauder. Always apply the fertiliser at the given rate written on the bag. This product may also be used on sedum blankets.

7 Irrigation

Extensive Substrate Installations

It is generally not considered necessary to irrigate extensive substrate green roof systems. It is, however, always advisable to ensure that there is a water supply point adjacent to the green roof, both to assist with general maintenance and as a precaution against extreme

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drought conditions.

Bauder XF301 Blanket Systems

The sedum plants used in the Bauder XF301 blanket system absorb and store water in their leaves, which they then use to survive during periods of drought. The purpose of the moisture retention fleece, which is incorporated into the system beneath the blanket, is to hold water after rainfall to give the plants sufficient time to take on as much water as possible. The moisture retention fleece is not a water storage medium, so you should not be concerned if it dries out during periods of dry weather. If drought conditions arise it is important to check the plant leaves to see if they are still fleshy and not completely dried out.

When the Bauder XF301 blanket system is installed we recommend the provision of either a leaky pipe or drip line irrigation system where the following conditions apply: -

- All south-facing roof slopes exceeding a 5° pitch.
- All roof slopes exceeding a 10° pitch.
- Exceptionally windy and exposed site locations, where the wind can dry out the blanket.
- Sites up to 50 miles inland of the east coast of the UK mainland.

Irrigation should only be activated during prolonged periods of hot, dry weather, or if the sedum plants are showing signs of distress. The irrigation system is best activated for 2-3 hours, preferably at dawn or dusk to minimize unnecessary evaporation. Then once every 4-6 days for the duration of the hot weather conditions. This can be easily managed by using an inexpensive battery-powered, programmable timer.

Please note - continuous daily watering is neither recommended nor necessary, and will only promote weeds and other unwanted plant species.

Advice and Supply of Irrigation Equipment

Access Irrigation Ltd is one of the country's longest established irrigation specialists and has considerable experience in green roofs. They are happy to provide irrigation advice on any Bauder project and can supply a wide range of irrigation products. Please contact:-
Access Irrigation Ltd
Crick Northampton NN6 7XS
T: 01788 823811 F: 01788 824256 E: sales@access-irrigation.co.uk
www.access-irrigation.co.uk

Support

Extensive roofs should require only minimal maintenance. Bauder is happy to offer advice on any issues concerning your green roof and any such query should be forwarded to the Bauder Green Roof Technical Department at the address below in the first instance. We believe our products and systems are of the highest standard and are always prepared to discuss any queries or concerns that may arise. It is always of great help if you can provide photographs of the affected area(s) to accompany any such queries.

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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