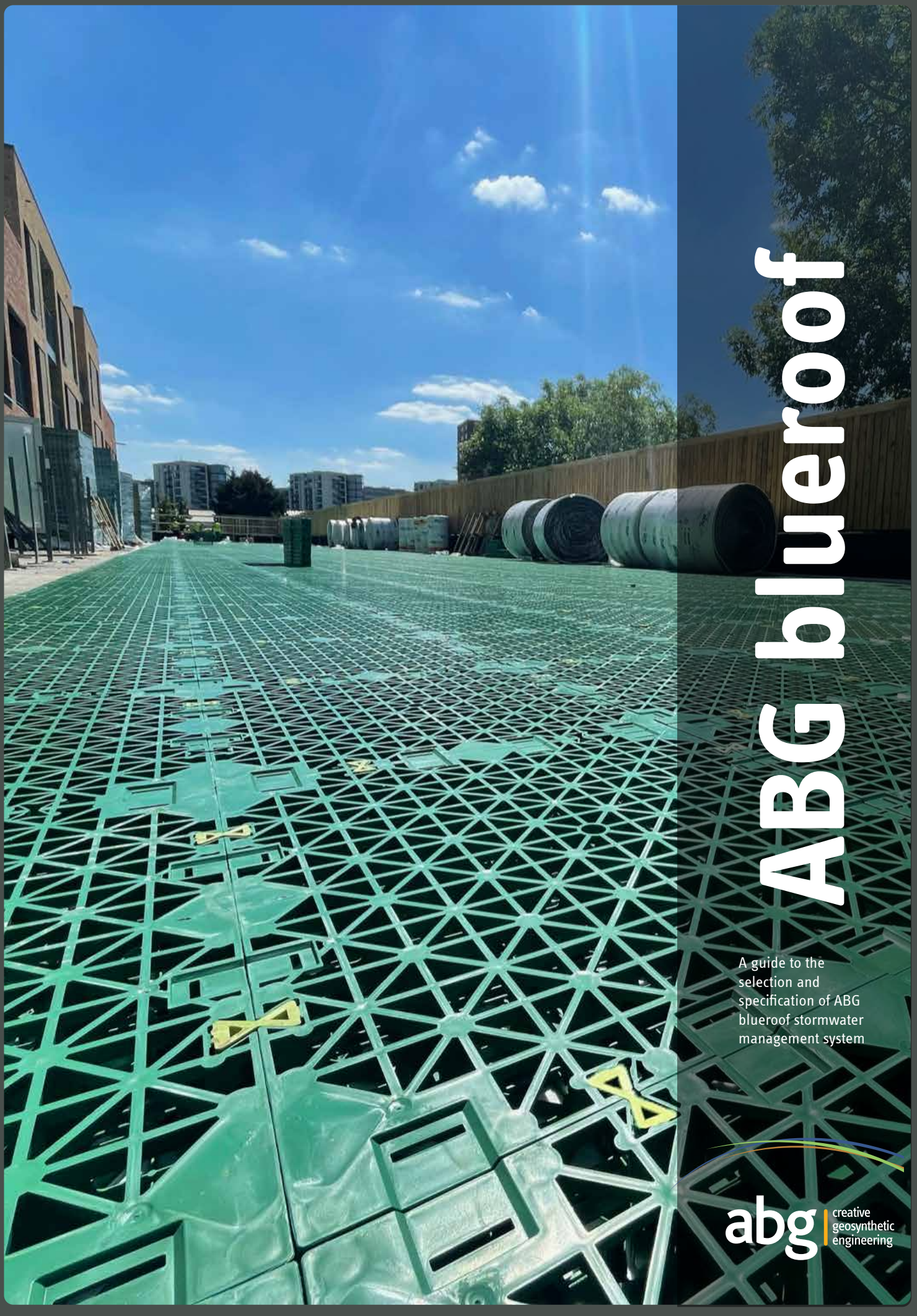

ABG blueroof

A guide to the selection and specification of ABG blueroof stormwater management system

abg creative geosynthetic engineering

Traditional roof drainage systems are designed to discharge rainwater from a building as quickly as possible. However, as pressure on water management within new developments becomes more critical and waterproofing systems evolve and improve, this principle is increasingly being challenged.

Blue roofs are intended to temporarily attenuate rainwater during storm events and release the storm water at a controlled rate. Designed and implemented correctly, they can form an integral source control and attenuation element within the Sustainable Drainage Systems (SuDS) requirement on modern developments.

