



## Blue Roofs



The BauderBLUE Roof System is a sustainable drainage method designed to attenuate and manage stormwater on a flat roof over a 24-hour period via a restrictive flow outlet.

This rooftop solution is specified where construction is being carried out in urban areas and particularly within flood sensitive areas.

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# BAUDER BLUE ROOF SYSTEM

Sustainable Urban Drainage





Development and expansion of towns and cities has seen exponential use of impervious surfaces causing artificially high rates of rainwater runoff. In measures to prevent flooding, planners are restricting the amount of rainwater leaving a site via the drainage system which can be limited to 5-10 litres per second per hectare, the same flow rates for regional greenfield sites.

A BauderBLUE Roof is a solution for urban areas where options for ground-based attenuation systems are limited, and in particular, where construction is being carried out within flood sensitive areas. This rooftop sustainable urban drainage system (SuDS) has weight load implications and the project's structural engineer will need to be engaged with the design process from an early stage.

### Blue Roof for SuDS

The specifically engineered Bauder outlet restricts the discharge of stormwater to a calculated and predesigned flow rate to significantly slow down the volume of water leaving the site. As the storm passes, water continues to discharge from the roof at a controlled rate over a 24-hour period that helps to avoid downstream or localised flooding.

The BauderBLUE Roof System can be constructed at either rooftop or podium level. The designed void space between the flat roof waterproofing membrane and hard or soft landscaping finish allows the stormwater to attenuate.

### Key Features

- Simple low maintenance design.
- Bespoke, project specific discharge rates to match the requirement of the SuDS report for the site.
- Can be created on zero falls or up to 1:40 pitch.
- Correct volume and weight of water storage with built in overflow to ensure the maximum water level (HMax) is never exceeded and a tell-tale parapet overflow is utilised to visibly identify if water levels rise close to the HMax.
- Designed to work in conjunction with the Bauder Total Green Roof System and Bauder Hot Melt System.

#### Specification Support



##### Specification downloads:

[www.bauder.co.uk/technical-centre](http://www.bauder.co.uk/technical-centre)



##### Telephone helpline:

0845 271 8800





# BLUE ROOF DESIGN

## System Configuration

The BauderBLUE Roof is designed for use with either the Bauder Total Green Roof System as a warm roof or the Bauder Hot Melt cold roof construction.

The design of the void space requires free-flowing water movement to the specifically engineered outlets.

The baseplate of the blue roof system sits within a standard Bauder outlet and slows water leaving the roof via a calculated number of restrictive flow holes. The number of flow holes, up to a maximum of 12, is calculated to reflect the SuDS calculation for permitted discharge rate for the site.

If, in the event of a storm of greater magnitude than 1:100 plus 40% for climate change, then water will evacuate the roof through the central overflow.

The design of every blue roof is individual to the project and geographical location. The roof should have minimal penetrations in the construction. We use details of the roof area and the drainage requirements for the site to produce a roof specific discharge report as part of our service.



Restrictor Flow Hole

## Bauder Infograph Video



To view the entire animation: <https://www.bauder.co.uk/blue-roofs>



# BLUE ROOF SURFACE FINISHES





# BLUE ROOF DESIGN CONSIDERATIONS

Many local planning authorities (LPAs) are adopting early perspectives that encompass Schedule 3 of the Flood and Water Act 2010 to bring in measures that prevent flooding. Within construction and development, planners are restricting the amount of rainwater leaving a site via the drainage system, limiting water egress to 5-10 litres per second per hectare, the same flow rates for regional greenfield sites.

We have a comprehensive Blue Roof Design Considerations Guide available to download from, [www.bauder.co.uk/technical-centre](http://www.bauder.co.uk/technical-centre).

## Design of a Blue Roof

A blue roof can be at rooftop or podium level and is designed to attenuate storm water within a void which sits directly above the waterproofing layer and beneath a surface finish such as a vegetated green roof or hard landscaping.

A blue roof should not be designed as a water storage facility but should allow all the water to evacuate the roof over a 24-hour period from the end of the projected maximum rainfall event.

## Key Aspects

- 1. Single Point Source and Guarantee.** Consider the waterproofing, blue roof and surface design finish as one element, to ensure compatibility and guarantee clarity.
- 2. Void Space.** To have the correct capacity to accommodate the predicted stormwater levels during a 1:100 year storm and the permanent load of the required finish and any imposing loading.
- 3. British Standards.** Standards and Systems Codes of Practice for waterproofing and roof detailing.
- 4. Roof Penetrations.** must be minimal or eliminated in the area where water is to be attenuated, other than the rainwater outlets or emergency overflows that are required for drainage functionality.
- 5. Emergency Overflow.** Unconnected to the blue roof outlet flow restrictor, to discharge the rainwater.

