


Appendix E

Blue Roof Specifications

Blue Roof Systems

Flat roof and podium level SuDS solutions



A photograph of a modern building with a green roof. The building has a facade of vertical metal panels and large windows. In the foreground, there is a lush green roof with various plants and a glass skylight structure. The sky is clear and blue.

Blue roof finishes can comprise a variety of vegetation for green roofs, hard landscaping, and even incorporate a biosolar PV array.

Bauder is a leading European manufacturer of flat roof waterproofing membranes and insulation to make buildings watertight and thermally efficient; photovoltaic systems for renewable energy generation; green roofs to support the environment and create better living and working spaces for people; and blue roofs for stormwater attenuation and prevention of localised flooding.

Customers choose us because of the way in which we do business, for our robust advice on the right system, and our approach to delivering projects. We work alongside clients to deliver the best solution for a building from our broad portfolio of systems.

Blue Roofs

Rooftop sustainable urban drainage solutions (SuDS)

Designed to attenuate and slow the discharge of stormwater on a flat roof for up to a 48 hour period via a restrictive flow outlet to help prevent localised flooding.

A BauderBLUE roof controls rainwater where it lands, one of the core pillars of SuDS design.

The blue roof outlet restricts the discharge of stormwater to a calculated and defined 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 set period (typically up to 48 hrs).

This rooftop SuDS design has weight load implications and the project's structural engineer will need to be engaged at an early stage.

Specifying a blue roof

A BauderBLUE roof system can be constructed at either rooftop or podium level with a variety of landscape finishes including green roofs, biosolar PV array, or hard landscaping.

Usually required to meet planning when restrictions have been placed on the construction to limit the flow rate of rainwater leaving a site via the drainage system.

Outline of our BauderBLUE solutions

- Three different systems with stormwater flow restrictor outlet.
- Our specification service will confirm suitability of waterproofing system for each roof area.
- Warm, cold, and inverted roof design options.
- Single point guarantee to comply with client's insurance company requirement.

Achieving technical objectives

- Bespoke, project specific discharge rates to match drainage requirements for the site.
- Precise volume and weight of water storage with overflow to ensure the maximum water level (H-Max) is never exceeded.
- Design support to meet relevant British Standards and blue roof guidance criteria.



BauderBLUE ST adjustable blue roof outlet flow restrictor

BauderBLUE Roof Systems

Three methods for creating a blue roof with our solutions

There are different systems available to the construction designer to achieve a blue roof depending on the finish desired and the volume of water to be attenuated.

BauderBLUE STORMsub System

This hybrid system utilises the water storage capacity of a green roof build up. The additional SUB-RE UK substrate layer and RE 40 drainage and attenuation board act with the flow restrictor to carefully control the water discharge off the roof. The STORMsub system reduces the plastic content of the blue roof compared to a 100mm STORMcell system to enhance the environmental focus of the solution.

Finish options:

- Extensive and biodiverse vegetation



BauderBLUE STORMcell System

This high-volume system creates a void space between the waterproofing and the surface finish. The void is created by the BauderGREEN RWR 100 and enables water movement to the flow restrictor outlet. The STORMcell system gives the greatest capacity for water storage, three layers of RWR 100 will hold up to 285 litres/m².

Finish options:

- Extensive, biodiverse, and semi-intensive green roofs
- BauderSOLAR G LIGHT • Paving • Stone ballast



BauderBLUE STORMvoid System

This simple system creates a void space with Bauder pedestals and hard landscaping finish to an exact finish height to allow water movement to the flow restrictor outlet. Utilising Bauder pedestals ensures the entire system is covered by our guarantee.

Finish options:

- Paving • Metal decking



Plus points

- Our specification service will confirm suitability of the Bauder waterproofing system and type of blue roof for each roof area.
- We provide technical calculations for the required discharge rate of the blue roof and its geographical location.

Blue Roof Construction

Warm, inverted, or cold roof design to zero falls according to BS 6229:2018

Overview of the fundamental elements required for a blue roof that will generally be constructed with a concrete deck. Your area technical manager will assist in the highly developed points of design and construction.