Blue roofs form an important part of meeting SuDS requirements, and are rated as the most sustainable technique in CIRIA's hierarchy. This is based on their contribution to reducing the risk of flooding and pollution and their positive impact on the local landscape & wildlife ecosystems when combined with a green roof finish. Legislation change, advancements in roofing and the need for sustainability in an evolving construction industry, means Blue Roofs are now becoming a first choice solution for new developments.

Implementing SuDS demands that water falling on a development is not simply channelled into storm water drains and discharged into overburdened local sewer and river systems. ABG blueroof is designed to mimic the process found in nature whereby water is attenuated, treated and filtered at a controlled rate using the patented ABG blueroof Restrictor Chamber.

With land at a premium, Blue Roofs allow the developer to maximise usage of any site, especially in city centre developments where underground storage systems are impractical and expensive to excavate.

Blue Roofs are not just limited to the roof areas, they are versatile and can be used on podium decks and amenity areas. ABG's development in product design and improved materials means a multitude of surface finishes can be achieved and a wide range of traffic requests accommodated.

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ABG blueroof

ABG blueroof provides temporary attenuation capacity within the roof or podium deck construction of a development. Utilising space in this way means that the source control management required to meet SuDS best practice can be achieved.

Installing the **ABG blueroof** patented* storm water management system within the roof structure delivers the following benefits:

- Attenuated water is released at a calculated discharge rate into the sewer system or used as grey water
- Storage capacity is calculated to match storm duration, designed to match 1 in 100 year storm events, with additional allowance made for the effects of climate change
- ABG blueroof can be designed to operate across multiple roof areas, or to cascade from higher to lower roof areas
- Under typical rainfall events, the roof will drain like a normal flat roof. The **ABG blueroof** water management system only comes into effect during a storm event
- The built in overflow provides a factor of safety in the event of a blockage or rainfall event that exceeds the design conditions
- The system can be designed to address specific climactic conditions. In the UK for example, the primary concern is to mitigate the impact of storms, with rainwater stored for up to twenty four hours before being gradually released via the surface water management system
- In regions or countries with extremely low rainfall, the blue roof stores rainwater to be harvested for use in irrigation or grey water processes
- In intermediate regions, the **ABG blueroof** can be configured to provide both storm water attenuation and the supply of water for irrigation.

The ABG blueroof ™ restrictor chamber & system design is registered with the Worldwide and European patent offices. Active applications are also filed directly in many other countries including Great Britain (Patent no. GB2504450B), Spain, Poland, South Africa, Australia and Canada.

1 Surface Finish

ABG blueroof can be designed to accommodate a variety of surface finishes, including green roofs (ntensive and biodiverse) and hard landscaping.

