ACO RoofBloxx

Blue Roof Attenuation Systems
for a Sustainable Urban Environment

Product Catalogue

ACO RoofBloxx Blue Roof Attenuation System

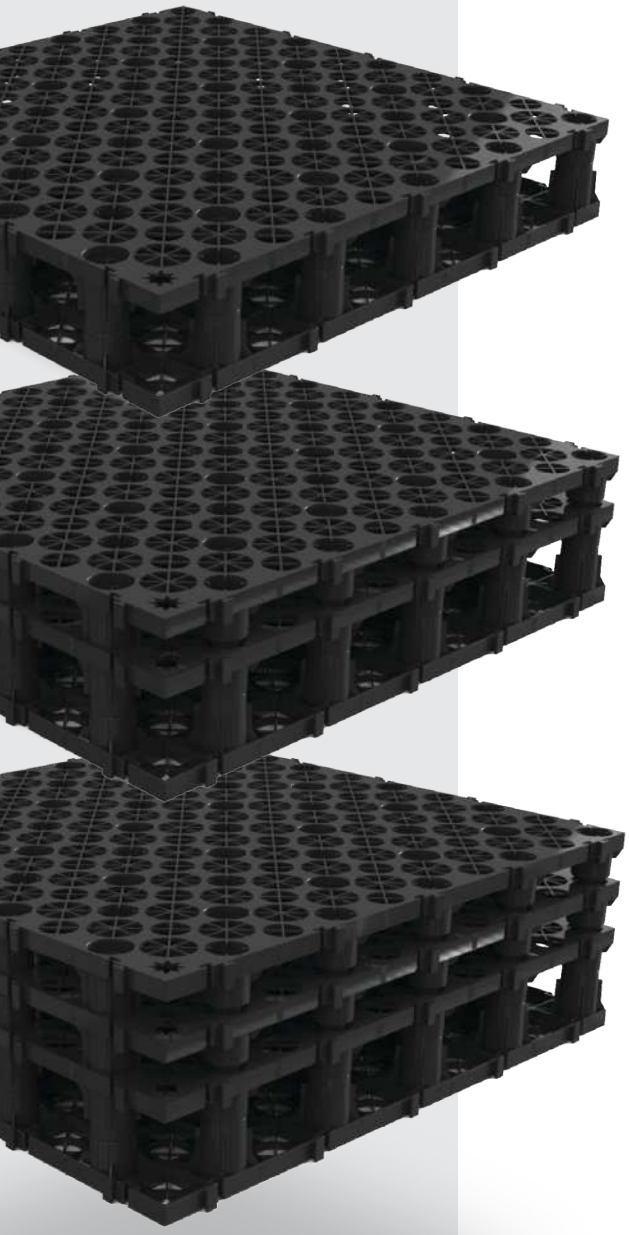
ACO RoofBloxx offers architects, engineers and property owners an environmentally sustainable, efficient and cost-effective method to reduce rainwater run-off, enabling water storage and irrigation of blue/green roofs in urban environments.

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. we care for water

ACO is a Water-Tech company that protects water. Building on our global drainage expertise that protects people from water, we increasingly see our mission as also protecting water from people.

With the ACO WaterCycle, ACO provides systems that collect and channel, clean, retain and ultimately reuse water. In this way, ACO contributes to the preservation of clean groundwater as a vital resource, and makes a contribution to tomorrow's world. In its Agenda 2030, the UN global community set the improvement of water quality as one of 17 sustainable development goals.

Intelligent drainage systems from ACO increasingly use smart technology to ensure that rainwater and wastewater are drained, or temporarily stored. With innovative separation and filter technology, we prevent water contamination by pollutants such as fat and grease, fuels, heavy metals and microplastics.

Today, ACO goes one step further: we accept the challenge of reusing water, and thus establishing a resource-saving cycle. For all products and systems, ACO attaches great importance to durability, reusability and a low carbon footprint. The pursuit of sustainability is an ongoing process that we strive to meet every day.

The ACO Group is a global family business that is one of the world market leaders in the Water-Tech segment. Founded in Schleswig-Holstein in 1946, it operates as a transnational network in over 50 countries. Worldwide, ACO is characterised by a high level of decentralised ownership, and explicit regional market proximity.

www.aco.com

Holder
Iver and Hans-Julius Ahlmann

Headquarters of the ACO Group
in Rendsburg/Büdelsdorf

5,200

employees in more than 47 countries (Europe, North and South America, Asia, Australia, Africa)

1 Billion

Euro Sales in 2021

37

production sites in 18 countries

ACO Academy
for practical training

What is a Blue Roof?