## Drainage

The discharge rate for the site is set by the local planning authority. The blue roof may be included to supplement other methods, or designed as the sole solution. The blue roof may be designed to accept a higher or lower percentage of the controlled discharge depending on other attenuation or storage options available in other areas of the site or because the building will have loading restrictions or limited available height for the rooftop solution.

## Deck Construction

The implementation of a blue roof will have considerable loading implication on the roof and its waterproofing. The roof deck construction will need to be designed not only to accept the dead and imposed loads\*, but also the weight loading associated with the water to be attenuated on the roof.

A blue roof can be designed on zero falls providing the waterproofing system holds relevant certification and the roof is designed in accordance with British Standards.

## Waterproofing

Consideration must be given to the appropriate form of waterproofing so that it can meet the demands placed on it by the blue roof.

If the blue roof construction has a finish where germination of any plant seedlings is possible the membrane should be tested and approved to the current FLL and GRO guidelines.

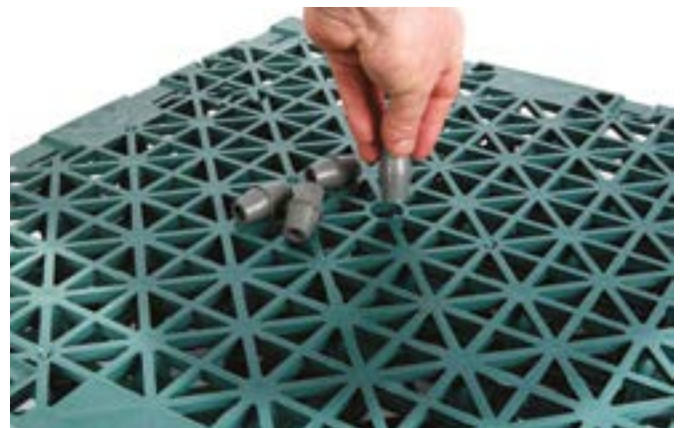
Our blue roof solutions utilise two robust waterproofing constructions; a bituminous warm or cold roof build-up with the Bauder Total Roof System (Green for soft landscaping) or a Bauder Hot Melt cold roof construction. Both systems carry BBA certification and are suitable to maintain the integrity required for blue and green roof applications.

## Void-Forming Component

The void forming component must have the correct structural capacity to resist the permanent load of the required finish and any imposing loading.

The void-forming components must:

- Have the capacity to fully accommodate the predicted storm water for a 24-hour period.
- Be resistant to chemicals such as fertilisers, petro-based compounds and water bound pollutants carried in by rainfall typically from 4-9pH.
- Allow free-flowing movement of water to the flow restrictor outlets.
- Be designed beneath the surface finish and be able to prevent any ponding or flooding occurring on the surface finish.



## Blue Roof Outlets

### Restrictor Outlets

The design, manufacture and installation of a flow restrictor and outlet is critical to the success of a blue roof as the outlet will be subjected to greater water pressures than standard gravity-fed drainage and it could be immersed for long periods.

### Emergency Overflows

Emergency drainage will be provided with the primary outlet and a secondary method of drainage to facilitate the removal of excess rainfall if the designed capacity is exceeded. The emergency overflow outlet will be specified and the base of the overflow pipe should be placed level with the top of the void height or H-Max.

Maintenance access is important to allow for clearing of any silt, debris, or leaf and plant matter which could block or restrict the flow of water through the emergency outlet. This is particularly important if trees are located nearby, as they can be a frequent source of material.

### Surface Finishes

The surface finish will be able to freely drain in to the attenuating void space without submitting to ponding water or flooding.

Suitable permeable surface finishes are:

- Paving or decking on a pedestal support system.
- Extensive green roofs, such as sedum or wildflower systems.
- Intensive green roofs, such as lawns, planters and more substantial planting.
- BioSOLAR.

Impermeable surface finishes require approaches to ensure the water can drain or filter in to the blue roof void space so that attenuation of rainwater can occur.

### Ensuring Success

Designing a blue roof requires specialist knowledge and a cohesive approach with full compatibility of the waterproofing void components, outlets and finish. We provide the complete design package and guarantees for every project to ensure success.

## BREEAM

If you are working to BREEAM, please contact a member of our technical team, who can advise on best practice for your individual project

### Pollution

This category addresses the prevention and control of pollution and surface water run-off associated with the building's location and use.