2 ABG Restrictor Chamber Access

3 Gravel firebreak

4 ABG Restrictor Chamber

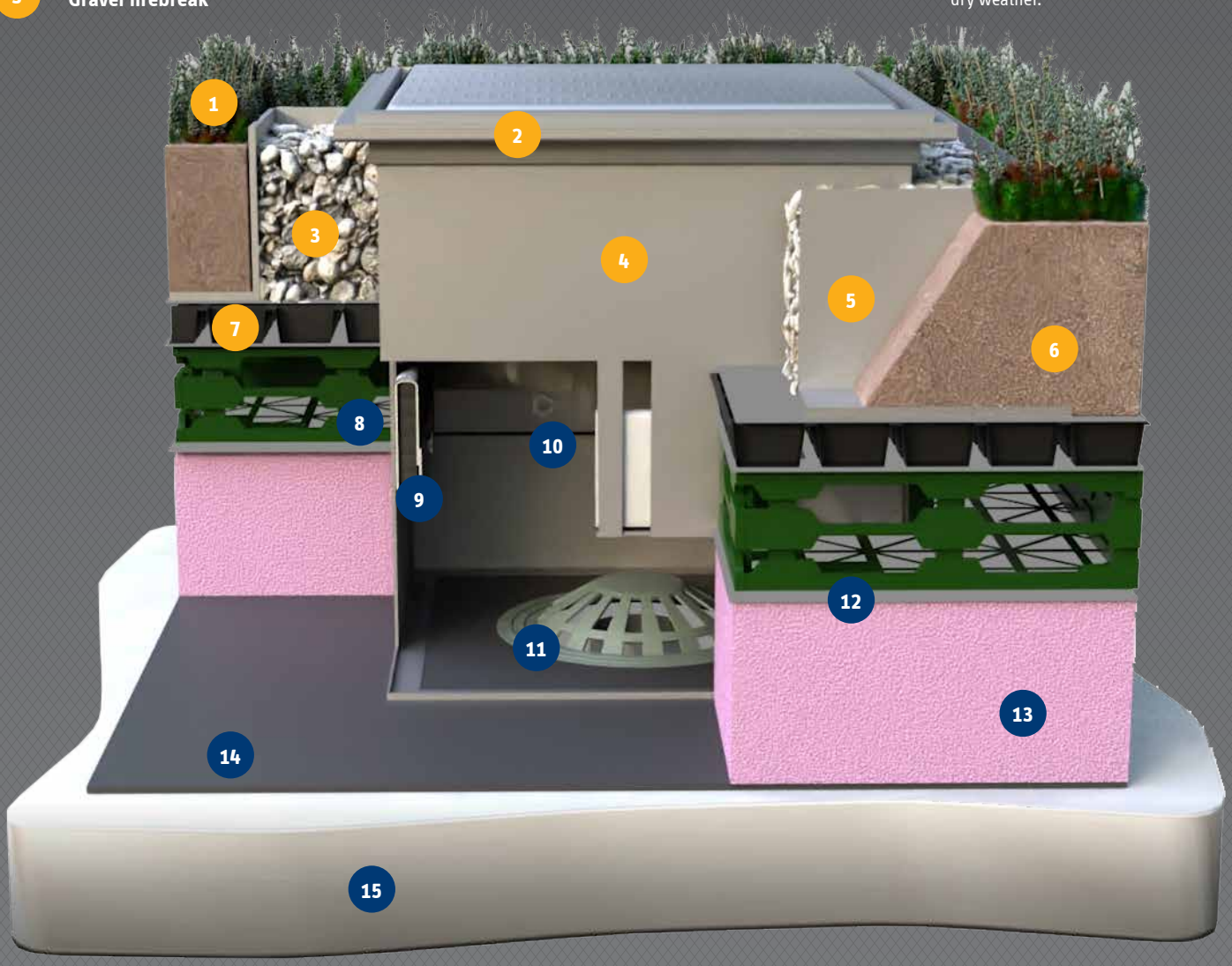
Attenuated water is gradually released through the patented ABG Restrictor Chamber and discharged to the roof outlet at the designed maximum flow rate.

5 ABG Abpro Aluminium Upstand

6 ABG Growing Media

7 ABG Roofdrain Reservoir Board

Where the roof includes a green roof or soft landscaping areas, the **ABG blueroof** features an integrated reservoir board to provide water for plants during spells of dry weather.



8 Attenuation void layer

Water falling on the roof surface percolates through the roof build up to the attenuation void. In normal rainfall events it simply flows through the void to the ABG Restrictor Chamber and into the roof outlet.

When rainfall exceeds the maximum permissible discharge, the void is utilised to attenuate the excess water and control the flow rate.

9 Filter strip

10 Control orifice

11 Rainwater outlet

12 Water flow reduction & geotextile protection layers

13 Insulation

14 Waterproofing

15 Roof deck

Illustration shows typical inverted roof build up. Warm and uninsulated roof systems are also available.

Design Considerations

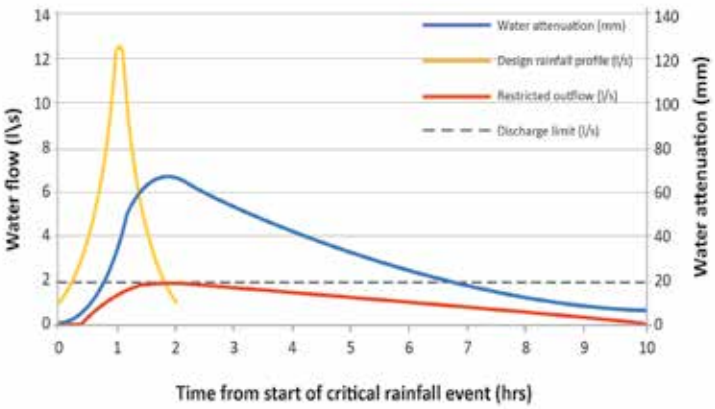
As part of designing a new blue roof storm water attenuation system, ABG develops response calculations to model the behaviour of the roof during storm events, with the information required usually contained within the surface water run-off assessment for the specific site.