The term Blue Roof is generally used to include a range of systems that are situated on the roof and intended to capture and control rainfall. This can include the use of the existing roof waterproofing and flat roof drainage system to capture and control rainfall, or they can be standalone systems, as with ACO RoofBloxx, that are separate from the roof waterproofing and drainage, with the explicit purpose of acting only as an attenuation system.

In order to meet planning conditions and to comply with guidance in C753 The SuDS Manual Blue Roofs are designed to drain down to half empty within a 24 hour period depending on the drainage specification and architectural requirements for the roof build-up.

Blue roof attenuation systems can be designed in conjunction with a variety of roof finishes, including green roofs where a standalone attenuation system can be used to provide passive irrigation and rainwater harvesting.

Blue Roof

A blue roof is a roof attenuation 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 above the roof membrane or be above the storage layer. A blue/green roof will be able to deliver on all the pillars of SuDS.

Why specify a blue roof attenuation 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 attenuation system 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 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.

Overview of current design practice

Conventional blue roof design looks to provide the rainwater attenuation within the build-up of a normal roofing system as a single solution in a similar way to that of a green roof. Ultimately this has led to a degree of confusion and differing interpretation as to how a blue roof should be designed given that its purpose and function is very different from flat roof drainage design.

In simple terms a standard flat roof is designed to drain quickly in the worst case event – a short intense summer storm lasting minutes, whereas a blue roof is designed to drain slowly – to mitigate the effects of downstream flooding that can be a duration of hours. Designing a roof drainage system to cater for both extremes is a difficult challenge.

Current design dilemmas associated with blue roofs include, drain down times, roof falls, number of roof outlets, pipe gradients, roof construction - most notably with inverted designs, and not least a lack of standards, all of which lead to issues with design liability and warranties.

The patented ACO Blue Roof Attenuation System

The ACO solution separates the competing drainage requirements by engineering an elevated structural attenuation system that operates independently of the flat roof drainage system, allowing both storm eventualities and systems to be engineered to known standards and best practice.

Separating the design issues ensures that compromise is not needed. The attenuation system can drain slowly in normal use and in an unforeseen eventuality the attenuation system can be bypassed if necessary and the flat roof drain quickly.

The system operates by creating a structural drainage void between the top of the roof waterproofing and the underside of the attenuation lining membrane that surrounds ACO RoofBloxx. As the blue roof tank sits inside the roof area a weir overflow is created at the perimeter of the tank and above the ACO roof outlets ensuring free flow of rainwater if the blue roof tank is full. The design of the system allows the blue roof tank to be controlled through as few ACO blue roof flow restrictors as needed and integrates with the ACO range of roof outlets.

The system can be incorporated under a wide range of roof finishes from soft landscaping to trafficked areas, new build and retrofit, and with a variety of roof construction types including inverted roofs and podium decks.

A closer look at the system

The ACO RoofBloxx system comprises a shallow, high-strength, height variable geocellular storage void, structural drainage cell and blue roof flow restrictor. 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 16 for further information.

ACO RoofBloxx Tank 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 Cell is a 30mm high strength structural drainage sheet for use with a drainage void in blue and green roof constructions.

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/m²)	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

To see the animation of our system in operation visit www.aco.co.uk/blue-green-roofs

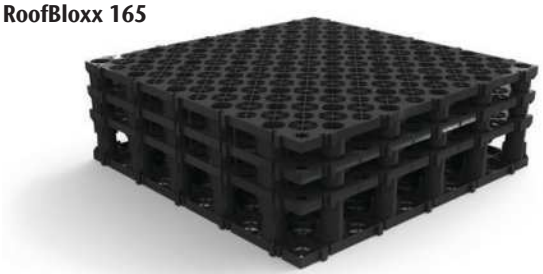
Number Key

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

Technical Specifications

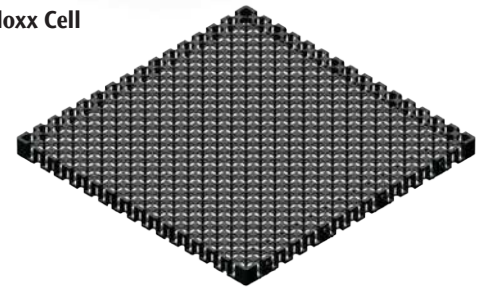
RoofBloxx 85

RoofBloxx 165



RoofBloxx 125

RoofBloxx Cell



Model	RoofBloxx 85	RoofBloxx 125	RoofBloxx 165	RoofBloxx Cell
Product Code	110001	110002	110003	110008
Size (mm)	500 x 500 x 85	500 x 500 x 125	500 x 500 x 165	500 x 500 x 30
Material	Polypropylene	Polypropylene	Polypropylene	Polypropylene
Colour	Black	Black	Black	Black
Top surface void area	~53%	~53%	~53%	~62%
Internal void ratio	~90%	~90%	~90%	~95%
Gross volume	~0.021m^3	~0.031m^3	~0.041m^3	0.0075m^3
Net water volume	~0.019m^3	~0.028m^3	~0.037m^3	0.0071m^3
Unit weight	~2.2kg	~3.3kg	~4.4kg	~2.5kg
Compressive strength	Max. 800kN/m^2	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	16.5 l/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 16 for further information.