### Pol 03 – Flood and surface water management

This section emphasises the importance to avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, thereby minimising the risk and impact of localised flooding on-site and off-site, watercourse pollution and other environmental damage.

**A BauderBLUE roof system** is a solution for urban areas where options for ground-based attenuation systems are limited. This rooftop sustainable urban drainage system (SuDS) has specifically engineered outlets to restrict the discharge of stormwater to a calculated and predesigned flow rate to significantly slow down the volume of water leaving the site.

# BLUE ROOF FLOW RESTRICTORS



## Bauder Bitumen Blue Roof Flow Restrictor

The Bauder Bitumen Blue Roof Flow Restrictor is designed to be used in conjunction with a standard Bauder Bitumen Blue Roof Vertical Outlet DN70. The Bauder Blue Roof Bitumen Flow Restrictor is comprised of four parts; Baseplate, overflow pipe, Baseplate inner and Baseplate outer seal. The polyamide Baseplate fits within the 70mm vertical outlet, with the EPDM outer seal creating a watertight fit. The HDPE Overflow slots into the central hole of the Baseplate with an inner EPDM seal preventing any leaks.

Baseplate has a number (1-12) of 10mm restrictive flow holes bespoke to the project.



## Bauder Hot Melt Blue Roof Flow Restrictor

The Bauder Hot Melt Blue Roof Flow Restrictor is designed to be used in conjunction with a Bauder Hot Melt Compact Vertical Outlet DN70. The Bauder Hot Melt Blue Roof Flow Restrictor is comprised of four parts; Baseplate, Overflow pipe, inner and outer seal. The polyamide Baseplate fits within the 70mm vertical outlet, with the EPDM outer seal creating a watertight fit. The HDPE Overflow slots into the central hole of the Baseplate with an inner EPDM seal preventing any leaks.

The Baseplate has a number (1-12) of 10mm restrictive flow holes bespoke to the project.



# DRAINAGE VOID FORMER

## Attenuation Cell 100 - For Blue Roofs



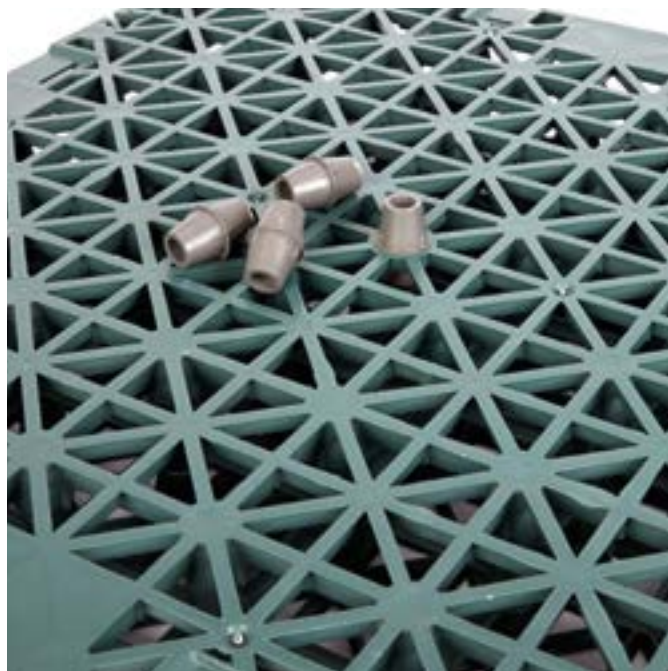
The Bauder Attenuation Cell 100 is a multi-directional drainage layer used primarily as a void former in our blue roof systems.

The boards are designed to create the void space required between the flat roof waterproofing and the hard or soft landscaping finish to allow the stormwater to attenuate. The product is over 95% void and has excellent compressive strength for use under green roofs and hard landscaping surfaces. Attenuation Cell 100 is laid on a protection layer above the completed waterproofing to provide continuous drainage.