Deck construction

The roof deck has to be built with zero falls (no back falls) to ensure the required water holding capacity is met and the blue roof is effective. When the construction is complete, a deck deflection survey will confirm the accuracy of construction, any back falls can then be corrected to ensure compliance to BS 6229:2018.

Waterproofing the building

An early and critical consideration for a blue roof is the waterproofing. There are two systems in our portfolio, reinforced bitumen membrane waterproofing and hot melt structural waterproofing that deliver the robust performance required. See page 12 for more information.

Warm roof construction

Insulation is between the layers of the waterproofing and the compressive strength of the insulation must exceed the maximum expected imposed loads for the blue roof, including the water within the blue roof components. Warm roofs normally allow for a shallower roof build-up.

Insulate with:

- BauderPIR
- BauderROCK
- BauderGLAS

Inverted roof construction

Insulation is above the waterproofing and will be subject to the force of buoyancy which causes floatation. The weight of the surface finish must exceed the force of buoyancy. Accurate calculation for thermal performance is not possible due to rainwater cooling around the insulation.

Inverted blue roofs are often preferred when a podium will be used as a site work space during construction.

Insulate with:

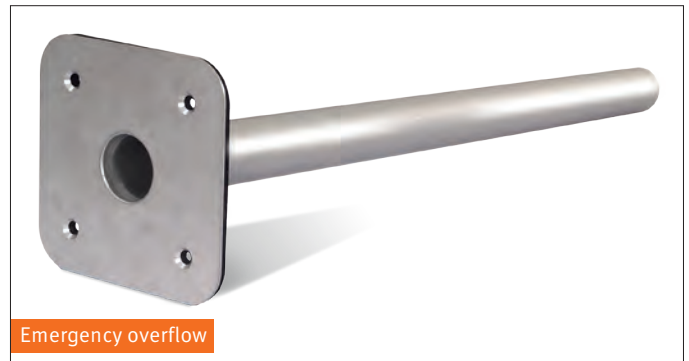
- BauderJFRI
- BauderXPS

Cold roof construction

The thermal effectiveness of the construction will have been included, where necessary, within the building rather than included in the blue roof solution.

Emergency overflow

An emergency overflow that is unconnected to the blue roof outlet will discharge the water should the maximum height of the blue roof design be exceeded.



Emergency overflow

Roof penetrations

The blue roof design must minimise or eliminate penetrations in the area where water is to be attenuated, other than the rainwater outlets or emergency overflows that are required for drainage functionality.

BauderBLUE STORMsub System

Creating a blue roof within a green roof where the substrate and water retention board attenuate stormwater

Extensive or biodiverse vegetation finishes can be coupled with a biosolar PV array for maximum environmental advantage.

Green roofs naturally, as part of their multi-layer design function, soak up water for the plants to use, retain it, and delay its run-off. Typically, a green roof will reduce annual run-off by 40-60% per annum*. However, simply using a green roof to attenuate water run-off has a major disadvantage, once saturated there is no control on the rate of water discharge so on its own it cannot be used to achieve a particular discharge rate.

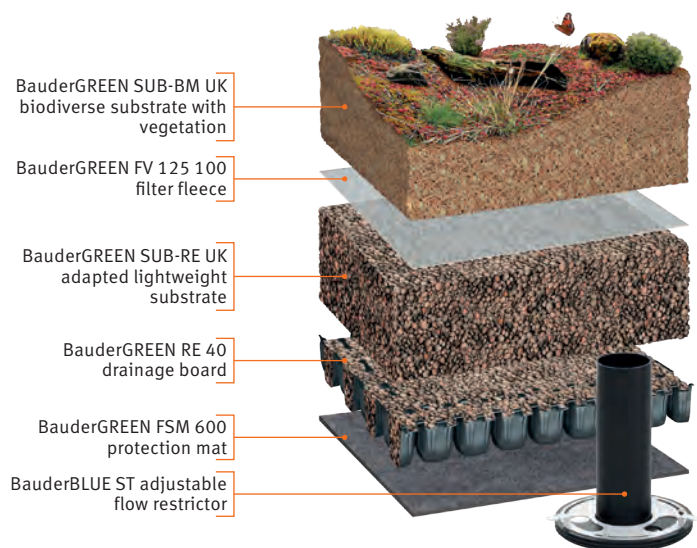
The BauderBLUE STORMsub system utilises our BauderGREEN RE 40 drainage and attenuation board and BauderGREEN SUB-RE UK adapted lightweight substrate as the specific water attenuation components; all other components in the green roof are specified as normal to support the vegetation and safeguard the waterproofing.