Rainfall Data

Rainfall depths for the site are calculated according to location, storm duration and return period (the number of times in a set period that a storm of that magnitude is likely to occur (with 1 in 30 year and 1 in 100 year storms usually considered). An allowance is also made for future climatic change.

In the UK, values are taken from either the Flood Studies Report (FSR) or Flood Estimation Handbook (FEH 2013), depending on which is key to determining the exact storm design.

Rainfall and run-off should be considered simultaneously to give an actual representation of the behaviour of the **ABG blueroof** system under storm conditions.



Waterproofing Design

ABG blueroof is compatible with all modern waterproofing materials, however the selection of the waterproofing type depends on the type of flat roof construction and a BBA certificate for zero falls is recommended. The **ABG blueroof** is compatible with both warm and inverted roof constructions.

As with traditional roof types, the waterproofing should be detailed to standard height above the final floor levels, with the recommended test methods for integrity adhered to. ABG partner with leading manufacturers and installers of waterproofing systems and can offer project specific advice and guidance to ensure the optimum solution is selected.

Rainwater Outlets and ABG Restrictor Chambers

The BS EN 12056-2:2000 standard for gravity drainage systems sets out a conservative approach to detailing the number of rainwater outlets required, based on the principle of discharging water from the roof as quickly as possible. This typically results in more outlets being specified than are actually required.

More current CIRIA SuDS best practice guidance sets out to slow the rate of rainwater discharge and since the **ABG blueroof** system calculates the exact number of restrictor chambers required to control the flow rate at each outlet, fewer outlets and penetrations are typically required. This has a positive knock on effect on the waterproofing and insulation details, and in turn helps to reduce the associated programme time and overall cost of the building.

ABG blueroof can be designed to accommodate both the latest SuDS best practice guidance and the requirements of BS EN 12056-2, meaning that if the roof is ever repurposed it can still meet the more conservative standard.

Overflow Outlet

As a precautionary measure in the event that the restrictor chamber becomes blocked, or a storm occurs that exceeds the designed capacity; an overflow outlet is positioned level with the top of the restrictor chamber to drain from above the nearest parapet wall. This provides a visual indicator from ground level that a blockage or exceedance has occurred and that maintenance may be required.

Structural and Loading Considerations

The introduction of a blue roof doesn't usually, but may have loading implications for the structure of the building and a structural engineer should be consulted at an early stage, especially when designing for a SuDS solution where water will be temporarily attenuated within the roof structure. This will enable any constraints to be determined, although these are often not as onerous as might be expected. The **ABG blueroof** attenuates the collected water across the entire area of the roof at a shallow depth, typically less than 100mm and at full capacity this would only exert a maximum additional load of 1.0kN/m^2.

The **ABG blueroof** components can be designed to take differing loads and to accommodate nearly all eventualities including; landscaped areas, podium decks for emergency fire and HGV vehicle access and large HVAC plant and PV installations.

ABG's technical department are able to advise on the loadings that the blue roof will generate and can withstand when empty, fully charged and surcharged.

Water Quality

Installing the **ABG blueroof** system has a positive impact on the quality of the water discharged. Before the water reaches the roof outlet, it has passed through several filtration layers that remove particulates and pollutants. Even if the surface finish isn't green, the water has passed through at least two layers of filtration.

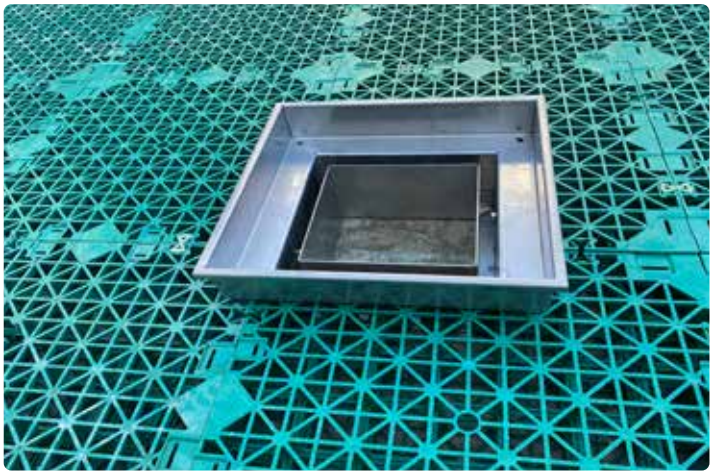
The water is treated to such a degree that it reaches the level required in treatment train stage one of the SuDS process, allowing the water to be released from the roof directly into the river or sewer systems.

