TREE PLANTING

Code	Species	Form	Girth cm	Height cm	Root condition	Quantity
AG	Alnus glutinosa	EHS	14-16	425-600	65/85 L	1
BP	Betula pubescens	EHS	14-16	425-600	65/85 L	4
PA	Prunus avium	EHS	14-16	425-600	65/85 L	1

SHRUB PLANTING

Code	Species	Height/ spread cm	Pot size (Litres)	Habit	Min no. of breaks	No. / m2	Quantity
BCP	Bergenia cordifolia Purpurea	15-20	3L	-	-	5	25
CSK	Cotoneaster 'Skogholm'	30-40	3L	Spreading	3	3	15
HH	Hypericum Hidcote	30-40	3L	Bushy	5	2	13
LAV	Lavandula Hidcote	20-30	3L	Bushy	5	5	55
LM	Lonicera 'Maygreen'	30-40	2L	Bushy	3	3	12
POL	Prunus Otto Luyken	30-40	3L	Bushy	3	2	30
RK	Rosa 'Kent'	30-40	3L	Bushy	4	3	12
RH	Rosa 'Hertfordshire'	30-40	3L	Bushy	3	3	12
RS	Rosa 'Suffolk'	30-40	3L	Bushy	4	3	27
SH	Symphoricarpos Hancock	40-60	3L	Branched	2	2	13
SKW	Skimmia 'Kew White'	30-40	3L	Bushy	3	3	15
SS	Senecio Sunshine	30-40	3L	Bushy	4	2	22
VD	Viburnum davidii	30-40	3L	Bushy	3	3	13

HEDGE PLANTING

Code	Species	Height/ spread cm	Pot size (Litres)	Habit	Min no. of breaks	No. / m2	Quantity

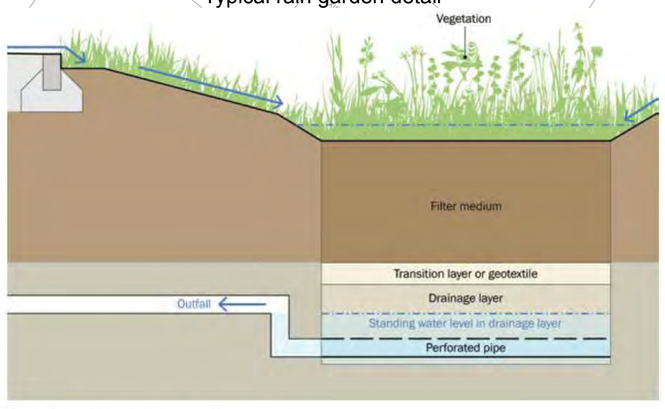
RAIN GARDEN SPECIES

Code	Percentage	Species	Root condition	No per sq.m	Quantity
AR	10%	Ajuga reptans	9cm Pot	8	70
HF	10%	Helleborus foetidus	2 L	8	70
EC	10%	Eupatorium cannabinum	9cm Pot	8	70
OR	10%	Osmunda regalis	9cm Pot	8	70
DFM	10%	Drypoteris felix-mas	9cm Pot	8	70
DD	10%	Dryopteris dilatata	9cm Pot	8	70
CP	10%	Carex pedula	2L	8	70
JE	10%	Juncus effusus	9 cm	8	70
CG	10%	Campanula glomerata	2L	8	70
CL	10%	Crocosmia 'Lucifer'	2L	8	70

N

0 25m

Typical rain garden detail



Blue Roof System With Extensive Green Roof Surface Finish.

Bauder Flora 9 Seed Mix provides a biodiverse assemblage of wildflowers that are adapted to tolerate salt laden winds, dry sandy conditions and the exposed, thin soils on roof top coastal sites.

See Bauder Technical Data Sheet for vegetation mix and maintenance, and ACO Roofbloxx Blue roof construction details.

KEY

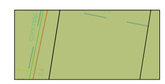
Proposed Tree Planting

Proposed Single Species Native Hedge

Proposed Shrub Planting - Hardy, mixed shrub planting, including species from RHS Plants for Pollinators

Proposed Amenity Grass - Hardy flowering lawn mixture

Proposed Rain Garden



Proposed Green-Blue Roof System with Bauder Flora 9 Seed Mix for coastal roof top sites.

Hard Landscaping

See site layout LT2108.04.01 - Proposed Site Layout - Rev.B - Proposed Site Layout for hard surfacing detials

Revision	Description	Date
-	First issue	4/12/20
A	Second issue	14/9/21

LANDARB SOLUTIONS

Project:
Rompney Castle, Cardiff

Description:
Landscape Proposals Plan- Sheet 1 of 2

Status:
For Planning

Scale:	Drawn I Checked	Date:
1:200 @A2	**DP MP**	**14/09/2021**

Job Number:	Drawing Number:	Revision:
LAS 167	**01**	**A**

1. TREE PLANTING

1.1 All trees to be planted in accordance with BS: 8545:2014, and the Soils and Development TGN.

Ground Preparation and Tree Pit Excavation

1.2 If the formation level is compacted it will be ripped through before top soiling.

1.3 A ripping tooth will be used for de-compacting subsoil.

1.4 Where necessary existing weeds will be treated with a suitable glyphosate-based herbicide and a suitable period allowed to elapse, as recommended by the manufacturer, for the herbicide to take effect.

1.5 Tree pits will be excavated to at least twice the diameter of the root spread and to be planted in accordance with BS 4428 (1989). The bottom and sides shall be forked to break up the subsoil. All extraneous matter such as plastic, wood, metal and stones greater than 50mm diameter in any dimension will be removed from site.

Planting

1.6 At the time of planting, root ball wrapping shall be removed once the tree and rootball are placed in the planting pit.

1.7 Trees are then to be backfilled with local topsoil previously stripped from the site. Where tree pits are more than 300mm deep, backfilled material shall be consolidated/firmed in 150mm layers.

1.8 Trees shall be well firmed-in and secured with stakes, proprietary rubber tree ties and spacers as below.

1.9 All newly planted trees will be held so that movement at the root collar is minimised until new roots have developed to anchor the tree. Therefore, low staking (75mm dia x 1.5m length) will be used and attached to the tree at approximately 600mm above ground level. Stakes will be driven 300mm into undisturbed ground before planting the tree, taking care to avoid underground services and cables. The trees will be staked using proprietary rubber ties and must be firmly fixed with a spacing device used to prevent chafing against the tree.

1.10 Trees will be double-staked. Organic bark mulch will be spread to a depth of 75mm, across in a 1.2m diameter circle around all individual trees, tapered to 25mm within 20cm of the stem, ensuring that desirable groundcover plants (where present) are not buried, and making sure not to build up around the root flare.

1.11 All trees shall be watered in at the end of each day of planting.

Maintenance during first growing season

1.12 All dead, dying or diseased trees will be replaced with trees of similar size and species. If the failure of the tree is due to disease and the disease is considered likely to re-occur then an alternative species may be used as replacement if agreed with the LPA.

1.13 The site is to be visited throughout the year to undertake the following operations:

1.14 Weed clearance: All tree planting areas will be kept weed free by hand weeding.

1.15 Checking trees: All tree ties and stakes will be checked and adjusted if too loose, too tight or if chafing is occurring. Any broken stakes will be replaced.

1.16 Formative pruning: Any damaged shoots/branches will be pruned back to healthy wood. Trees will be pruned in accordance with good horticultural practice (BS: 3998) to maintain healthy well-shaped specimens.