Material	Recycled HDPE
Board size	0.6 x 0.6m
Thickness	100mm
Weight	2.9Kg/m <sup>2</sup>
Water holding capacity	95 litres/m <sup>2</sup> (95% void space)
Compressive strength	≥400kN/m <sup>2</sup> vertically 100kN/m <sup>2</sup> laterally

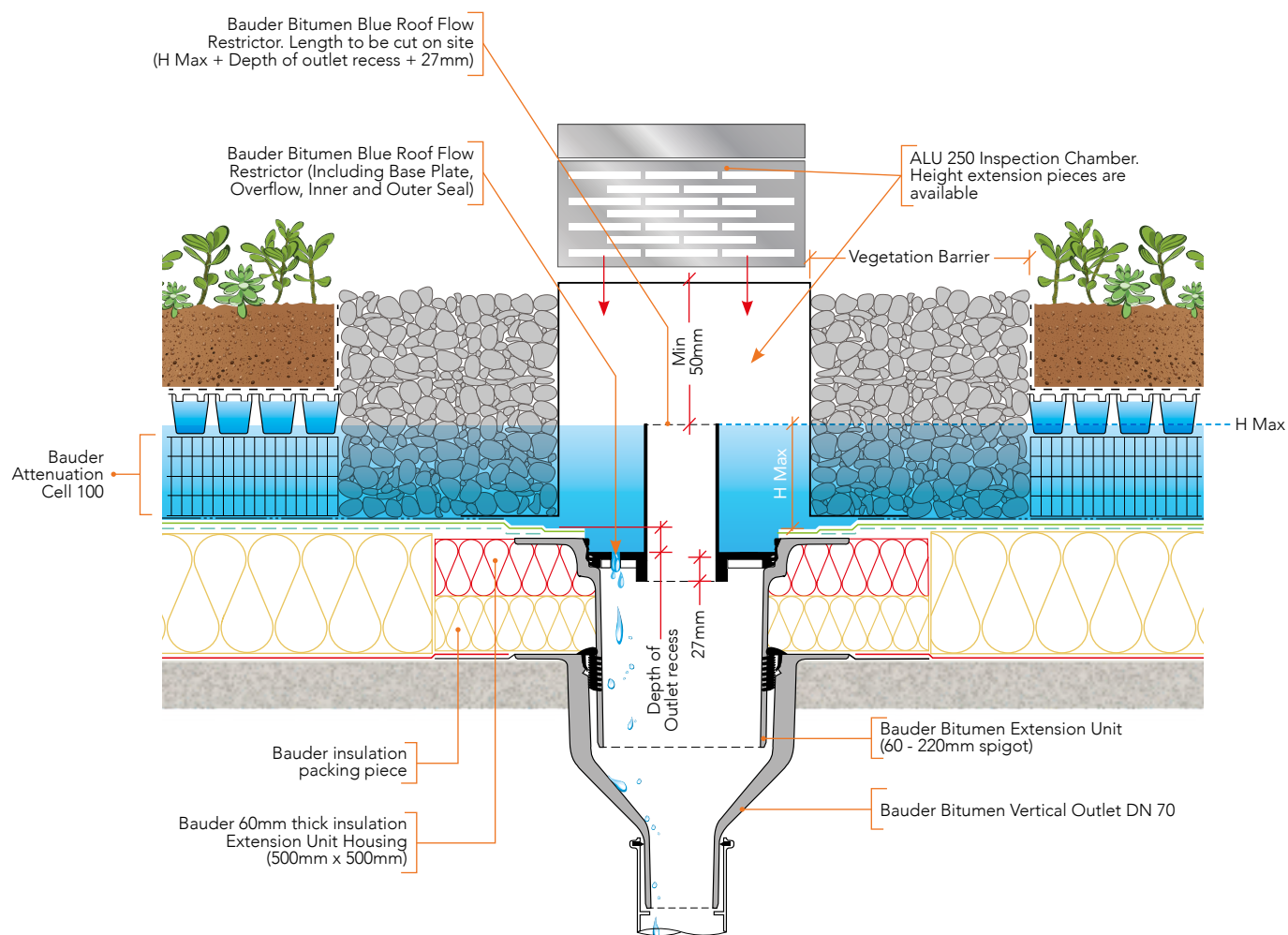
### Attenuation Cell Connectors

The Cross Connectors link the boards together horizontally, the Shear Connectors connect two layers of Attenuation Cell 100 should they be required.