Installation Process, Access and Maintenance

The **ABG blueroof** system is delivered via our approved installer scheme, supervised by our in-house installation team with documented training, post installation quality checks and sign off procedures. The **ABG blueroof** has a mandatory provision for maintenance and therefore future access should be considered to suit the final finish, as with all roofing applications.

The **ABG blueroof** restrictor chambers contain integral geotextile filters that are inspected and serviced twice a year (consistent with the BS EN 12056-2 provision that rainwater outlets on flat roofs should receive bi-annual maintenance).

Paved podium decks and ballasted roofs are relatively low maintenance, whereas extensive green roofs usually require an annual maintenance visit to remove weeds and trim vegetation. Intensive green roofs require maintenance like any garden or landscaped area, and this is a service that ABG provide on most projects.



Geography

Geographical location and orientation are an important part of designing a blue roof. The region, average amount of rainfall in that location and the prevalent wind direction all affect the design and must be considered. This can affect the calculation depending on the data that is coming out from either the FSR, FEH 2013, or other global data standards.

Depending on the location, the specific regulatory design guidance will reflect the local climatic conditions, for example to store water for plant irrigation in the Middle East or to attenuate and slowly release water as part of a flood management strategy in Central Europe. The geographic location also impacts the growing media and plant selection for vegetated surface finishes, with many species suitable for green roofs being specific to the region.

Thermal Performance

Currently the components of a blue or green roof are not considered as part of the roof build up when calculating thermal performance, so the insulation design and specification is the same as for a traditional roof design.

Despite no allowance being made in the building regulations at present, research shows that the introduction of layers of drainage, growing media and vegetation (for green roof surface finishes) does have a positive impact on the thermal performance of a roof, with the most significant benefit being a reduction in solar gain.

Surface Finishes

The **ABG blueroof** system must include a surface finish above the water attenuation layers. This surface finish can be constructed from any permeable surface that is in-keeping with the development. This protects the blue roof system, and is in accordance with wind uplift allowances. An impermeable surface can be used, but adequate measures should be taken to ensure the water can filter into the blue roof system.

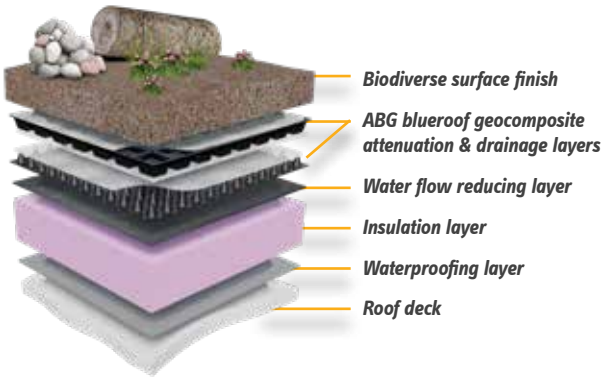
Roof Types

The modular nature of the ABG blueroof components mean a system can be designed for all types of flat roof and podium deck construction. The examples on this page demonstrate the range of surface finishes and area uses that can be adopted.

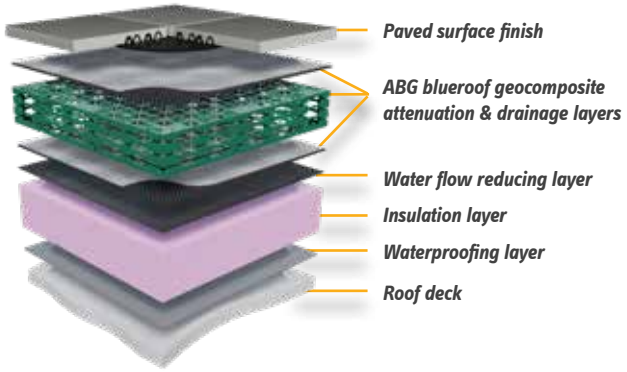
Roof Constructions

The illustrations below represent some of the most common roof build-ups for the **ABG blueroof system**.