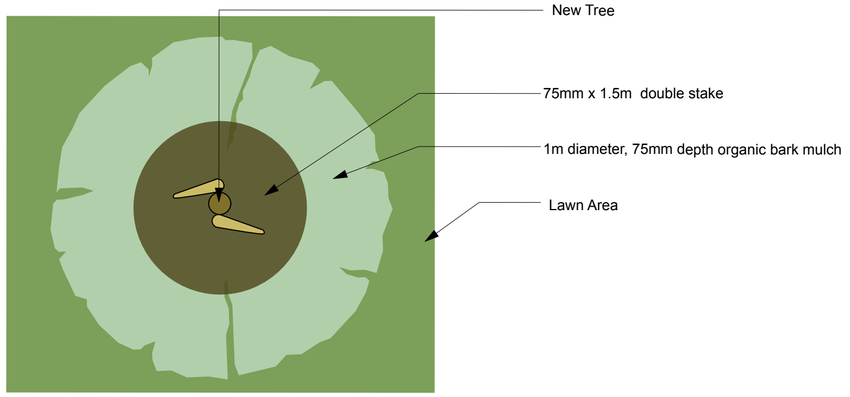
Watering during first growing season

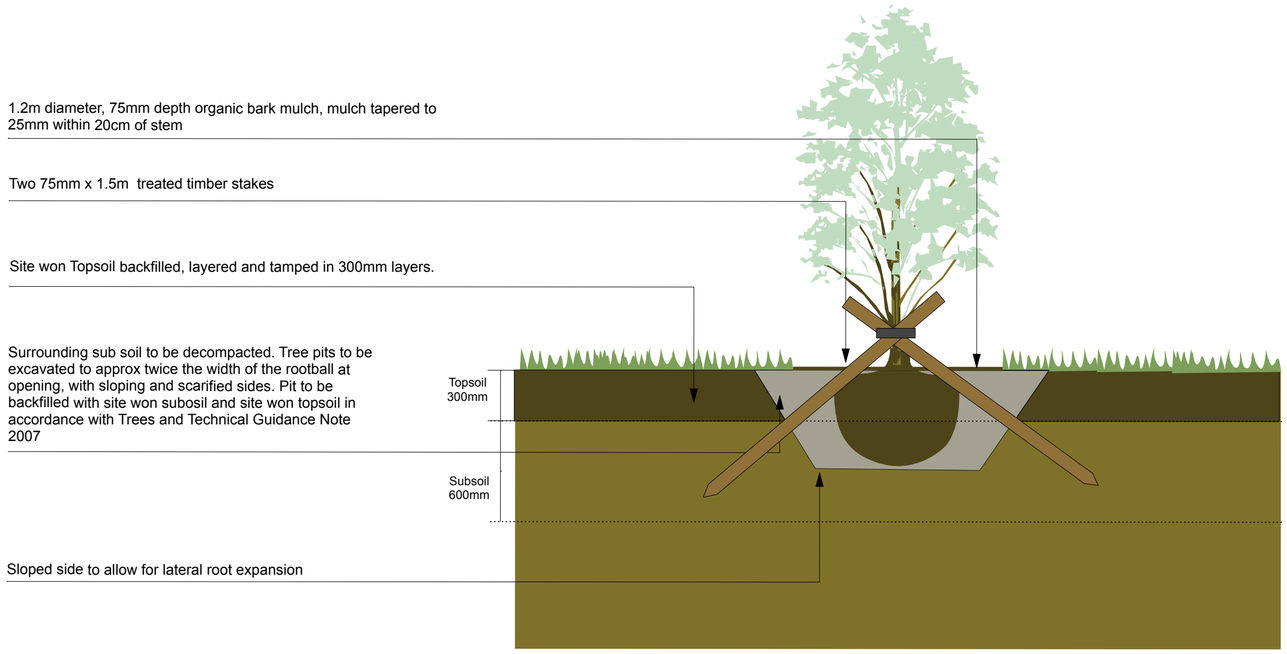
1.17 The requirement for watering of newly planted trees will generally be dependent on weather conditions during the first growing season following planting. In a dry season watering may be required on a fortnightly basis from immediately after planting until the end of the growing season, but in a wet season watering may not be required at all. Therefore, trees shall be monitored regularly by test digging down to root level to assess the water content of the soil, with watering undertaken as required to ensure that the soil is at field capacity 2-3 days after watering.

5-Year Management Programme

1.18 The following management schedule will be adhered to in respect of post tree planting management.

1.19 Tree planting will be checked twice yearly, in spring and autumn, for signs of stress, pests, disease or any structural or physiological defects. Checks will also ensure the post planting management has been carried out and any remedial measures required or any changes in management required as the tree establishes and grows.





Revision	Description	Date
-	First issue	4/12/20
A	Second issue	14/9/21

LANDARB SOLUTIONS

Project:
Rompney Castle, Cardiff

Description:
Landscape Proposals Plan - Sheet 2 of 2

Status:
For Planning

Scale:	Drawn I Checked		Date:
1:25 @A2	**DP**	**MP**	**24/08/2021**

Job Number:	Drawing Number:	Revision:
LAS 167	**01**	**A**

1. GENERAL

1.1 All plants will conform to BS 3936-1 (1992): and be in accordance with the National Plant Specification. Supplying nurseries will be registered under the HTA Nursery Certification Scheme. Trees will be planted in accordance with BS: 8545:2014. All plants will be packed and transported in accordance with the Code of Practice for Plant Handling as produced by CPSE.

1.2 Planting will not be carried out when the ground is waterlogged, frost bound or during periods of cold drying winds.

1.3 If the formation level is compacted it should be ripped through before topsoiling. Recommended topsoil depths are 450mm for shrubs and 150mm for grass.

2. TREE PLANTING

Ground Preparation

2.1 If the formation level is compacted it will be ripped through before topsoiling.

2.2 Where necessary existing weeds will be treated with a suitable glyphosate-based herbicide and a suitable period allowed to elapse, as recommended by the manufacturer, for the herbicide to take effect.

Planting

2.3 Shrubs and hedges are to be set out as shown on the drawing and pit planted into the prepared soil at the specified centres with minimal disturbance to the rootball and well firmed in. Spread ornamental pine bark mulch to a depth of 75mm across all new planting areas, ensuring groundcover plants are not buried.

Maintenance during first growing season

2.4 All dead, dying or diseased trees will be replaced with trees of similar size and species. If the failure of the tree is due to disease and the disease is considered likely to re-occur then an alternative species may be used as replacement if agreed with the LPA.

2.5 The following operations are to be carried out throughout the year:

2.6 Weed clearance: All planting areas will be kept weed free by hand weeding or herbicide treatment.

2.7 Checking trees: All tree ties and stakes will be checked and adjusted if too loose, too tight or if chafing is occurring. Any broken stakes will be replaced.

2.8 Formative pruning: Any damaged shoots/branches will be pruned back to healthy wood. Plants will be pruned in accordance with good horticultural practice to maintain healthy well-shaped specimens.

Watering during first growing season

2.9 The requirement for watering of newly planted trees will generally be dependent on weather conditions during the first growing season following planting. In a dry season watering may be required on a fortnightly basis from immediately after planting until the end of the growing season, but in a wet season watering may not be required at all. Therefore, trees shall be monitored regularly by test digging down to root level to assess the water content of the soil, with watering undertaken as required to ensure that the soil is at field capacity 2-3 days after watering.

3. GRASS

Preparation

3.1 The area to be seeded will be sprayed out with a glyphosate herbicide and cultivated to a depth of 100mm removing all weeds, debris and stones over 25mm diameter. The surface will be raked to smooth flowing contours with a fine tilth, incorporating pre-seeding fertiliser at 70 g/m2.

Seeding

3.2 Grass seed will be sown in accordance with BS 4428 (1989), and will be sown from April to May or from September to October, during calm weather and not when the ground is frost bound or waterlogged. Seed will be sown in two equal sowings in transverse directions at 4g/m2 for EL1 flowering lawn mixture. After sowing the seed will be lightly raked to create intimate contact with the soil.

Amenity Grass Cutting

3.3 When newly seeded areas reach 40mm they will be lightly rolled and cut to a height of 30mm. All arisings will be removed. Any bare patches will be made good at this time. Seeded areas shall be cut for a second time when the sward reaches 50mm high.

Proposed Tree Planting – Management Objectives

- To ensure successful establishment of tree planting
- To maintain newly planted trees to ensure a good survival rate and development
- To minimise competition from grass and weeds

Management Objective	Maintenance Task	Method	Timing	Years
Ensure successful establishment of tree planting	Check stakes and ties	Adjust/replace stakes and ties and remove when the tree is self-supporting (minimum year 3).	Twice yearly, spring and autumn	1,2,3
Keep planted areas free from weeds to reduce competition	Weeding	Weed clearance by hand, hoe or fork. Bark mulch to be used around new trees. Take care not to disturb roots and avoid excessive treading of bed surface.	Monthly from March to October or as required	1,2,3,4,5
Keep planted areas free from weeds to reduce competition	Check and top up mulch	Check and top up mulch to 75mm	As required.	1,2,3,4,5
Avoid damage to trunks of trees	Keep weed free area around tree trunks	Take care during mowing operations. The use of strimmers within 1.2m of tree is not acceptable.	Whenever mowing and strimming operations take place	1,2,3,4,5

BAUDER FLORA 9 SEED MIX

Coastal

The Bauder Flora 9 Seed Mix provides a biodiverse assemblage of wildflowers that are adapted to tolerate salt laden winds, dry sandy conditions and the exposed, thin soils on roof top coastal sites. The seed mix includes a high diversity of plant species found on British coastlines, delivering maximum BREEAM credits and biodiversity enhancements for wildlife.

The seed mix delivers a typical coastal cliff top plant community that will blend into or complement surrounding coastal habitats, whilst also providing a nectar and pollen rich habitat for pollinators and larval food plants for butterflies and moths.

Mix Details:

- British Provenance Seed Mix
- 24 species including:
  - 14 native / naturalised wildflower species
  - 3 annuals
  - 4 grasses
  - 3 sedums
- 20 wildflowers classed as RHS Perfect for Pollinators
- 8 butterfly larval food plants
- Mix percentages; 75% perennial wildflowers, 10% annuals and 15% grass

Key Specification Features

- Suitable for exposed coastal areas.
- Contains salt tolerant species.
- Lengthy flowering season – April to October.
- Varied heights of flowers to give structured planting.
- Species include Sea Campion, Sheep's Fescue and native sedums for ground cover and soil stabilisation.
- Attractive to wildlife, mix includes Viper's Bugloss and Common Rock-rose.
- Can be added to other Bauder Flora Seed Mixes.

Ecological Value

The Flora 9 Seed Mix has a high diversity of wildflower species selected to deliver a long flowering period and rich nectar sources for priority coastal species. Plants with long flower tubes, such as Viper's Bugloss, will provide valuable nectar sources for native bumblebee species, such as the White-tailed Bumblebee.

The mix also comprises larval food plants for butterfly species including Common Sorrel for Small Copper and Sheep's Fescue for Marbled White and Grayling, which are prevalent in coastal areas. Plants were chosen with a variety of heights to give a good vegetation structure all year round for invertebrates, such as spiders and beetles. A rich invertebrate fauna will attract foraging for priority coastal bird species, such as the Ringed Plover and Black Redstart. Seed heads of plants like Teasel provide foraging for finches, such as Linnets and Goldfinch, which inhabit coastal areas.

BAUDER FLORA 9 SEED MIX

Establishment and Growth

Typically, the Flora 9 Seed Mix delivers a long flowering period from April to October, with Thrift and Dog Violet giving early flowering and Sea Aster and Wild Marjoram providing nectar at the end of the season. The mix contains pioneer and ephemeral species such as annuals (which will give cover and colour in the first season), biennials and grasses, allowing time for the slower growing perennials to establish in later years. The mix has been specified to include low growing robust species of exposed habitats. Grasses can be invasive, however the mix only contains two non-aggressive species (typically <15%), which will also help to establish and stabilise the substrate.

The seed source is British Provenance and all plant species are widely naturalised along British coastlines, the mix also including some "naturalised" plants such as Red Valerian and Seaside Fleabane. All the Seed suppliers are signatories to the Flora Locale Code of Practice for growers and suppliers.