Product Type	Nominal Size (mm)	Diameter (mm)	Overflow
50/75 Blue Roof Flow Restrictor	50 & 75	300	Height to suit max storage depth
100/150 Blue Roof Flow Restrictor	100 & 150	380	Height to suit max storage depth
50/75 Blue Roof Flow Overflow	50 & 75	300	Height to suit max storage depth
100/150 Blue Roof Flow Overflow	100 & 150	380	Height to suit max storage depth

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

The ACO Blue roof drainage system is designed to comply with the requirements of BS12056-3:2000 whilst also meeting the site discharge parameters required under planning conditions.

ACO Blue Roof Diffuser and Access Unit

The ACO Blue Roof Diffuser and Access Unit is a modular stackable frame and riser system that is designed to be used with the ACO RoofBloxx range for blue green roofs and podium decks.

It can be used as an access unit as well as an inlet diffuser with combined shallow silt trap.

Available with an 85mm base frame and 165mm raising pieces the unit can accommodate 68-150mm diameter pipe connections.

ACO Blue Roof Diffuser key features:

- Modular stackable base and raising pieces
- Easy access for routine maintenance
- Allows 68– 150mm pipe connections
- Integrates with the ACO RoofBloxx tank and cell system
- Available in 85 and 165mm height increments
- Can be cut on site to suit finished cover levels
- Manufactured from stainless steel
- Can be used with the ACO range of access covers
- Helps dissipate high water flows
- 100% recyclable

RoofBloxx	RoofBloxx Diffuser/ Access Base Unit	RoofBloxx Diffuser/ Access Raising Piece	RoofBloxx Diffuser/ Access Slotted Cover	RoofBloxx Diffuser/ Access Solid Cover
Part Number	20995	20997	20999	20962
Length (mm)	485	485	480	480
Width(mm)	485	485	480	480
Height(mm)	85	165	8	8
Stainless Steel	304 Grade	304 Grade	304 Grade	304 Grade
Inlet Connection (nom mm)	68	68/100/150	n/a	n/a
Top/side surface void area	~8%	~11%	~7%	N/A
Unit weight	~2.0kg	~3.1kg	~4.8kg	~5.1kg

System Products

ACOTex plus protection fleece

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

Product code	Unit	27041
Description		Mechanically bonded continuous filament non-woven sheet
Material		100% UV stabilised polypropylene
Sheet dimensions - Length	Length (m)	100
Sheet dimensions - Width	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
Strip tensile strength (cd)	kN/m	24
Elongation at maximum load	(md)	100%
Elongation at maximum load	(cd)	40%
Cone drop test	(mm)	15
Opening size	µm	90
Permeability vertical	$l/m^2/s$	60

ACOTex infiltration geotextile

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.

Product code	Unit	27038
Description		Mechanically bonded continuous filament non-woven sheet
Material		100% UV stabilised polypropylene
Sheet dimensions - Length	Length (m)	100
Sheet dimensions - Width	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
Strip tensile strength (cd)	kN/m	10
Elongation at maximum load	(md)	90%
Elongation at maximum load	(cd)	65%
Cone drop test	(mm)	24
Opening size	µm	105
Permeability vertical	$l/m^2/s$	115

Welded Geomembrane

For applications where permanent storage of rainwater on the roof is specified e.g passive irrigation and rainwater harvesting, then a welded geomembrane should be used.