Plus points

- Greater depth of substrate improves the vegetation cover and drought tolerance of the plants.
- Reduces the volume of plastics in the blue roof (84% reduction) compared to our STORMcell system with 100mm depth of BauderGREEN RWR 100.
- Suitable to use with our biosolar PV system.
- Can be used with Bauder's full range of vegetation options to suit visual preference or Biodiversity Action Plan.
- Comprehensive range of guarantee packages to fulfil cover requirements for the project (dependant on system/product selection). For more information contact our technical dept for a sample guarantee outlining cover level, terms and conditions.

Roof finish options

- Extensive green roofs.
- BauderGREEN XF 301.
- BauderGREEN Flora 3 biosolar and shade tolerant seed mix.
- Intensive green roof.
- Pebble ballast.



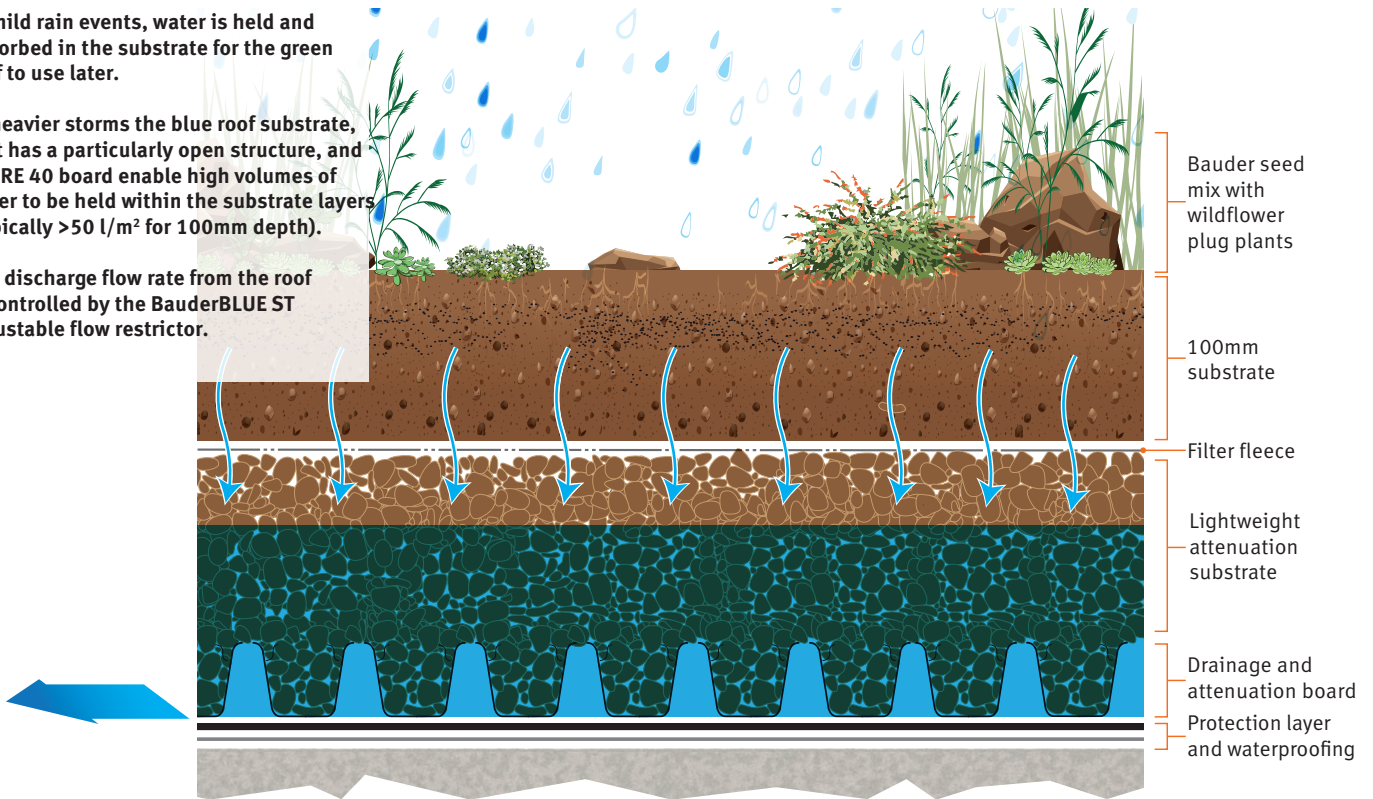
*(Source: Green roofs as a tool for solving the rainwater run-off problem in the urbanised 21st century? Mentens, J.; Raes, D.; Hermy, M. Revised 2005)