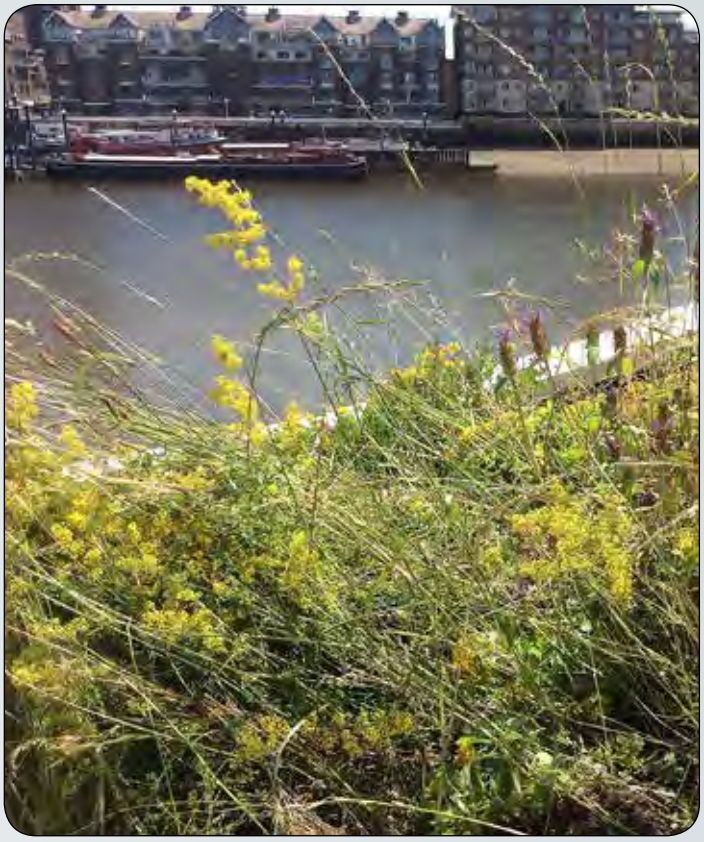
(Flora locale is an independent charity. Promoting and advancing the conservation and enhancement of native wild plant populations)

Bauder's Unique Additive Mix

To maximise the germination and establishment of the seed, Bauder has developed a unique blend of seed, adhesive, organic nutrients and mycorrhizal fungi.

- Mycorrhizal fungi increases the root surface area helping the transfer of water and nutrients from the substrate to the developing root system of the plant, enabling the plants to establish quickly.
- The adhesive binds the seed to the substrate preventing it from being blown away in windy conditions or being washed deep into the substrate and failing to germinate.
- A small quantity of organic slow release fertiliser gives the seed a gentle boost as it establishes.

The seed mix and additives are combined with a bulking agent, which enable the correct sowing rate to be achieved.



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Specification Support

Specification downloads:
www.bauder.co.uk/technical-centre

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BAUDER

GENERAL MAINTENANCE

Green Roof Extensive System

Lightweight sedum system XF301.

BAUDER EXTENSIVE GREEN ROOF SYSTEMS

XF301 and SB & WB vegetation blankets and other substrate based planting schemes.

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 plants including sedums, 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, 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.
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 will become smaller and turn red/brown in colour as they prepare themselves to withstand the coming winter frosts. This gives the vegetation a 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.

It is another misconception that extensive green roofs are maintenance free> Green roofs are 'low maintenance' rather than 'no maintenance'. Bauder recommend that all green roofs have a way of watering during prolonged periods without rain. All green roofs will benefit from water during droughts (See Bauder's Watering Guide).
All green roofs will require feeding from time to time e.g. Bauder's lightweight 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 14-17 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 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.

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Watering and Irrigation: all green roofs will require water during prolonged periods of dry weather, generally sedums are much more drought tolerant than native wildflowers but both will benefit from a prolonged soaking (not little and often) to prevent them from fully drying out (Details are in the Bauder Watering Guide).

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 do 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. Advice the client of the need to repair or renew as necessary.
- Examine all mastic sealant and mortar pointing for signs of degradation. Advice the client of the need to repair or renew as necessary.
- Check that all promenade tiles and paving slabs remain in position, secure and in good condition.
- Ensure that any new items of plant/equipment that may have been introduced to 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, contamination 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.

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- When carrying out maintenance to adjoining areas, care must be taken not to damage either the landscaping or the waterproofing system. If it is considered that either has been affected, the Bauder should be contacted for advice. Any waterproofing damage caused after completion of the original installation may invalidate the guarantee.
- 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.

Vegetation Maintenance Tasks

The following tasks should be carried out annually: -

Application of Fertiliser to the vegetation: As a general rule all sedum based green roofs require feeding annually to promote strong growth in the sedum and make them more drought tolerant. Biodiverse and Wildflowers system often do not need annual fertiliser as this may allow weed species to out compete them.

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”, is 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 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 fertiliser 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 fertiliser pellets settle on the leaves. Dung-based organic fertilisers should be avoided.

6 Irrigation

Bauder SB sedum blanket and XF301 systems

When Bauder sedum systems are installed we recommend installed we recommend the provision of either a sprinkler or drip line irrigation system where the following conditions apply: -

- All south-facing roof without shade.
- All roof slopes exceeding a 2° pitch.
- Windy or 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 periods of 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.

Native Wildflower/Biodiverse Roofs

Extensive substrate green roof systems vary greatly in the amount of water they require. Sedum is very drought tolerant, wildflowers much less so. The watering requirements will depend on the following factors:

- The Pitch of the roof
- The amount of rainfall it receives.
- The exposure of the roof.
- The vegetation growing on the roof.
- The depth of the substrate and drainage board.

Bauder always advise that there should be a way to water the roof during times of dry weather. This might be a water supply point adjacent to the green roof, or a fully automatic irrigation system.

Some Biodiverse roofs are designed not to be watered. Whilst this will remove the water demands from the roof, it will reduce the flowering period of the plants and over time reduce the number of species as plants struggle with the harsh environment.

In these cases Bauder would strongly recommend that increasing the depth of substrate in some areas (15-2000mm+) to help prevent the substrate drying out completely (See Bauder Water Guidelines).

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 we 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.

BAUDER GREEN ROOF MAINTENANCE SERVICE

With over 30 years' experience in the design and supply of green roofs throughout the UK and Ireland Bauder can offer unparalleled experience and expertise in green roof maintenance including sedum, plug planted and wildflower.

Having established the largest UK facility cultivating green roof vegetation blanket we have unique knowledge and horticultural expertise for roofscape vegetation. With national coverage by over 50 field personnel, you can be assured of a prompt reliable service to fully meet your requirements.

Our Service

Bauder's experienced team will provide you with a tailor-made maintenance programme for your green roof. A typical Bauder maintenance programme Includes:

- Full inspection and evaluation of your green roof
- Application of organic slow release granular fertiliser
- Removal of leaves and debris
- Removal of unwanted vegetation
- Inspection and clearance of outlets
- Examination and testing of irrigation

This work is undertaken by Bauder's experienced maintenance technicians who will carry out the necessary risk assessments and comply with all current health and safety legislation throughout the duration of the work. Finally, you will be provided with a bespoke report with photographic verification outlining the condition of the planting and any areas requiring on going treatment.

To discuss your specific requirements, please call our Green Roof Maintenance Team for a no obligation quote.

T: 0845 271 8801 **E:** greenmaintenance@bauder.co.uk

UK OFFICE
Bauder Limited
70 Landseer Road, Ipswich, Suffolk IP3 0DH, England
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E: info@bauder.ie

ACO RoofBloxx

Product Overview

Blue Roof Attenuation Systems for a
Sustainable Urban Environment

ACO RoofBloxx Blue Roof Attenuation System

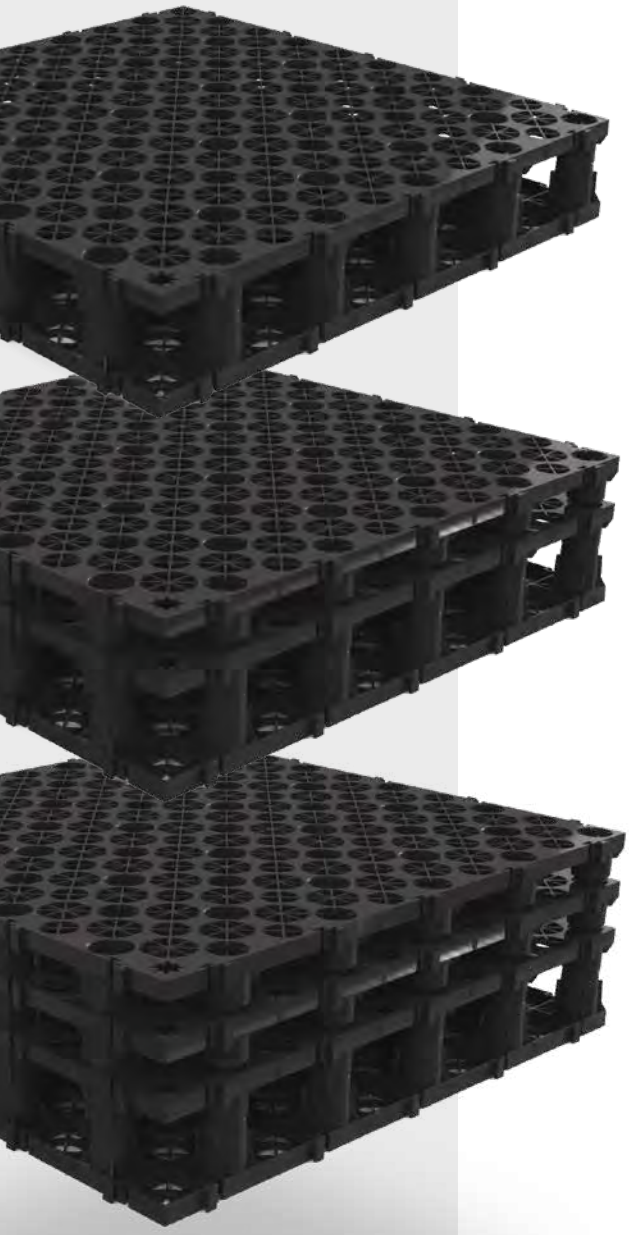
ACO RoofBloxx offers architects, engineers and property owners an environmentally sustainable, efficient and cost-effective method to reduce rainwater run-off, enabling water storage and irrigation of blue/green roofs in urban environments.