Tested Property	Test Method	Minimum Values*
Thickness** (mm)	ASTM D 5199	1
Density (max) g/cm^3	ASTM D 792 / 1505A	< 0.939
Tensile properties (each direction)	ASTM D 6693, Type IV, Speed: 50mm/min	
Strength at break		27
Elongation at break	G.L. = 50mm	800
Tear resistance	ASTM D 1004	100
Puncture resistance	ASTM D 4833	250
Carbon black content	ASTM D 1603	2
Carbon black dispersion	ASTM D 5596	1/2†

* Value at 95% confidence interval
** Average value of 10 specimens taken across roll width. No value to be less than 90% of average value

ACOWrap

Product code	Unit	27042
Description		Geomembrane suitable for taped joints
Sheet dimensions - Length	Length (m)	12.5
Sheet dimensions - Width	Width (m)	4.0
Material mass per unit area	(g/m^2)	460
Colour		Black

ACO Tape

Product code	Unit	27044
Description		ACO double-sided butyl mastic tape
Length	Length (m)	15
Nominal width	Width (m)	100
Thickness	(m)	1.5
Weight	(kg)	3.70

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	110010	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/m²	470	618
Reservoir capacity l/m²	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	170 mm
Thickness	4 mm

Threshold Drain

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

Please refer to product brochures for more information.

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.

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. Rainfall data set FSR or FEH

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 flat roof, although the ACO system can be installed on flat roofs with a more conventional fall. BS6229:2018 defines a zero roof fall as one having between 0 and 1:80 fall, but it must not have any back falls.
- Porosity – 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 using capillary wicks or above using the ACO RoofBloxx Reservoir Tray (see page 15).

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 85 - 165mm in depth, (1.0-1.5kN/m² load) the actual increase in load is minimal.

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

Surface Finishing

An ACO blue roof attenuation 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.

Prevention of Fire

Blue green roofs should be designed to provide the necessary resistance to the external spread of fire by the following measures:

- increasing the non-combustible content of the growing medium
- decreasing the organic content of the growing medium
- preventing the system from drying out.

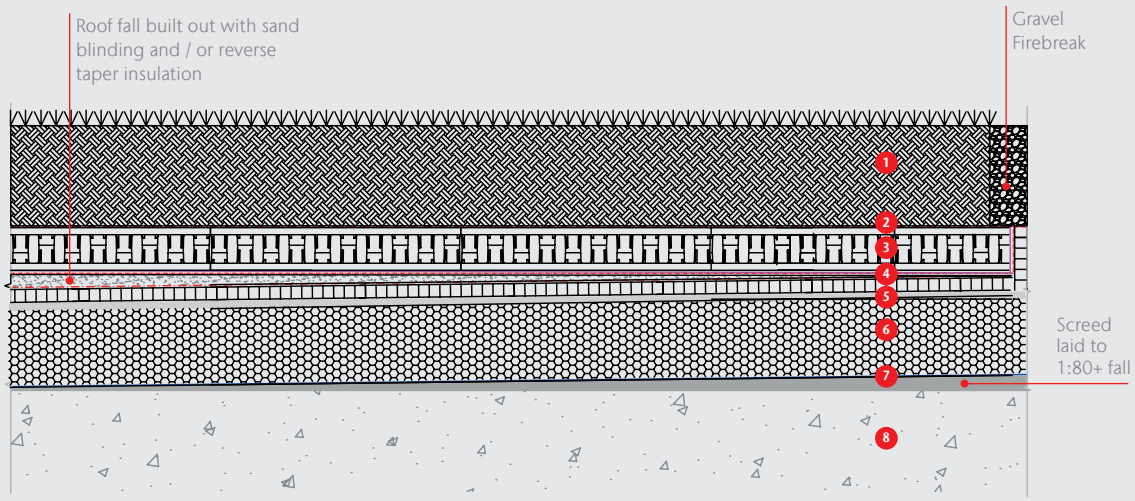
Blue green roofs have to be studied and integrated within the building fire strategy design. Based on each case, a fire risk assessment will be made by the appointed fire consultant and they will propose the most suitable solutions in order to mitigate the fire risks associated with the blue green roof. A number of measures can be proposed by the fire consultant, however this will be done on a bespoke basis. Each project will have its own individual technical solution

Flat Roofs with Falls

Unlike other blue roof systems, the ACO Patented Blue Roof Attenuation System does not require the roof to be built to absolute zero Falls, this is because it operates independently of the roofing system and does not therefore require the designer to compromise existing building standards or performance.

The diagram below illustrates how a flat roof designed to falls is overcome with the use of the ACO Blue Roof Attenuation System.