# GENERAL DETAILING

## Blue roofs for SuDS

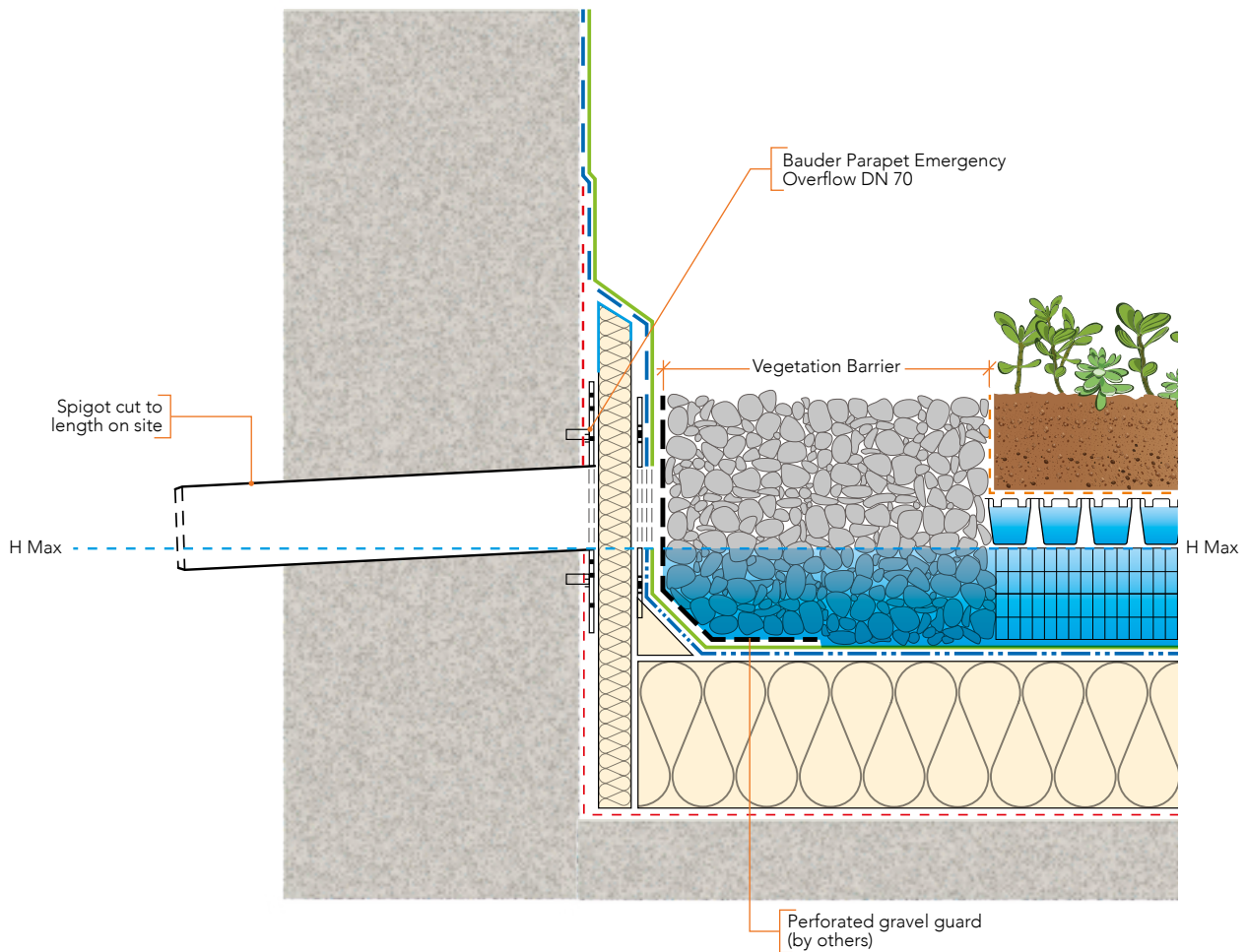


The cross section above shows the BauderBLUE Roof System. The Flow Restrictor sits securely within the outlet and precisely controls the flow rate of rainwater off the roof (each restrictor is bespoke to the roof requirements).

The Attenuation Cell 100 provides an open void for holding back rainwater in the short term. This will only start to fill in heavy storm conditions when the restricted flow is exceeded. During a heavy storm, the water builds up to a maximum (normally set at a 1:100 Yr storm event (+40% for global warming)). In the event of this being exceeded the water is safely discharged through the overflow in the centre of the flow restrictor.

Prior to finalising the roof design Bauder carries out detailed calculations to establish the configuration of the restrictors and their individual flow rate plus the maximum depth of water allowed to build up on the roof (H-Max).

The layers above the Attenuation Cell 100 (DSE drainage board, substrate and vegetation) are the green roof elements, and whilst they greatly help with the attenuation of water on the roof they are separate to the blue roof elements.



NFRC guidelines for blue roofs recommend that a parapet overflow is always installed to enable excess water to drain off the roof.

The Bauder Emergency Overflow is designed to act as a highly visible 'tell-tale' of the level of water on the roof. It provides a useful indicator should water build up to the H-Max point. Bauder's Flow Restrictors have additional vertical overflows to prevent the H-Max ever being exceeded.