Inverted Roof Examples

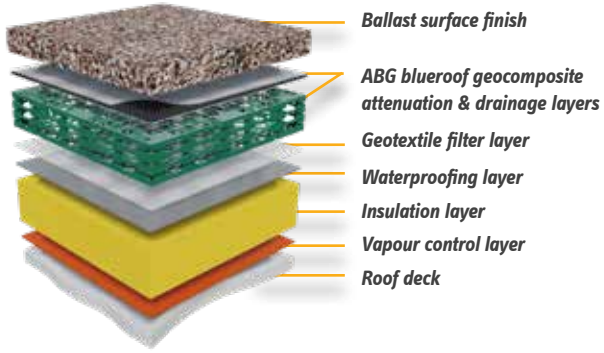


An inverted roof refers specifically to constructions where the water-proofing is below the insulation. The insulation layer helps to protect the waterproof membrane and prolong its life.

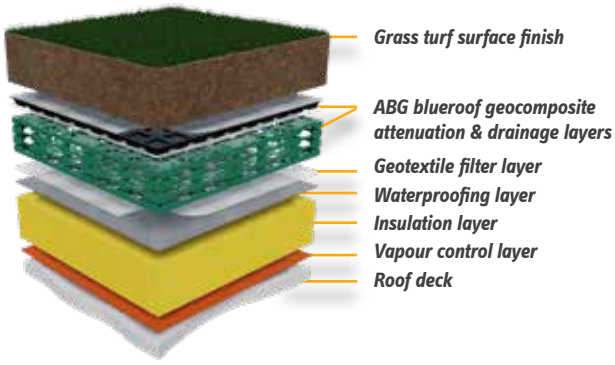


In paved or ballasted roof construction, the voids within the ballast can provide additional attenuation capacity and this can be taken into consideration in the design of the blue roof system to enable a smaller main attenuation void, providing a very cost effective solution.

Warm Roof Examples

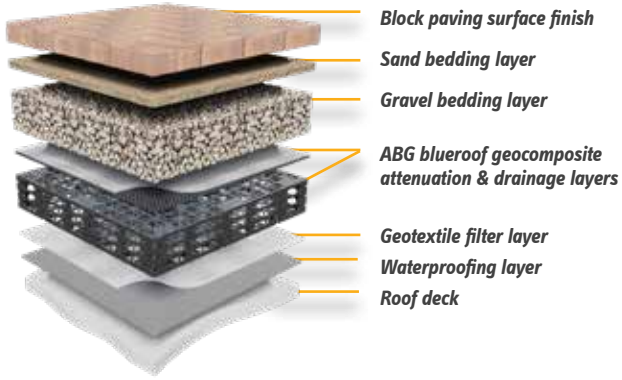


In warm roof construction the geocomposites behave in much the same way as within the inverted roof construction whilst providing protection to the waterproofing system laid over the insulation, allowing heat to be retained within a building without the need for a ventilation system.

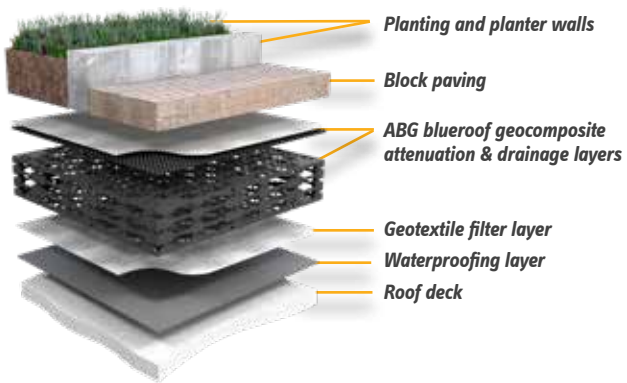


All green roof types including extensive, intensive and biodiverse; are suitable above an **ABG blueroof**. For green and biodiverse roofs, ABG has a patented combination of a water retention and water attenuation layer.