ACO RoofBloxx

Geocellular unit

ACO Blue Roof Flow Restrictor

The restrictor has been designed for use with the ACO range of HP Vertical spigot and screw 45 and 90 degree roof outlets and accessories.



ACO RoofBloxx
Introducing our blue roof attenuation system.

ACO. creating the future of drainage

Throughout the world ACO branded drainage and surface water management systems are recognised for their innovative design, high quality manufacture, environmental excellence and industry leading performance.

Today the ACO Group has a research and production base that spans four continents. This unmatched resource pioneers the development of solutions that are tailored to individual applications, meeting the need for high performance, sustainable products that deliver optimum value throughout their operational life.

ACO Technologies plc

ACO operates as ACO Technologies plc in the United Kingdom and Ireland. Founded over 30 years ago, the company has grown quickly on a reputation for design, innovation and customer service.

There are now two core divisions, ACO Water Management and ACO Building Drainage, that serve every sector of the construction industry, providing solutions for applications as diverse as rail, highways, airports, landscaping, retail, distribution centres and environmentally sensitive projects.

To help architects, designers and contractors meet the stringent legal requirements which control the way surface water is managed, ACO has created its unique 'Surface Water Management Cycle' – Collect, Clean, Hold, Release – the four core processes now required for the complete and sustainable management of surface water drainage.

ACO Building Drainage

With the introduction of ACO RoofBloxx, ACO can offer a complete and comprehensive solution for rainwater management within the building envelope. When specified with the existing range of ACO Water Management and ACO Building Drainage products, ACO RoofBloxx provides building owners and specifiers with the sustainable drainage systems required to make greener urban environments a reality.

ACO Group

in Rendsburg/Büdelsdorf

5,000

5,000 employees in more than 40 countries (Europe, USA, Asia, Australia, Africa)

850

Sales 2018: €850 million

30

30 production sites in 15 countries

What is a Blue Roof?

A blue roof is a roof design which is explicitly designed to store rainfall. Normally featuring a flat roof design, a blue roof is intended to temporarily store stormwater on the roof (attenuate) to alleviate flooding in sewer systems. In its simplest form, a blue roof is an open storage area but it can also form part of a podium deck or a green roof system.

In dense urban environments blue roofs form an increasingly important part of a developments' SuDS strategy as the opportunity for underground storage is limited and increasingly costly. Blue roofs are designed to drain down from full to empty within a 24 hour period.

Blue roof systems can be designed in conjunction with a green roof to offer the added benefit of permanent water storage for passive irrigation for planting. These systems are commonly called blue green roofs.

Blue Roof

A blue roof is a roof design that is explicitly intended to store rainfall. Blue roofs that are used for temporary rooftop storage can be classified as "active" or "passive" depending on the types of control devices used to regulate water drainage from the roof.

Green Roof

A green roof or living roof is a roof of which is partially or completely covered with vegetation and a growing media which has been planted over a waterproof membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems.

Blue/green Roof

A blue/green roof is a roof design that combines the benefits of both a blue roof and a green roof. It can have the added benefit of providing passive irrigation to the green element of the roof. The irrigation reservoir can sit on the roof membrane or be above the storage layer.

Why specify a blue roof system?

Planning requirements and guidance across the UK commonly requires engineers to use SuDS techniques wherever feasible. This ensures that the potential for flooding is mitigated and that due consideration is given to climate change and sustainability. In some parts of the UK, local planning guidance recommends the use of blue green infrastructure wherever suitable, for example, The London Plan and The National Planning Policy Framework.

Blue green roof systems provide numerous benefits, particularly in urban environments:

- Climate change – flood control
- Urban heat island mitigation
- Amenity space
- Passive rainwater harvesting and irrigation
- Energy efficiency through improved insulation
- Prolongs life of roofing membrane
- Reduces noise and air pollution
- Biodiversity
- Carbon sequestration

Blue green roofs can also help to achieve BREEAM credits for energy, land use and ecology, management, health and wellbeing, materials and waste.

One of the main reasons for specifying a blue roof is the space it saves on below ground attenuation. In an urban setting, due to the lack of external space around the development and poor ground conditions, the attenuation storage may have to be within the building footprint itself and is often part of the basement construction. This is expensive to construct and may have ongoing running costs.

Therefore, it is logical to temporarily store water in the area where it falls and where gravity can gradually drain the water to the sewer. In addition, it means that valuable space could be freed up within the building for other uses, for example, car parking, plant rooms etc.

What is ACO RoofBloxx?

ACO RoofBloxx is a complete roof water attenuation system for blue, green and blue/green roofs. It enables you to create a drainage platform which gives architects the design flexibility required to create imaginative, multi-functional open green spaces at roof or podium level.

A closer look at the system

The ACO RoofBloxx system comprises a shallow, high-strength, height variable geocellular storage void and roof outlet flow control system. This can be combined with ACO roof outlets, downpipes and surface water drainage systems to give a complete SuDS solution.

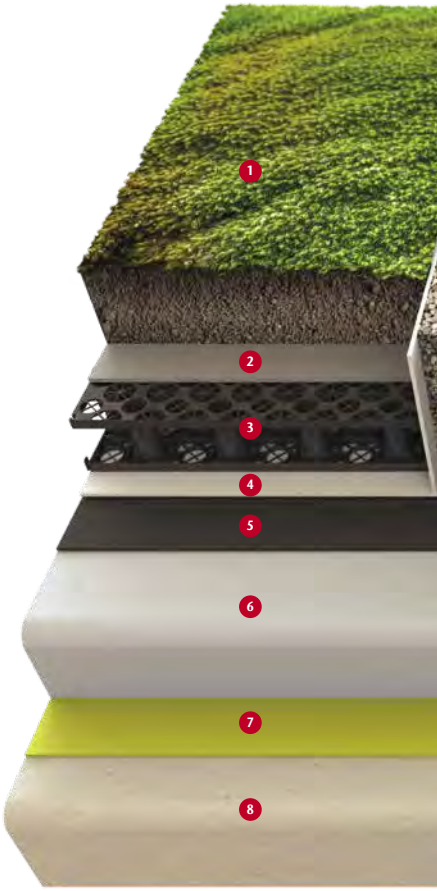
ACO Design Services can provide you with free guidance on the hydraulic design of blue roof and surface drainage systems. See page 14 for further information.

ACO RoofBloxx is an interlocking geocellular drainage system ranging in depth 85mm – 165+mm. It has been designed for shallow, high-strength roof attenuation systems and is also ideal for intensive green roof designs.

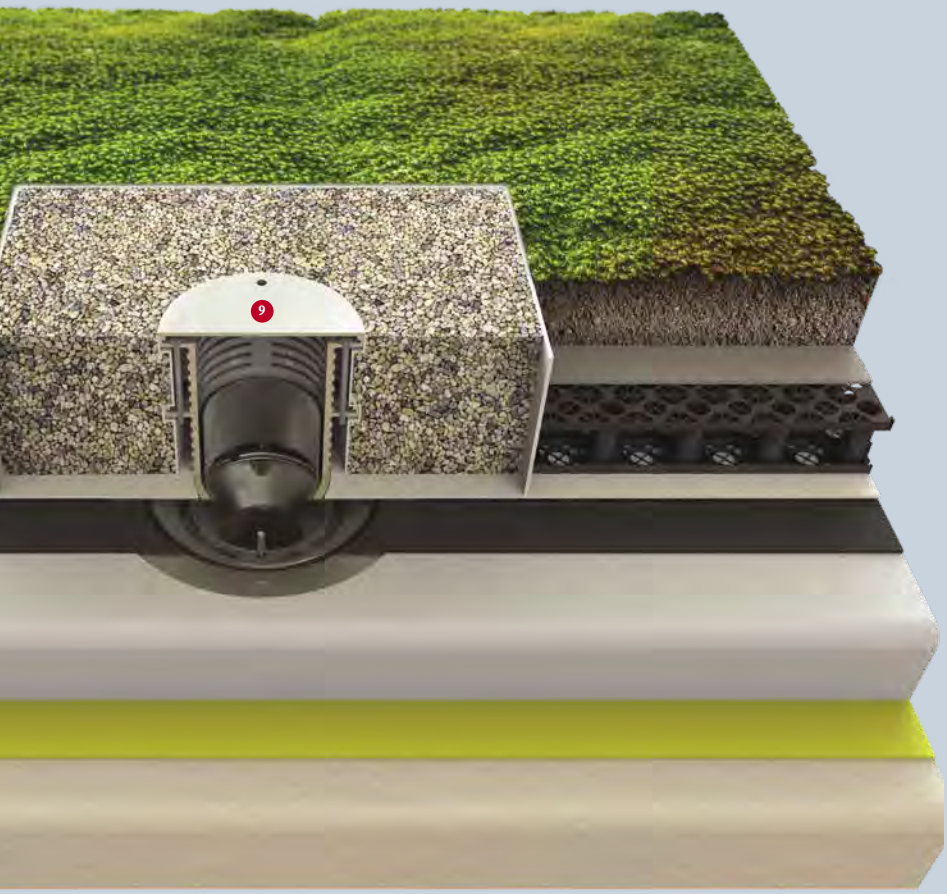
ACO RoofBloxx modularity and high-void structure makes it an ideal system to be incorporated into complex on-structure landscapes.

When combined with the ACO Blue Roof Flow Restrictor, the geocellular unit can store rainwater at source and control the run-off to mitigate impact from pre to post development rates.

The system can be designed to permanently store a percentage of the captured water above or within the ACO RoofBloxx geocellular unit (see technical section for further information). This enables passive irrigation and re-use of water at source during prolonged dry periods.



