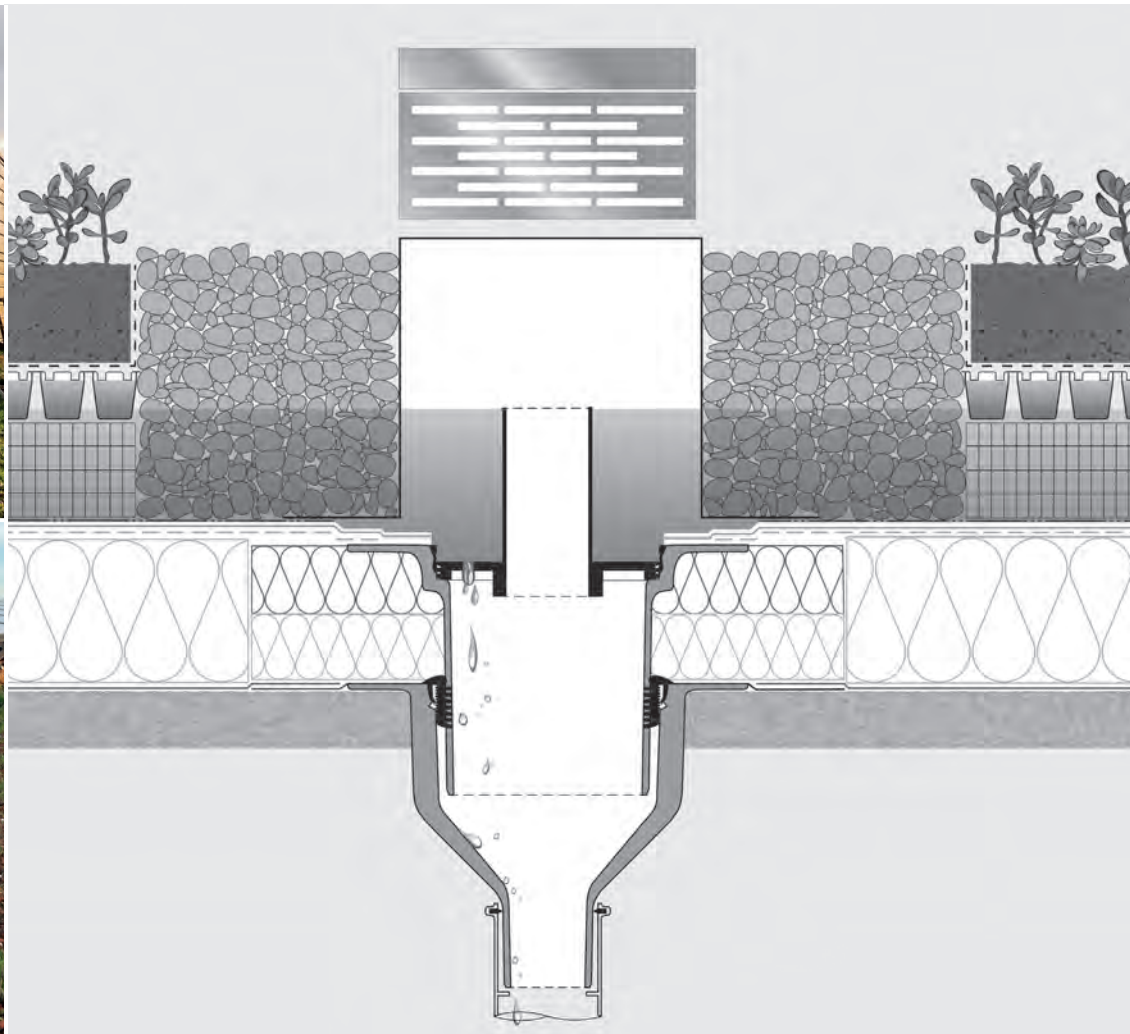


Design Considerations Guide

Blue roofs for SuDS solutions



**The London School of Hygiene & Tropical Medicine
London**

BUILDING BOARD

Type:	New Build
Location:	London
Roof Size:	675 m ²
Waterproofing System:	Bauder Total Green Roof System (BTGRS)
Specifier:	BMJ Architects
Main Contractor:	8 Build Ltd
Approved Contractor:	All Metal Roofing Ltd

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 living and working spaces for people; and blue roofs for stormwater attenuation and prevention of localised flooding.

Customers choose us because of the way we do business, for our robust advice on the right solutions, and our approach to delivering projects. We collaborate with clients to find the optimal solution for a building from our broad portfolio of systems.