BauderBLUE STORMsub System

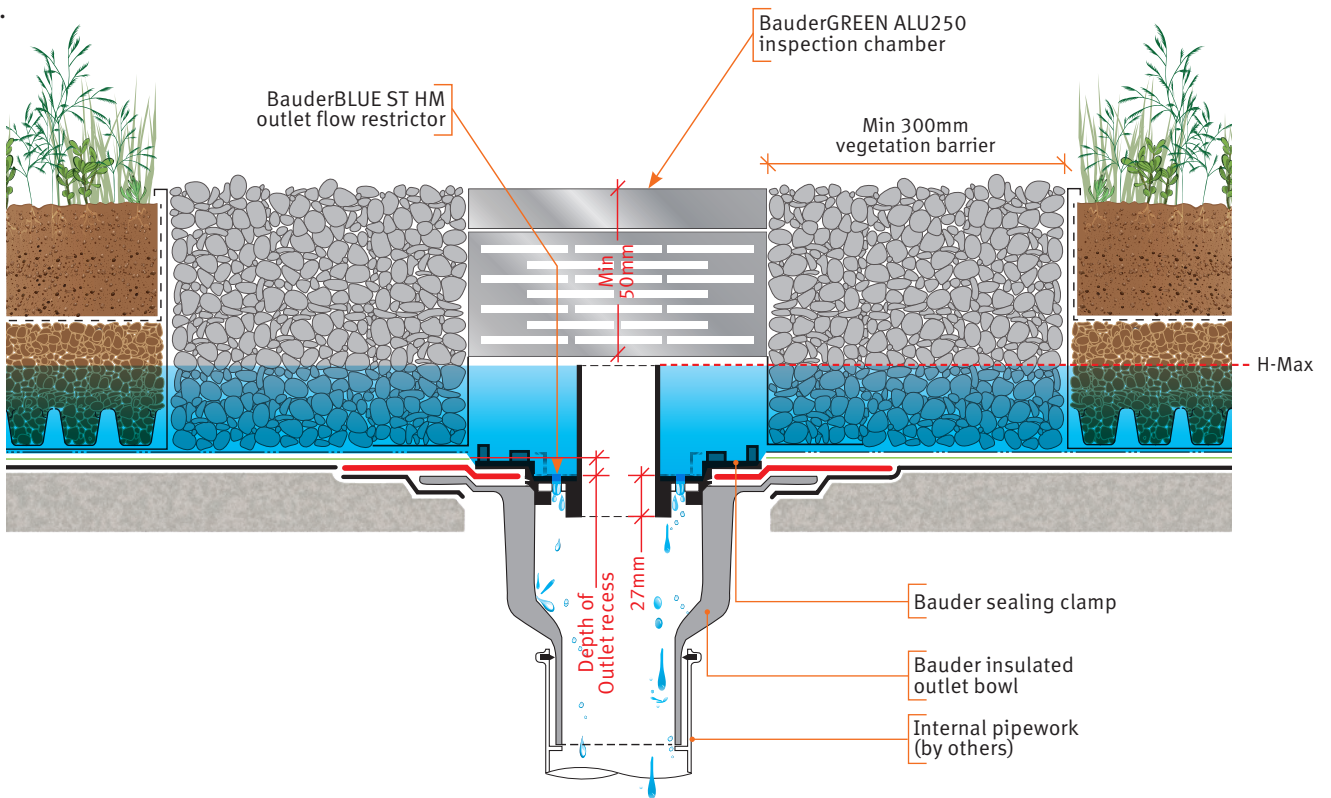
In mild rain events, water is held and absorbed in the substrate for the green roof to use later.