Features	Benefits
High strength (800kN/m^2)	Suitable for pedestrian and vehicular areas Minimal cover reduces structural load
Interlocking units	Forms a structural raft
Stackable units (40mm increments)	Adjustable storage depth No additional shear connections required



Number Key

1. Planting (200 - 1000 mm)
2. Filter geotextile
3. ACO RoofBloxx (85 - 165 mm)
4. Protection fleece
5. Waterproofing
6. Insulation
7. Vapour barrier
8. Roof slab
9. ACO Blue Roof Flow Restrictor

Technical Specifications

Model	RoofBloxx 85	RoofBloxx 125	RoofBloxx 165
Product Code	110001	110002	110003
Size (mm)	500 x 500 x 85	500 x 500 x 125	500 x 500 x 165
Material	Polypropylene	Polypropylene	Polypropylene
Colour	Black	Black	Black
Top surface void area	~53%	~53%	~53%
Internal void ratio	~90%	~90%	~90%
Gross volume	~0.021m^3	~0.031m^3	~0.041m^3
Net water volume	~0.019m^3	~0.028m^3	~0.037m^3
Unit weight	~2.2kg	~3.3kg	~4.4kg
Compressive strength	Max. 800kN/m^2	Max. 800kN/m^2	Max. 800kN/m^2
Discharge capacity			
- @ 0% gradient	6.4l/m/s	12.2l/m/s	16.9l/m/s
- @ 1% gradient	7.5l/m/s	13.4l/m/s	17.9l/m/s
- @ 2% gradient	8.5l/m/s	14.1l/m/s	18.8l/m/s
Biological/chemical resistance	Unaffected by moulds and algae, soil borne chemicals, bacteria and bitumen		

Key Features

- Modular structure allows for design flexibility
- Interlocks in any orientation
- Stackable without additional shear connectors
- Stormwater attenuation at shallow depth
- Passive irrigation attainable with capillary wick
- Suitable for use beneath both permeable and impermeable surfaces
- High loading bearing capacity in excess of 800 kN/m^2
- 100% recyclable
- 90% void volume for maximum water discharge or storage
- Nested packing for easy storage and delivery

ACO Blue Roof Flow Restrictor

ACO offers a Blue Roof Flow Restrictor as a means of controlling the rate of runoff from a blue roof.

The restrictor has been designed for use with the ACO range of HP vertical spigot and screw, 45 and 90 degree roof outlets and accessories.

The design of the restrictor is individually tailored to suit the site-specific requirements for each blue or blue green roof. The design of the flow restrictor(s) can be carried out with tailored roofs designed to BSEN12056-3:2000 or to attenuation sizing principles.

To size the restrictor, ACO Design Services will need to know:

- The desired flow rate from the roof (l/s)
- The maximum design storage depth (mm)
- The number of roof outlets and overflows
- Water Reservoir depth (mm) if required

ACO Design Services can also assist and provide guidance on the design and sizing of the blue roof storage – please see page 14 for further information.

Product Type	Diameter (mm)	Depth	Overflow
50/75 HP Vertical Orifice	300	3	Height to suit max storage depth
100/150 HP Vertical Orifice	380	3	Height to suit max storage depth
50/75 Horizontal Orifice	300	3	-
100/150 Horizontal Orifice	380	3	-

Features

1. Manufactured from corrosion-resistant 304 grade stainless
2. Built-in overflow with vertical orifice option – provides a failsafe drainage solution
3. The orifice height can be positioned so water can be retained on the roof for passive irrigation of a green roof.
4. Larger single orifice is less prone to blockages – applies to vertical and horizontal orifices if the system is designed using attenuation principles
5. Wide flange allows a secondary liner (if needed) to be dressed and sealed around the outlet without disturbing the roofing membrane seal.
6. The position of the orifice ensures that the roof membrane clamp ring seal is not subjected to prolonged periods of hydrostatic pressure when surcharged.
7. Coded solid cover (with vent) ensures the restrictor position is easily identified and prevents debris from entering and potentially blocking the outlet.

Note

BSEN12056-3:2000 – This standard uses a traditional approach to the sizing and positioning rainwater outlets as the primary aim is to remove rainwater from the roof as quickly as possible. The primary aim of a blue roof is to retain rainwater on the roof for a defined period of time (normally not more than 24 hours).

System Products

ACOTex plus protection fleece

Product code	Unit	27041
Description		Mechanically bonded continuous filament non-woven sheet
Material		100% UV stabilised polypropylene
Sheet dimensions	Length (m)	100
	Width (m)	4.0
Material thickness (for 2 kPa)	(mm)	2.9
Material mass per unit area	(g/m^2)	325
CBR puncture resistance	(N)	3850
Strip tensile strength (md)	kN/m	24
(cd)	kN/m	24
Elongation at maximum load	(md)	100%
	(cd)	40%
Cone drop test	(mm)	15
Opening size	µm	90
Permeability vertical	$l/m^2/s$	60

ACOTex Plus is used underneath the ACO RoofBloxx system to provide additional protection to the roofing membrane.

ACOTex infiltration geotextile

Product code	Unit	27038
Description		Mechanically bonded continuous filament non-woven sheet
Material		100% UV stabilised polypropylene
Sheet dimensions	Length (m)	100
	Width (m)	4.0
Material thickness (for 2 kPa)	(mm)	1
Material mass per unit area	(g/m^2)	125
CBR puncture resistance	(N)	1500
Strip tensile strength (md)	kN/m	9
(cd)	kN/m	10
Elongation at maximum load	(md)	90%
	(cd)	65%
Cone drop test	(mm)	24
Opening size	µm	105
Permeability vertical	$l/m^2/s$	115

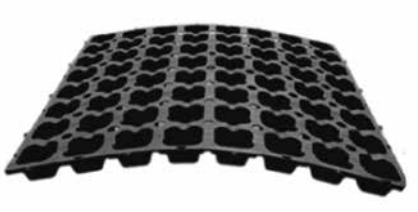
ACOTex is used on top the ACO RoofBloxx system to act as a separation layer between the ACO RoofBloxx system and the green roof substrate or landscaping.

ACO Flat Roof Outlets

ACO offers a full range of flat roof outlets including vertical 45 and 90 degree spigot and threaded outlets, balcony, gully, two-way and overflow outlets. All ACO Building Drainage high performance rainwater outlets are manufactured from die-cast marine-grade LM6 aluminium silicon alloy. This grade of aluminium alloy is highly corrosion resistant, weather-proof and resistant to ultra-violet radiation.

ACO RoofBloxx Reservoir Tray

ACO RoofBloxx Reservoir Tray is a lightweight interlocking modular green roof tray designed for versatility. Its flexibility means it can easily be cut-to-fit different shapes. Its easy-to-interlock feature facilitates the connection of adjacent trays for stability. It can be used in conjunction with ACO RoofBloxx 85 - 165 mm to provide a green roof reservoir above the blue roof storage layer. See typical installation details page 16.



Product Code	110008	110007
Material	Recycled Polypropylene	Recycled Polypropylene
Size	500 mm x 500 mm	500 mm x 500 mm
Height (overall)	30 mm	60 mm
Vertical Compressive Strength kN/m^2	470	618
Reservoir capacity l/m^2	11.6	18

Capillary Wick

ACO offers a wicking rope to assist with the irrigation of a green roof where the storage reservoir is contained within the RoofBloxx geocellular unit. See typical installation details page 16.

Product Code	110011
Material	Cotton
Roll Length	15m
Thickness	6 mm

Threshold Drain

Manufactured from extruded plastic and aluminium, ACO Threshold Drain eliminates water ponding at external doorway entrances.

ACO Pipe

ACO PIPE® is a reliable, lightweight and durable stainless steel push-fit pipework system, designed, produced and tested for soil, waste, rainwater and industrial wastewater drainage applications.

Please refer to product brochures for more information.

Design Considerations

ACO Design Services

ACO's in-house technical design team can assist with attenuation sizing and the design of blue roof drainage systems. They can also consider any other surface water drainage requirements by modelling the behaviour of the roof during various storm events.

The information required by ACO to size the blue roof is as follows :

1. Project location
2. Roof area (plus any other areas discharging directly onto the roof)
3. The design storm return period plus any climate change adaptation factor
4. Permitted discharge rate

Please note: A blue roof system is generally specified in conjunction with other SuDS components. Changes in the blue roof design and other SuDS systems are likely to have an impact on the performance of the whole system. Such changes should be assessed by an appropriately qualified engineer.

ACO offers a wide range of surface water management solutions. For more information, contact ACO design team or visit our website: www.aco.co.uk/aco-water-management

Hydraulic Design

It is not uncommon for a blue roof system to be specified where there is limited opportunity and available space for more traditional methods of SuDS and attenuation control. In such circumstances the engineer must consider the design of the blue roof in conjunction with other site SuDS to ensure the hydraulic performance meets the overall surface water drainage requirements needed for planning conditions to be met.

- The roof drainage design should comply with BSEN12056-3:2000, and should include the provision of emergency overflows. ACO Design Services can provide guidance regarding the sizing and location of roof outlets to BSEN12056-3:2000
- Blue roofs are generally installed on a 'zero fall' roof. BS6229:2018 defines a zero roof fall as one having between 0 and 1:80 fall, but it must not have any back falls.
- Void ratio – The total roof area must factor in the void ratio of any gravel surround and fire break strips as well as the void ratio of the storage void. ACO RoofBloxx geocellular unit has a void ratio of 90% and gravel typically has a 30% void.
- Reservoir capacity – The ACO blue roof system can be designed to accommodate an additional reservoir capacity, either within the ACO RoofBloxx system for a warm roof construction using capillary wicks or above for inverted roof designs using the ACO RoofBloxx Reservoir Tray (see page 13).

Structural Design

Blue roofs will generally require a concrete slab due to the dead and live load. As such the incorporation of a blue roof system should be considered as early in the planning process as possible to ensure the additional weight of the stored water is accommodated in the structural design calculations for the roof structure.