Design Considerations for Blue Roofs

This document is intended to support our clients in making informed decisions when specifying blue roof systems for Bauder waterproofed roofs, and does not replace the need for client expertise. All blue roof installations should be designed on a project-by-project basis. For further information regarding installation and maintenance guidance, please consult the technical centre on Bauder's website.

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1 Blue Roofs

Blue roofs are a direct response to the growth in urbanisation and the ever-increasing number of extreme weather events, including flooding, causing high rates of rainwater run-off.

Key to sustainable urban drainage solution (SuDS) design is the principle of dealing with rainwater as close as possible to where it falls. This means that blue roofs are now fundamental to many drainage plans, as a blue roof controls and limits the rainwater flow from the roof, ensuring that the drainage system below is not overwhelmed.

Blue roofs can be incorporated into projects at rooftop or podium level. Blue roofs attenuate storm water within a void which sits beneath a surface finish, such as vegetated green roof or hard landscaping.

A blue roof is not normally designed as a water storage facility but should allow all the water to evacuate from the roof over a 24- to 48-hour period. This ensures the roof is ready for the next rain event.



2 The Bauder Approach

Bauder works with the client, architect and drainage engineer to provide a single-point solution for waterproofing and blue roof and green roof layers, allowing a comprehensive system guarantee to be issued.

Bauder carries out detailed rainfall modelling to determine an effective scheme for the project by using geographical and climate information, allowable discharge for the roof, and the maximum attenuation volume for the roof.

Typically, Bauder will provide the following information:

- Number of blue roof outlets required and their settings – these restrict the flow of water in line with the required discharge rate for site
- Depth of void required on the roof to which any landscaping finish can be installed (referred to as the H-Max)
- Weight of ballast required to prevent floatation in inverted blue roofs

This information will then be drawn up into a specification for the project, complete with compatible waterproofing layers, blue roof system and landscaping/green roof layers.

Blue roofs are relatively new to the flat roof industry. To protect the building below, building insurers may require a single-point supplier who can provide the waterproofing, insulation and any green and blue finishes as part of a single supply package covered by an inclusive warranty.

Bauder's single-point source and guarantee considers the waterproofing, blue roof, and surface design finish as one element to ensure compatibility and guarantee clarity.



3 Design of a Blue Roof

Blue roofs require a flat roof finish (with no designed fall, but no backfalls) and will be subject to high levels of 'live' load. Therefore, early engagement with Bauder to establish the roof design is strongly recommended. Design considerations include:

Deck

Designing the blue roof to be as flat as possible while still conforming to BS6229:2018, is the most effective way to maximise water-holding capacity (BS6229:2018 describes a zero falls roof as between 0 and 1:80 with no backfalls away from outlets.)

Adequate overflows

Whilst a blue roof system may only require comparatively few outlets to discharge rainfall, the CIRIA 2024 Blue Roof guidance document recommends that, in an emergency, roofs have adequate additional overflows to ensure the roof can drain a CAT 1 storm at H-Max.

Reduced numbers of penetrations

Every penetration increases the risk of water ingress. To minimise this, if possible, penetrations should be reduced or grouped, and isolated to prevent damage to the insulation (see section 8).

Surface finishes

The end use for the roof should be considered, including how those finishes (plant, paving, etc) will interface with the blue roof system.

Project insurance

Please inform Bauder of any specific requirements from the project insurer as early as possible.



4 Roof Deck and 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, such as performance characteristics for durability and membrane thickness, tensile strength and elongation.

Deck

Blue roofs are likely to be deep, heavy systems. Most blue roofs are constructed on concrete decks which are more able to cope with dead and imposed loads*, as well as the weight loading associated with the water to be attenuated on the roof. Whilst other deck types can be considered, their performance should be carefully evaluated. However, Bauder recommends the use of reinforced concrete to reduce risks.

*Dead and imposed loads - should be calculated in accordance with BS EN 1991-1-1, BS EN 1991-1-3 and BS EN 1991-1-4 and should include the weight of the roof structure, waterproofing system, plus an allowance applied for snow load.

Waterproofing

Retaining water at roof level will test any waterproofing system. BauderBLUE roof systems utilise two options for waterproofing:

- Bituminous warm, cold roof or no insulation build-up comprising Bauder Total Roof System (BTRS) or Bauder Total Green Roof System (BTGRS)
- Bauder's hot melt solution for inverted or cold roof construction

These systems carry BBA certification and help maintain the integrity required for blue and green roof applications.