Patented Warm Blue Roof Laid to Fall



Number Key

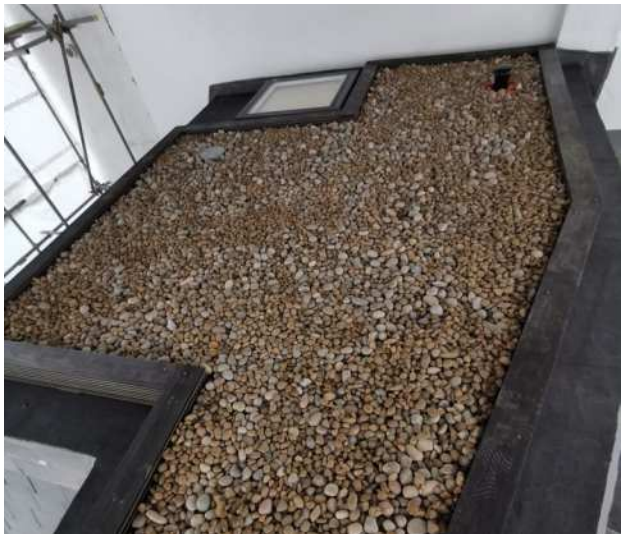
1. Planting (200-1000mm)
2. Filter geotextile
3. ACO RoofBloxx (85-165mm)
4. Protection fleece and attenuation lining membrane
5. Waterproofing
6. Insulation
7. Vapour barrier
8. Roof slab

Case Study

ACO and Aquality create a Blue Roof like no other at Queen's Gate Place Mews

ACO Building Drainage combined with Aquality to retrofit a blue roof in central London where it was initially thought not possible.

Part of the collection of quaint residential and commercial properties at Queen's Gate Place Mews is The Lodge. Recently revamped and extended with a new mansard roof to enable a second storey, one of the key challenges of the project was meeting the SuDS (sustainable urban drainage system) requirement and managing the water runoff from the roof, as set out by the The Royal Borough of Kensington and Chelsea planning committee.



Doing what no others can

With sustainable drainage as a vital factor of the extension being granted planning approval, Keystone consulted several blue roof manufacturers and roofing contractors to look at how this could be achieved. However, all the suppliers Keystone approached had refused the project and stated that it would be impossible, given the small roof area and the necessity of holding the water on the roof's surface while controlling the runoff rate.

ACO and Aquality stepped in with an approach that nobody else could offer. Using ACO's innovative patented RoofBloxx attenuation system, this was adapted into a free-standing retrofit application that sits separately above the roof construction, without adding any risk of water leaking onto the mansard roof itself.

Martin Durham, Managing Director, and owner of Keystone Construction said: "We were faced with a very tricky challenge set by the authorities. On one hand, to achieve planning permission, we had to comply by controlling the runoff to prevent flood risks and overwhelming the sewer. However, we couldn't go forward with a typical blue roof, as holding water on top of a conventional roof invariably adds risk and goes against best practice of roof construction. Water will eventually seep into the roof layers and compromise the structure.

"This was a key reason for choosing to work with Aquality and ACO – as their solution was unlike anybody else's. By being a standalone system, we could install it on top of the roof build up and it works independently of the roof. Alongside the ingenuity of the system itself, we were very pleased with the design service as well as the ease of the installation too."

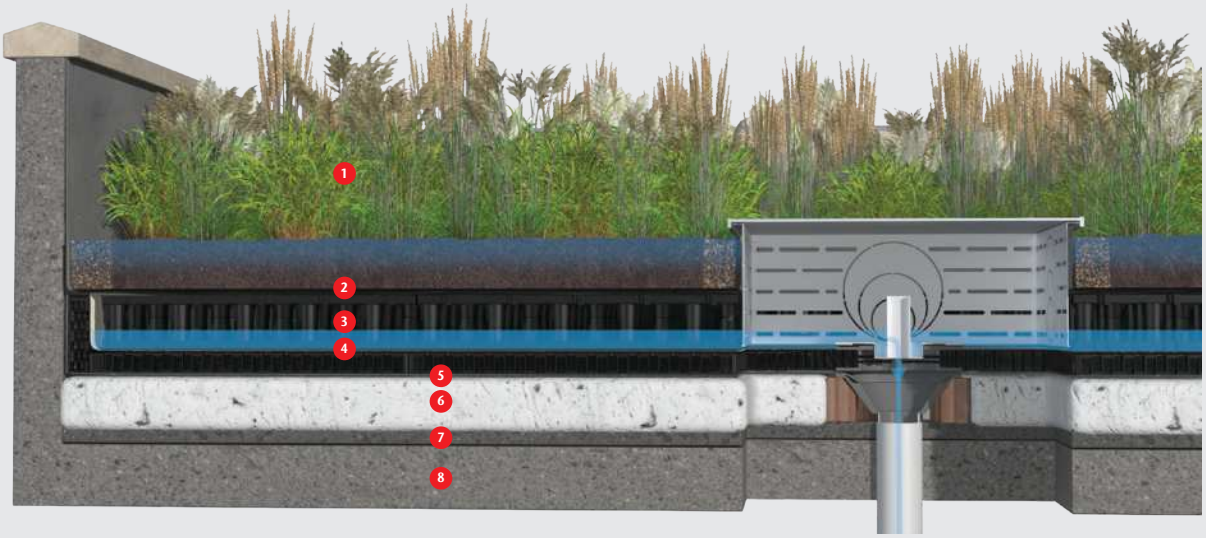
To read the full story:
www.aco.co.uk/news/article/queensgate