A detailed structural analysis should be carried out by a suitably qualified engineer to consider construction tolerances, deflection and settlement under load. As the usual depth of the stored water is unlikely to be much more than 100-150mm in depth, (1.0-1.5kN/m² load) the actual increase in load is minimal.

Surface Finishing

An ACO blue roof drainage system can be designed to work in conjunction with a variety of roof constructions and types including warm and inverted roofs, and podium decks.

The high-strength ACO RoofBloxx geocellular unit makes a blue roof suitable for use beneath:

- Extensive and semi-intensive green roofs
- Intensive green roofs
- Paving and decking on suitable pedestals or fixings
- Raised planters
- Pedestrian areas
- Trafficked areas such as podium decks
- Areas with photovoltaic cells (PV) – fixing may be possible through the ACO RoofBloxx unit to avoid the requirement for additional ballast – please consult ACO Design Services.

The design of the ACO RoofBloxx system also allows for services to be laid in the drainage void if required.

Building Fabric Design Requirements

The permanent and/or temporary storage of rainwater on a roof also requires additional consideration. For waterproofing and exceedance drainage, both BS6229:2018 and the Green Roof Organisation's (GRO) "Green Roof Code of Practice" provide excellent design guidance. Key considerations include, but are not limited to, the following:

- Surface water drainage – consideration needs to be given for surface drainage on landscaped roof and podium decks. Design should be carried out to BSEN752:2008 - Drain and sewer systems outside buildings.
- Waterproofing details should finish 150mm above the finished level of any landscaping
- Penetrations: upstand depth restrictions.
- Detailing: Existence of expansion joints.
- Roof geometry – the incorporation of walls and plant equipment may obstruct flow paths to outlets.
- Fire and vegetation breaks.
- Roof outlets and outlet restrictors should be detailed to prevent clogging from fines, they should also include vegetation breaks.
- Thermal insulation – particularly for inverted roof constructions.
- Floatation – notably with inverted roof construction.
- Wind uplift

ACO Design Services

The ACO Design Services team can advise and assist with project specific design guidance to help meet the individual client requirements.

askACO

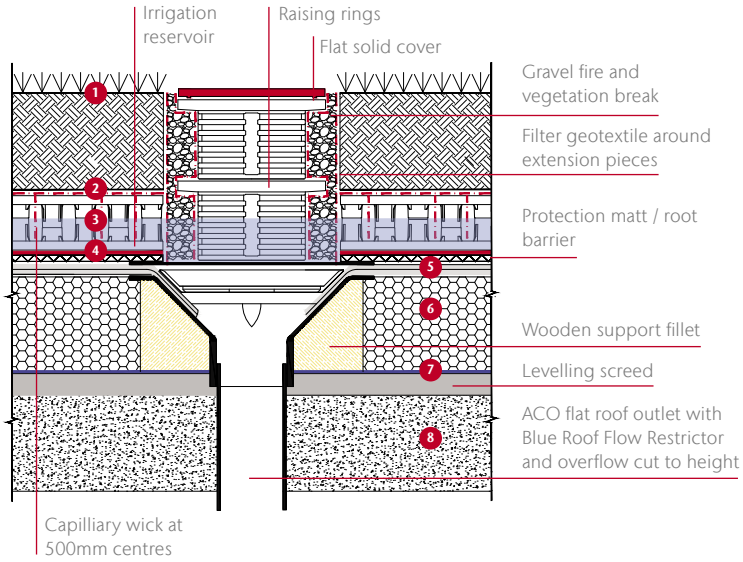
Telephone 01462 810431
or visit www.aco.co.uk

Typical Installation Details

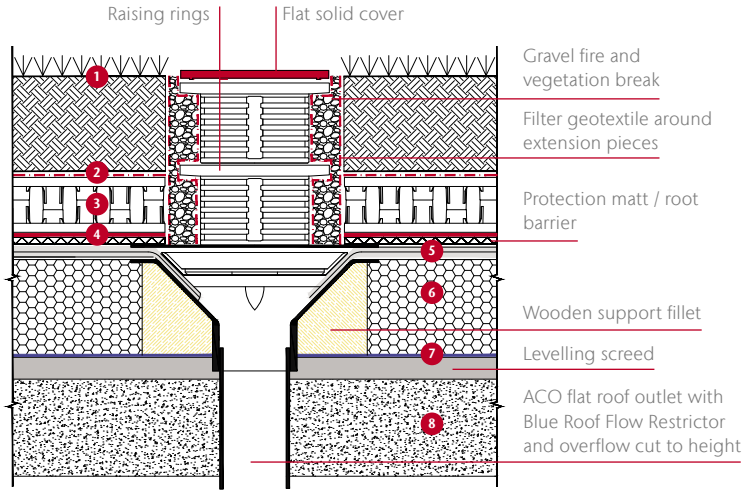
With some minor design modifications, blue roof storage systems can be easily incorporated into most flat roof systems at relatively little additional cost.

Warm Roof Construction

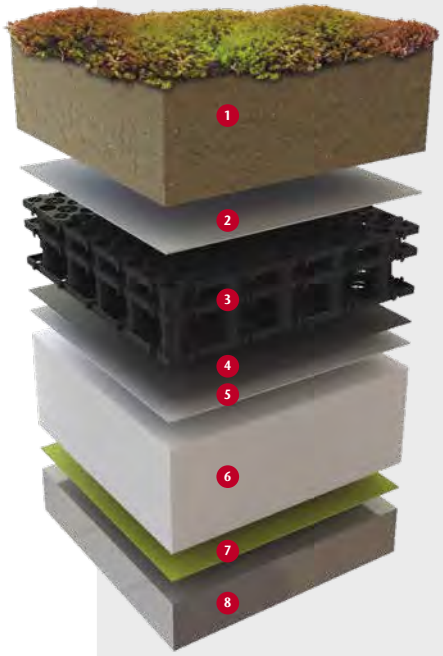
Warm roof with reservoir



Warm roof no reservoir



Warm Roof – is a type of roof construction that has an insulation layer above the structural deck, and immediately below its weatherproofing membrane. This type of construction allows heat to be conserved within a building without the need for a ventilation system.



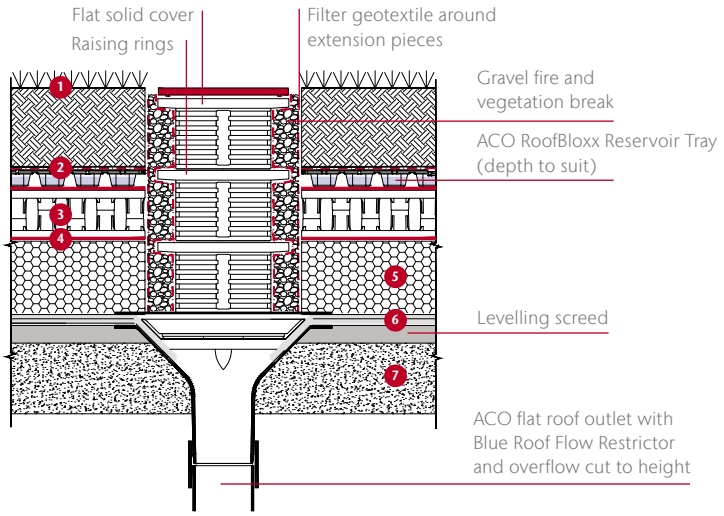
Number Key

1. Planting (200-1000mm)
2. Filter geotextile
3. ACO RoofBloxx (85-165mm)
4. Protection fleece
5. Waterproofing
6. Insulation
7. Vapour barrier
8. Roof slab

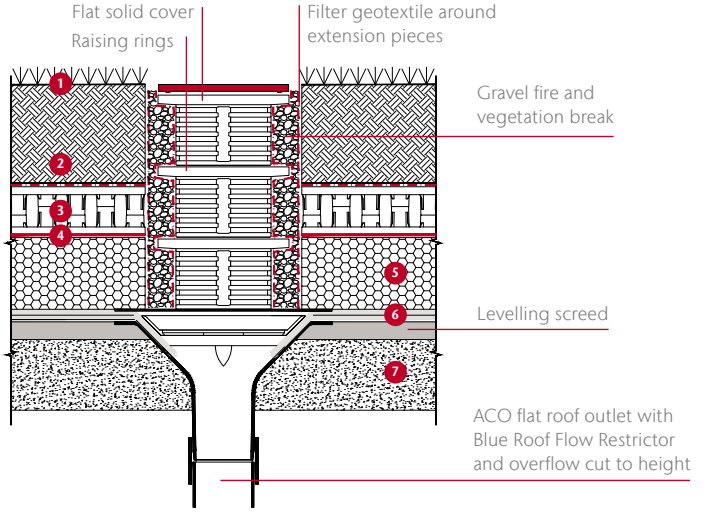
Inverted Roof Construction

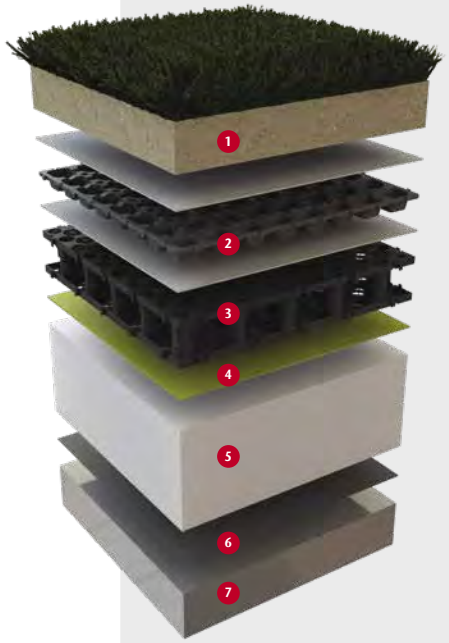
Inverted Roof – An inverted roof, also referred to as an 'upside down' roof, is a form of flat roofing that has the waterproofing layer underneath the thermal insulation rather than above it. The insulation layer helps to protect the waterproof membrane and prolong its life.