Podium Deck Examples



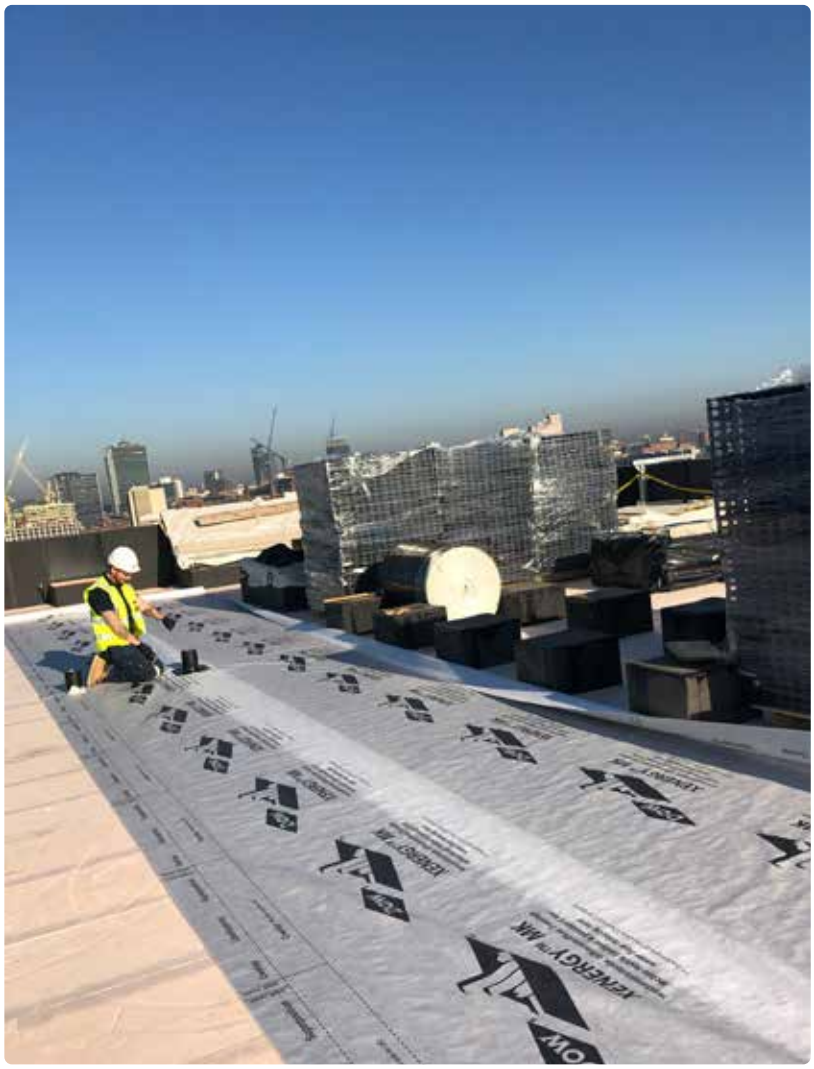
ABG blueroof is suitable for inverted, warm and uninsulated podium deck constructions. The system typically utilises higher strength components within the build-up so the area can be used for a multitude of applications, ranging from landscaped pedestrian amenity areas to the need to take additional loadings from vehicular traffic (up to and including fire engine access).



The **ABG blueroof** system is suitable for installation beneath landscaped amenity areas incorporating planter wall designs. Where larger walls are detailed, concrete footings can be poured in-situ or pre-cast wall sections can be installed on top of the system.

Installation

Together with our approved supplier partners, ABG has developed a wealth of installation experience over the past twenty years, incorporating many different types of roof construction. Some in progress examples from recent installations are shown on this page.



Project Calculation - Sixty London Wall

This project example shows the calculation details for a medium-sized office building in central London. The roof provides temporary storm water attenuation and restricts rainfall outflows.

BLUE ROOF STORAGE AND OUTFLOW SUMMARY

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Project Name:	60 London Wall, London, EC2M 5TN - Plant Area		
Prepared for:			
Date:	29/07/2019		
ABG Project ID:	11889	Calculator version:	1.2
Prepared by:			
Notes/description:	Ballasted & paved, plant area - maintenance access only. Inverted roof construction, with zero falls. Plant supports - all on concrete slabs on top of insulation and/or waterproofed slab - 'blue roof' dressed around these areas. Attenuated roof area = 1,326m2 - 72.5m2 of concrete slabs = 1,254m2 of 'blue roof'.		

Input Parameters - Rainfall Information (Flood Studies Report 1975)			
Return period:	100	years	*As supplied by Client*
Allowance for Climate Change:	40	%	*As supplied by Client*
Location selected for FSR data:	London (Central)		

Input Parameters - Roof Information			
Total catchment area:	1529	m^2	*As supplied by Client*
Attenuation area:	1254	m^2	*As supplied by Client*
Maximum allowable runoff:	1.3	l/s	*As supplied by Client*

Output - Rainfall Calculation

Duration	Time to Empty	Restricted Outflow (l/s)
15 mins	24 hours and 40 minutes	0.9
30 mins	29 hours and 10 minutes	1.0
1 hour	32 hours and 50 minutes	1.1
2 hours	35 hours and 40 minutes	1.2
4 hours	38 hours and 0 minutes	1.3
6 hours	38 hours and 40 minutes	1.3
10 hours	39 hours and 30 minutes	1.3
24 hours	36 hours and 0 minutes	1.2
48 hours	27 hours and 30 minutes	1.0

Total attenuation required: 121 m^3
Half empty time: 15 hours and 0 minutes.