Typical Installation Details

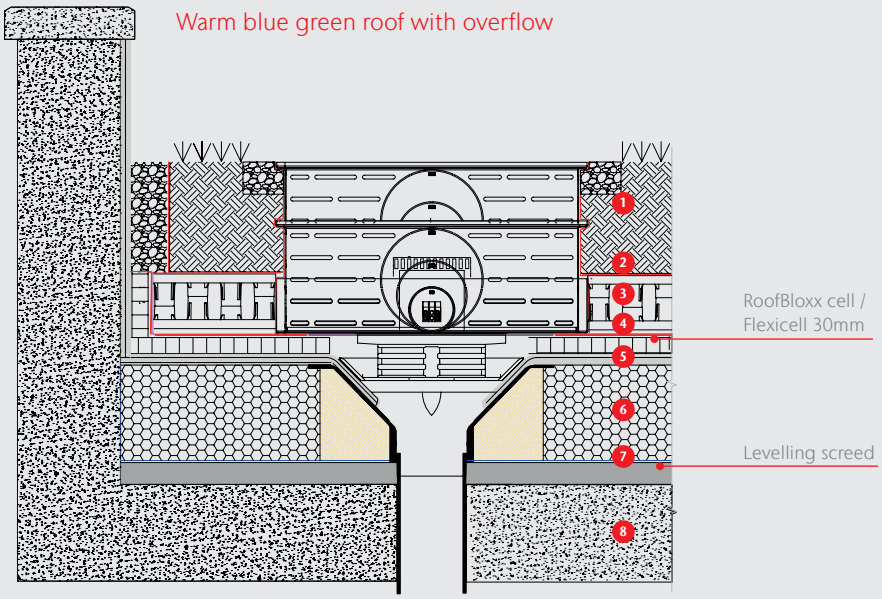
With some minor design modifications, blue roof storage systems can be easily incorporated into most flat roof systems with a variety of finishes, at relatively little additional cost.

Warm Roof Construction

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.