Inverted roof with reservoir



Inverted roof no reservoir





Number Key

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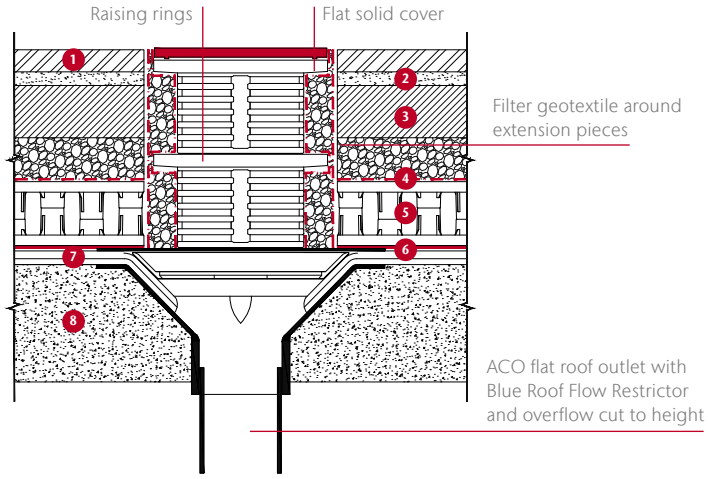
2. Filter geotextile
3. ACO RoofBloxx (85-165mm)
4. Protection fleece
5. Insulation
6. Waterproofing
7. Roof slab

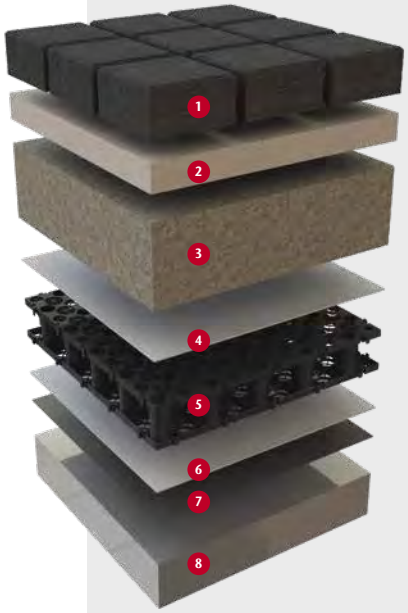
Podium Deck Construction



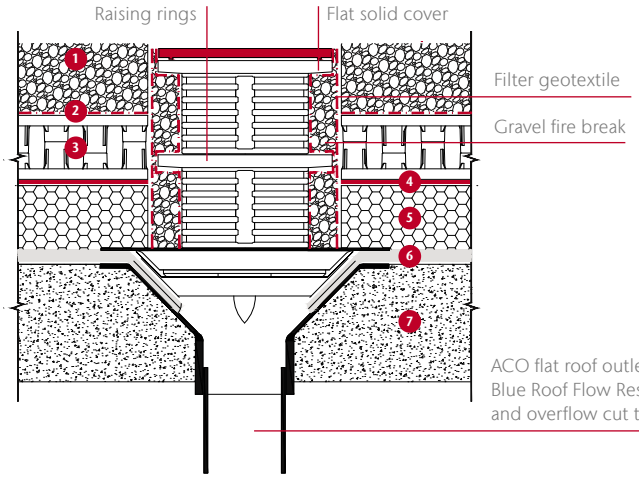
Number Key

1. Porous block paviors (80mm)
2. Sand blinding (50mm)
3. Sub base (150mm)
4. Filter geotextile
5. ACO RoofBloxx (85-165mm)
6. Protection fleece
7. Waterproofing
8. Roof slab

Podium Deck – A podium deck is a raised structural platform or one that has a void underneath it, for example, when it is situated above a basement They are often uninsulated and may be at ground level.



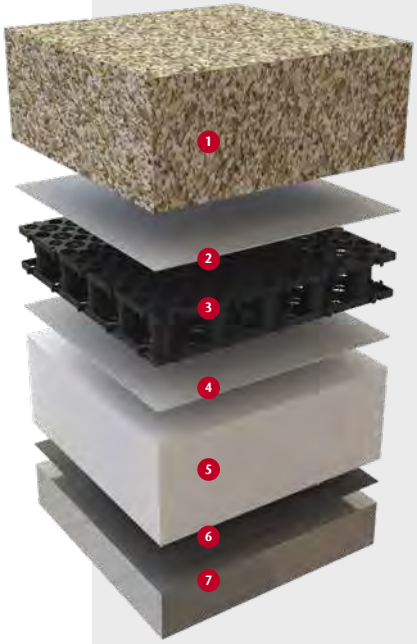
Inverted Ballasted Roof



Number Key

1. Ballast
2. Filter geotextile
3. ACO RoofBloxx (85-165mm)
4. Protection fleece
5. Insulation
6. Waterproofing
7. Roof slab

Ballasted Roof – Is a flat roof where the roofing membrane is not anchored or adhered in any way to the decking material. The stones used in a ballasted roof are more substantial and resist wind uplift.



Installation Guide

Installation of ACO RoofBloxx

ACO recommends that the ACO RoofBloxx geocellular unit together with a protection fleece is installed across the complete design area. The fleece protects the waterproofing layer during construction whilst giving the landscape contractor full access during construction.

1

The ACO RoofBloxx units are delivered in bundles of 4 unassembled units. An unassembled unit comprises of two panels that need the top panel to be rotated to form a 85mm high unit

2

Each panel has one corner that has a star. To assemble one complete unit, the top panel will need to be rotated so that the stars align.

3

Once the stars align on top of one another, the supporting columns will join together. Simply push down and the 85mm unit is assembled.

4

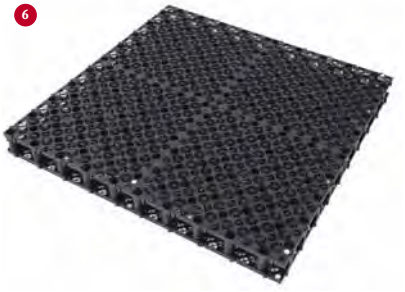
An assembled 85mm unit

When creating units over 85mm in height, we recommend that an 85mm unit is created first and additional layers are subsequently added.

5

To join units together, simply align both top and bottom adjoining integral connectors and push down firmly.

6



This procedure is then repeated with all units so that a solid sheet is created. The panels can be cut around roof protrusions and details without compromising strength provided columns are cut round and not through.

7

To create units which are more than 85mm in height, simply stack a single sheet of ACO RoofBloxx directly on top of an 85mm high unit to create a 125mm high unit. An additional layer can then be added to create a 165mm high unit. Please note the stars must align.

ACO Blue Roof Flow Restrictor

1

Install the ACO roof outlet in accordance with installation instructions on page 33 in the ACO Rainwater Outlets brochure. Screw the threaded studs supplied with the outlet restrictor into the clamping ring on the installed roof outlet.

2

Place the flow restrictor plate over the threaded studs and tighten ensuring that the neoprene gasket and washer are under the nuts to create a water-tight seal.

3

Place a raising ring over the flow restrictor and using the two spare nuts secure in place

4

Secure additional extension pieces so that the required finished height is achieved and cut the extension pieces to required height. Wrap non-woven geotextile infiltration fabric around the raising rings prior to the placement of gravel and green roof substrate to ensure there is no possibility of debris ingress that might block the outlet restrictor.

5

Finally place the outlet flow restrictor cover plate over the raising ring and secure in place using the bolts supplied.

6

Additional notes: If using a secondary containment liner on top of the main roof waterproofing layer, insert the geomembrane and protection fleece under the outlet flow restrictor plate between steps 1 and 2 and tighten and /or fix to the adaptor plate.

If fitting overflow outlets, please refer to page 25 of the ACO Building Drainage High Performance Rainwater Outlets for Flat Roofs, Car Park Gullies and other areas brochure.

Maintenance Considerations

The ACO blue roof system should be regularly maintained to ensure optimum performance and the inspection of roof outlets to check for potential blockages should be carried out in conjunction with fire and irrigation (where fitted) inspections. ACO has colour coded and clearly delignated the flow roof flow restrictor outlets to assist inspection.

All inspections should be carried out twice per annum to remove vegetation from the gravel surrounding all outlets and inspection chambers. The maintenance should be carried out with due regard to safety and access in accordance with the CDM regulations, The Health and Safety at Work Act, and The Construction (Health, Safety and Welfare) Regulations.

Specification Clauses

ACO RoofBloxx

The blue roof storage unit is ACO RoofBloxx by ACO Building Drainage measuring 500 x 500 x 85/125/165 mm (as appropriate) with an ultimate vertical compressive strength of not less than 800 kN/m^2 with a 90% void ratio. The ACO RoofBloxx system shall be laid on ACOTex 300gsm Protection Fleece and overlaid with ACOTex 125gsm geotextile. All laps should be a minimum of 300 mm.

If an irrigation reservoir is required, then add either:

Warm Roof

The system will include an additional internal irrigation reservoir of (insert depth) xxmm deep using the ACO Blue Roof Restrictor and ACO Capillary Wicks at a maximum of 500mm centres.

Inverted Roof

The system will comprise an additional external irrigation ACO RoofBloxx Reservoir Tray – 500 x 500 x 30/60 mm (as appropriate) with an ultimate vertical compressive strength of not less than 470 / 600 kN/m^2 (delete as appropriate) above the ACO RoofBloxx geocellular layer.

ACO Blue Roof Flow Restrictor

The blue roof outflow shall be controlled by an ACO Blue Roof Flow Restrictor(s) as designed by ACO Building Drainage. The flow restrictor shall be manufactured from 304 stainless steel and used in conjunction with ACO roof outlets. The outlet flow restrictor(s) shall be designed to control the roof run-off to (insert depth) xx l/s at a design hydraulic head of (insert depth) xxmm (depth of storage void).