In heavier storms the blue roof substrate, that has a particularly open structure, and the RE 40 board enable high volumes of water to be held within the substrate layers (typically >50 l/m² for 100mm depth).

The discharge flow rate from the roof is controlled by the BauderBLUE ST adjustable flow restrictor.



Both illustrations show Bauder biodiverse green roof. All types of green roof finish are suitable.



BauderBLUE STORMcell System

Creating a blue roof beneath a green roof finish for high volumes of stormwater attenuation

The surface finish freely drains into the attenuating cavity forming layers that allow free-flowing movement of water to the flow restrictor outlets.

This solution is designed to hold high volumes of stormwater during severe rain events and reduce the flow rate from the roof to acceptable levels for the drainage system.

The BauderGREEN RWR 100 creates the void space beneath the roof finish and can be used in a multi-layer solution for increased levels of water attenuation. The product is >95% void and achieves compressive strength $\geq 400\text{kN/m}^2$ for use under green roofs, roof mounted equipment, and hard landscaping surfaces.

Plus points

- Accommodates high volumes of water.
- Suitable as a base to build soft and hard landscaping including planters and paving details.
- BauderGREEN RWR 100 made from recycled plastic.
- High levels of compressive strength, suitable to mount plant equipment.
- Ideal as part of a comprehensive BREEAM solution.
- Specify with our BauderSOLAR G LIGHT biosolar PV array.
- Comprehensive range of guarantee packages to fulfil cover requirements for the project (dependant on system/product selection). For more information contact our technical dept for a sample guarantee outlining cover level, terms and conditions.

Roof finish options

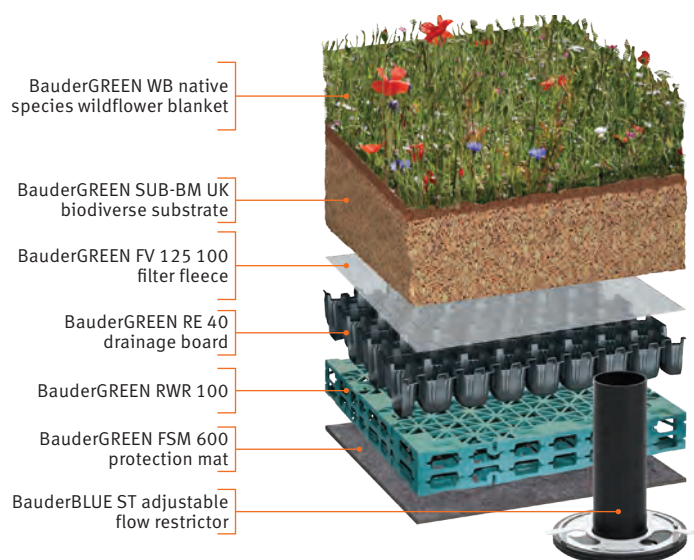
- Extensive green roofs.
- BauderGREEN WB native species wildflower blanket.
- BauderGREEN Plugs.
- BauderGREEN Flora 3 biosolar and shade tolerant seed mix.
- Intensive green roof.
- Pebble ballast.



Biosolar PV with wildflower finish



BauderGREEN RWR 100



BauderGREEN WB native species wildflower blanket

BauderGREEN SUB-BM UK biodiverse substrate

BauderGREEN FV 125 100 filter fleece

BauderGREEN RE 40 drainage board

BauderGREEN RWR 100

BauderGREEN FSM 600 protection mat

BauderBLUE ST adjustable flow restrictor