Warm blue green roof with overflow

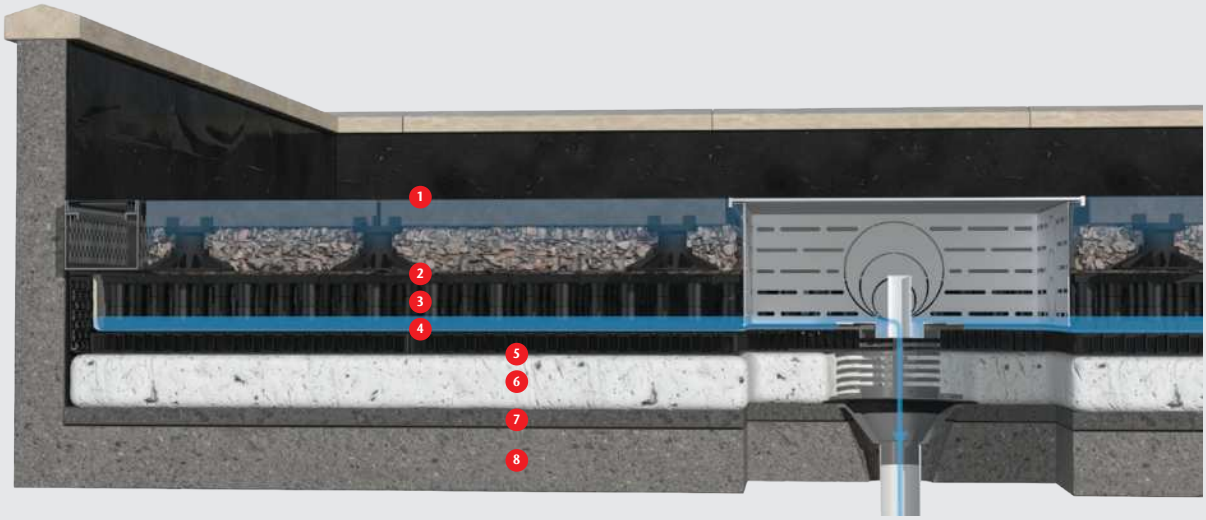


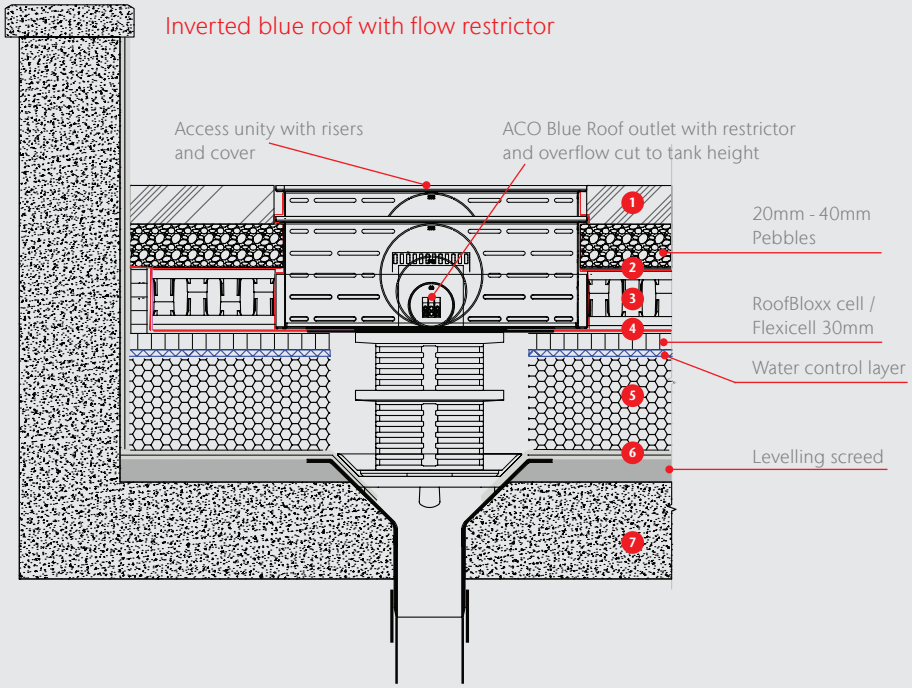
Number Key

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

Inverted Roof Construction

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.



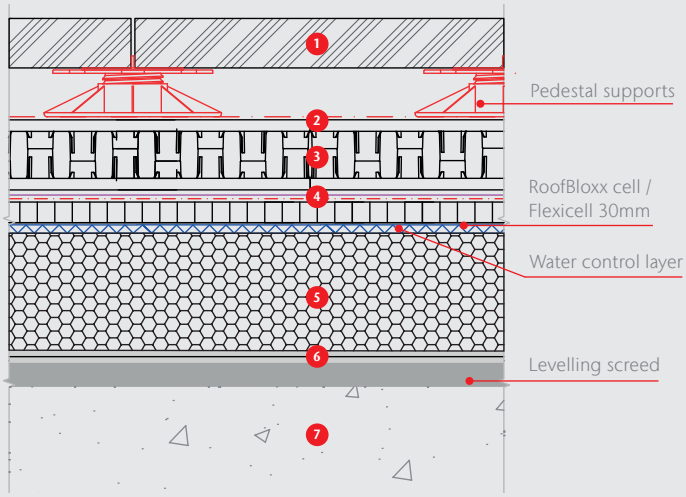


Number Key

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

Inverted Ballasted Roof

Ballasted roof is a flat roof where the insulation is not anchored or adhered in any way to the decking material. The stones/slabs used in a ballasted roof are more substantial and resist wind uplift.