Output - Recommended Blue Roof System	
System Name:	ABG blueroof VF HD+ 108mm
Description:	5 no.of 'active' control positions TBC by design team, and also with the structural engineer's deflection analysis. 5 no. of 'passive' positions required in addition.
Total attenuation capacity:	121.6 m^3
Number of Blue Roof outlets:	5

Blue Roof Estimate

ABG blueroof - FAQs

Q: Can the ABG blueroof system be installed on an inverted roof?

A: Yes, ABG blueroof can be installed on any flat or podium roof design to zero falls. A minimum 80kg loading for wind uplift is stipulated by BS EN 12056-2, typically achieved with a 50-100mm depth of washed pebble fill.

Q: What are the weight and loading implications?

A: For approximately 95% of the time, the system behaves like a normal roof. Only in storm conditions is the weight loading increased, and from peak storage volume the system discharges at a continuous rate until the roof is half empty, typically released over a period of 12 hours.

Q: Can the sytem be retrofitted?

A: Yes, owing to the fact that little additional loading is placed on the roof, the systems can be retrofitted.

Q: Can the ABG blueroof system improve my BREEAM rating?

A: ABG blueroof achieves up to 10 credits, accumulated from sections POL5 (3 credits), LE4 (2 credits), LE5 (3 credits) and LE6 (2 credits). Blue roofs are also identified as the most effective SuDS treatment method for reducing flood risk and pollutants, avoiding the need to excavate expensive basement storage tanks and the associated carbon output and safety risks incurred.

Q: What type of surface finishes are available?

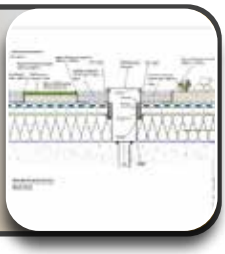
A: A wide range of soft and hard landscaping surfaces can be used; from extensive green roof finishes to ballasted, paved or MUGA areas on podium decks.

Technical Support

CPD Presentations

Datasheets

CAD Sections



BIM Objects

Green Guide Assessments

Case Studies

Installer Training

ABG blueroof Approved Installer

Installation Guides

Maintenance

ABG Associated Products

Permeable Paving

ABG offer a range of components for integrated porous paving systems to effectively manage the safe collection, treatment, management and dispersal of surface water.

Structural Drainage

ABG manufacture and supply a wide range of geocomposite drainage layers designed to alleviate hydrostatic pressure, control groundwater and manage surface water for structures including podium decks, basements, retaining walls, landscaping and highways applications.

Green Roofs

ABG green roofs have been used extensively on many leading sustainable developments across the UK. Offered as a full turnkey solution including PI covered design through to installation and on-going maintenance, a number of final surface finishes are available including extensive, intensive and biodiverse vegetation along with paved finishes.

Webwall Retaining Walls

Webwall is a geosynthetic system designed for the construction of flexible retaining walls. It uses a geocellular mattress which is laid in layers, with each expanded and filled with site won materials in order to form a structure with a vegetated face.

About ABG

ABG is a market leader in the design, development, manufacture and technical support of high performance geosynthetic systems for use in a wide range of civil engineering, environmental and sustainable building projects.

Formed in 1988 and based in Meltham, in the heart of the Pennines, ABG have developed an excellent reputation for developing quality products and delivering outstanding service. The ability for rapid product development ensures that the most innovative, up to date and cost effective solution can be found for many engineering problems.

ABG's involvement in roof drainage goes back over twenty five years and we have a complete range of products developed specifically for use in this technically demanding application. ABG are one of the leading proponents of Blue Roof systems in the UK, with a patented design for **ABG blueroof** and over 20 years experience of installing the system.

Technical support is provided by our trained and experienced staff, many of whom are Chartered Civil Engineers. This extensive support extends to full design, design validation, feasibility studies, cost advice and advice on meeting regulatory requirements.

Part of this technical support includes developing and driving knowledge within our active markets including working with both international and local regulatory bodies on developing guidance and best practice in the use of innovative geosynthetics to solve complex engineering issues.

abg | creative geosynthetic engineering

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ISO 14001

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