NBS Specification Clause:

ACO RoofBloxx should be specified in section R10/365/465. Assistance in completing this clause can be found in the ACO Building Drainage entry in NBS Plus, or please contact the ACO Design Services team. Note: A specification in NBS format is available to download from www.thenbs.com or www.aco.co.uk

Further Learning

Design Support Services

Surface water management system design can often be a complex task. Success in combining products and processes requires a thorough understanding of how these different elements work together.

The ACO Design Services team is able to work closely with you through the entire design process to ensure accurate and cost-effective product selection is made.

Services we offer include (free and without obligation):

- Whole system design, from collection to the attenuation of surface water
- Hydraulic calculations and AutoCAD detailing
- Parts schedules

ACO Professional Development

ACO has recognised that knowledge transfer is fundamental in keeping up-to-date with the latest advancements in surface water management and has a unique training offer that can be accessed online, in-house or at the state-of-art training facility at the ACO Academy.

In Company

ACO offers face-to-face professional development sessions. These are carefully designed to last up to 1 hour, so they can be undertaken across a lunch break.

A member of our team will contact you directly to discuss your requirements and will tailor the session to meet your needs.

Webinars

ACO has developed a series of webinars that will keep you up to date, bringing you technical expertise as well as more specific product information. Whatever your involvement from specification to installation, there will be a webinar to meet your needs and further your learning.

ACO Academy Days

ACO's training facility at its UK head office in Bedfordshire has a theatre-style facility that can hold up to 50 people as well as a number of breakout rooms for small groups.

Professional development training can be combined with more in-depth product training at the on-site learning zone.

Seminars

ACO is bringing the experts to you via our programme of regional events, and by sharing information from key influencers within the industry as well as more specific product information. ACO's seminar events will include opportunities to enhance existing knowledge as well as network and discuss thoughts and ideas with other delegates.

www.aco.co.uk/professional_development | email: ukprofessionaldevelopment@aco.co.uk

Sustainability

Playing our part

ACO recognise that sustainability is the single most important issue that the construction industry will face over the coming years. Our research and development programme aims to maximise the use of sustainable material but, importantly, also strives to improve manufacturing and administrative processes that impact our environment.

Responsible sourcing

ACO have developed a programme of continual improvement which seeks to ensure, where practical, all products manufactured are made from sustainable materials – recycled and recyclable.

The company has a programme of residues, ensuring that all packaging, palletising and office residues are segregated and managed in an ecologically sustainable manner.

Sustainable drainage systems (SuDS)

Sustainable Drainage Systems (SuDS) aim to control surface rainfall run-off by controlling the rate and volume of runoff from your site, relieving pressure on sewerage systems and mimicking natural drainage as closely as possible. Used effectively, SuDS can help developers deliver greener housing infrastructure.

We have unrivalled experience in designing, creating and advising on fully-integrated and sustainable surface water management systems. Whatever your requirements, we can help you deliver an effective solution and support you with best practice, relevant information and dedicated resources on an ongoing basis.

ACO believes that the best SuDS will be cost effective to operate and provide efficient drainage throughout their life. Rather than being inherently ‘soft’ or ‘hard’, they will instead include an optimized and integral mix of ‘soft’ and ‘hard’ components that will combine to bring out the best in each other.

askACO

For further guidance and technical advice, contact our in-house technical design team who will be pleased to help you with the specification and design of your blue roof.
Telephone **01462 810431** or visit **www.aco.co.uk**

- ACO Access
- ACO Water Management
  Civils + Infrastructure
  Building + Landscape
- ACO Building Drainage
- ACO Sport
- ACO Wildlife

ACO Building Drainage

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e-mail Sales: abdcommercial@aco.co.uk
e-mail Technical: abdtechnical@aco.co.uk

www.aco.co.uk

ACO. creating the future of drainage

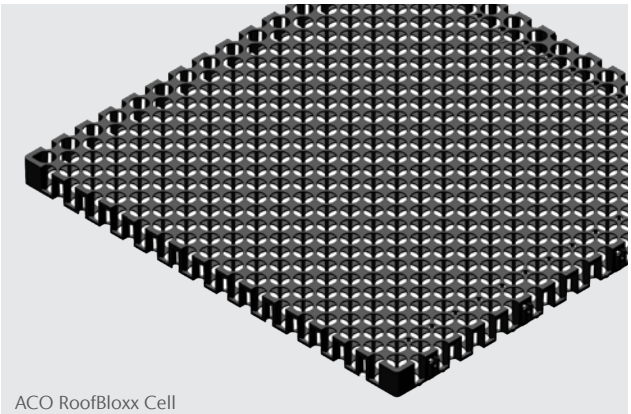
PM302

ACO. creating
the future of drainage

ACO RoofBloxx Cell

ACO RoofBloxx Cell is a lightweight high strength sub-surface drainage sheet that provides superior performance.

It provides heat and sound insulation whilst also acting as a waterproofing membrane protection layer. ACO RoofBloxx Cell eliminates the need for the use of heavy gravel aggregates for sub-surface drainage and screeds for waterproofing membrane protection in planter boxes and intensive roof gardens.



ACO RoofBloxx Cell

Benefits

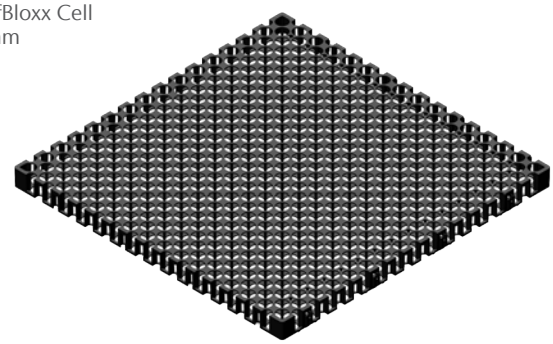
- Design flexibility
- Easy installation
- Lightweight and high strength
- Efficient
- Sustainable and environmentally friendly

Applications

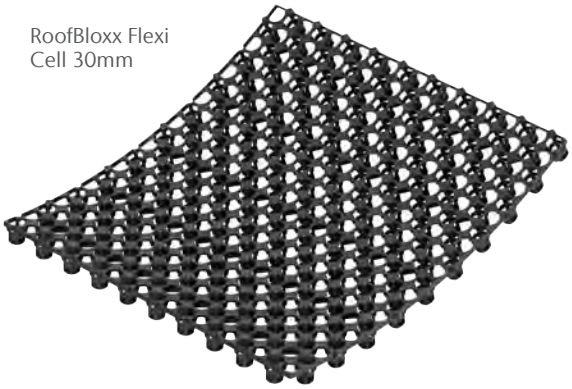
- Intensive green roofs
- Podium decks
- Planter boxes
- Paved areas and roadways

System Overview

RoofBloxx Cell 30mm



RoofBloxx Flexi Cell 30mm

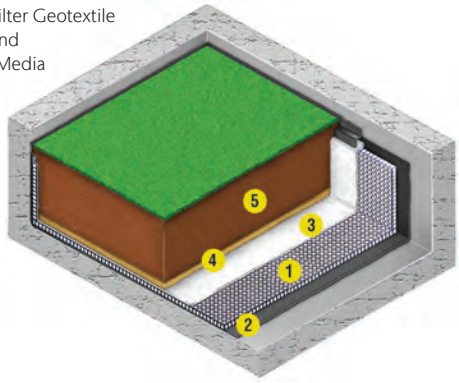


Product Code	Description	Size	Height	Material	Weight	Ultimate Compressive Strength	Discharge Capacity @ 1% gradient	Surface Void Area	Internal Void Area
		[mm]	[mm]		[kg/m²]	[kN/m²]	[l/m/s]	[%]	[%]
ACO RoofBloxx Cell									
110008	ACO RoofBloxx Cell 30mm, Black	500 x 500	30	Recycled Polypropylene	2.5	800	16.5	62	95
110009	ACO RoofBloxx Flexi Cell 30mm, Black	500 x 500	30	Recycled Polypropylene	2.0	600	16.5	62	95

ACO RoofBloxx Cell Installation

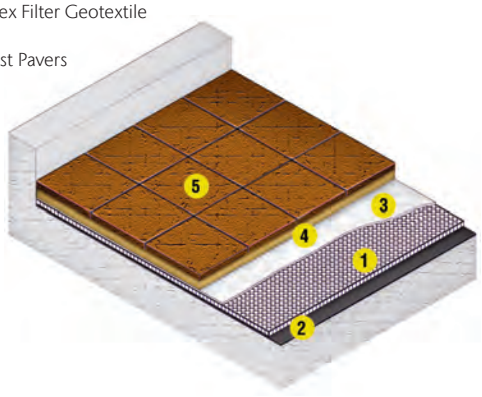
Intensive Green Roof

1. RoofBloxx Cell
2. Waterproof Membrane
3. ACOTex Filter Geotextile
4. Coarse Sand
5. Growing Media



Podium Deck

1. RoofBloxx Cell
2. Waterproof Membrane
3. ACOTex Filter Geotextile
4. Sand
5. Pre-cast Pavers



Typical Specification Clause

The modular sub-surface drainage system shall be ACO RoofBloxx Flexi Cell / ACO RoofBloxx Cell by ACO Building Drainage, consisting of individual interlocking components 500 x 500 mm (nominal) x 30 mm height weighing no more than 2.5 kg/m². Black in colour and manufactured from re-cycled polypropylene. Voids are to be circular in design and shall be at least 62% of the horizontal surface area. Discharge capacity is to be a least 16.5 l/m/s (at hydraulic gradient of 1%).

To download a copy of the ACO RoofBloxx Product Overview brochure visit **www.aco.co.uk/products/roofbloxx**

ACO Building Drainage Contacts:
e-mail Customer Enquiries: abdcommercial@aco.co.uk
e-mail Technical: abdtechnical@aco.co.uk
Tel: 01462 810411
www.aco.co.uk/products/roofbloxx

ACO. creating the future of drainage