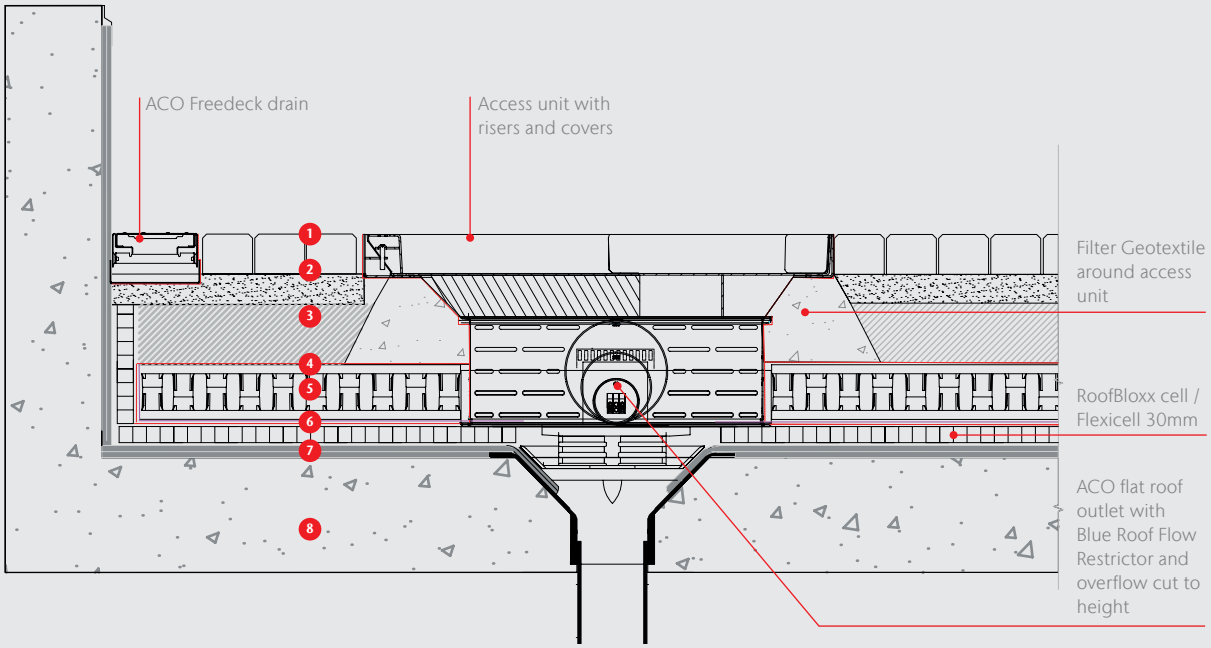


Number Key

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

Podium Deck Construction

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.



Number Key

1. Block paviors
2. Bedding layer
3. Sub base to engineers specification
4. Filter Geotextile
5. ACO RoofBloxx (85-165mm)
6. Protection fleece and attenuation lining membrane
7. Waterproofing
8. Roof slab

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.

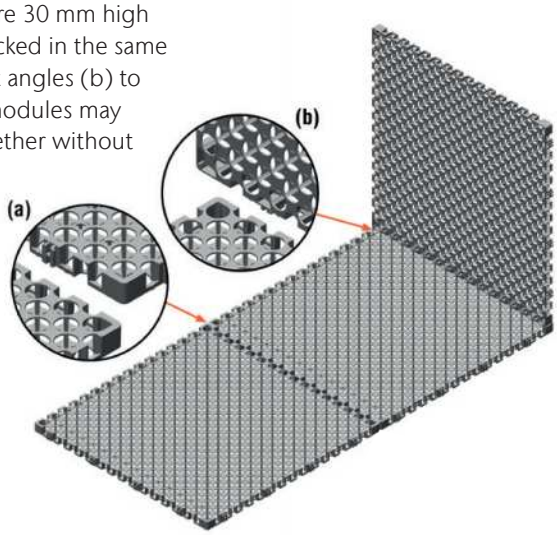
6

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.

RoofBloxx Cell 30 are 30 mm high and may be interlocked in the same plane (a) or at right angles (b) to one another. The modules may also be butted together without interlocking.



ACO Blue Roof Flow Restrictor and Overflow

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 on top of any raising pieces required to bring the flow restrictor up to the correct level on the roof build up.Place 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: The protection fleece should be placed under the outlet flow restrictor / overflow plate between steps 1 and 2 and tighten and /or fix to the adaptor plate.

Seal the secondary geomembrane to the top flange of the flow restrictor / overflow using a proprietary weld or tape method.

If fitting standard 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 marked the 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/m2 with a 90% void ratio. The ACO RoofBloxx system shall be laid on a welded/taped 0.5 - 1.0mm geomembrane, ACOTex 300gsm Protection Fleece, ACO RoofBloxx Cell 30mm, and overlaid with ACOTex 125gsm geotextile. All laps should be a minimum of 300 mm.

If an irrigation reservoir is required, then add either:

Within the RoofBloxx storage unit

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.

On top of the RoofBloxx storage unit

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/m² (delete as appropriate) above the ACO RoofBloxx storage unit.

ACO Blue Roof Flow

The blue roof outflow shall be controlled by an ACO Blue Roof Flow Restrictor(s) and internal overflows as designed by ACO Building Drainage. The flow restrictor and overflows 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.aco.co.uk/nbs

Warranties

ACO appreciate that given the relatively novel nature of Blue Roofs that the provision of warranties is considered an important commercial consideration.

The ACO patented system is a ‘standalone’ system, that can be independently warranted through third party installers.

It is important to note that as the attenuation system is independent of the roofing system it does not put the roofing membrane under any additional stress than a conventional flat roof.

ACO also work in partnership with several roofing manufacturers and their approved installers, if a single point warrantee is required then can be offered to provide additional peace of mind.

Please contact ACO Design Services for further information.

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.

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.

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.

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