4 Roof Deck and Waterproofing *continued*

Insulation within a waterproofing system

Since blue roofs require a flat roof finish and are subject to high 'live' loads, the compressive strength of the insulation is a key consideration. Therefore, we strongly recommend early engagement with Bauder to establish the appropriate roof design. Considerations include:

Warm roof construction with BTRS or BTGRS

The thermal effectiveness of the roof will not be impacted by the water held in the blue roof, but it is critical that the compressive strength of the insulation exceeds the maximum expected imposed loads for maximum height (H-Max) of the water within the blue roof element and the saturated weight of the roof finish.

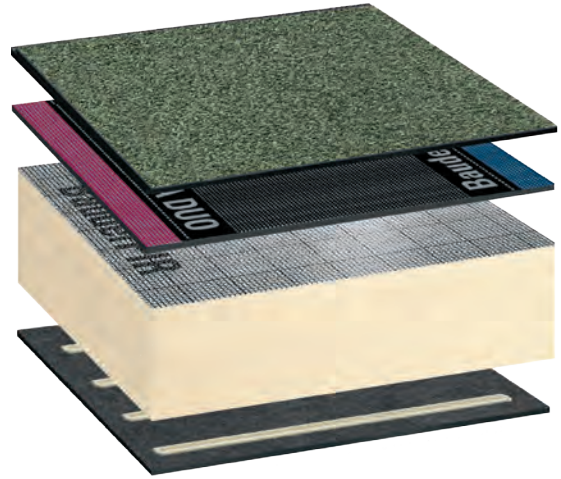
Cold roof or uninsulated roof construction with BTRS, BTGRS or Bauder hot melt systems

The thermal effectiveness of the construction will have been included within the building rather than in the waterproofing system.

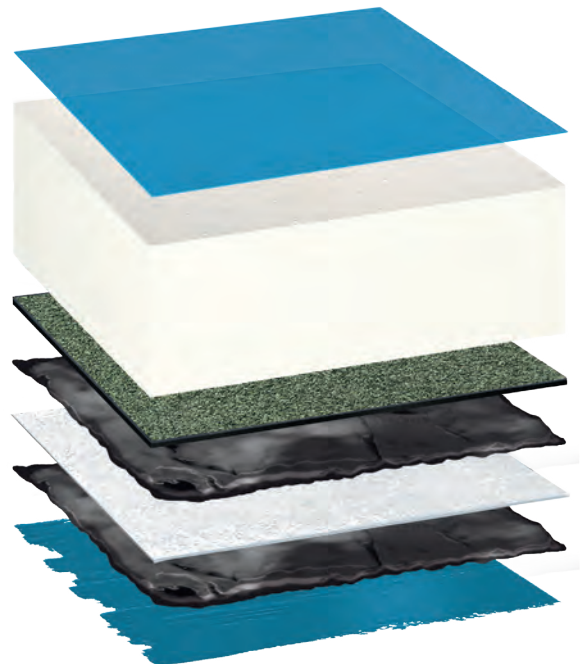
Inverted roofs

Whilst inverted blue roofs are often seen as the most practical solution, there are two key considerations for the design team:

- ❑ **Floataction:** With a normal inverted system there is an allowance for an amount of trapped water; however, these calculations assume unrestricted flow of water off the roof. Under storm conditions the water held in the blue roof will be forced beneath and in-between insulating layers, greatly increasing the risk of flotation.
- ❑ **Thermal performance:** Cold rainwater reaching the roof waterproof layer in inverted blue roofs will temporarily affect the rate of heat loss from the roof and should be accounted for by adding a correction to the calculated roof U-value, in accordance with BS 6229.



Reinforced bitumen membrane systems for warm roof construction



Hot melt waterproofing for inverted roof construction

5 Outlets

The design of every blue roof is individual to the geographical location, construction project and the total allowable discharge defined by the Local Planning Authority (LPA) within the planning approval.

Bauder calculates the discharge rates for each blue roof project, producing roof-specific discharge reports and blue roof outlet specifications. The overall site calculations for project drainage requirements are a specialist discipline and should only be carried out by a qualified professional.

Blue roof outlets should have easily accessible inspection chambers fitted for regular maintenance to ensure the outlet is free from blockages.

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 could be immersed for longer periods.

The flow restrictor components are an integral part of the roof system and will be supplied by Bauder as a full system.

Emergency overflows

Emergency drainage must be provided in case of blockage with the primary outlet. This must be capable of removing excess rainfall for a category 1 storm event. The base of the overflow pipe must be placed level with the H-Max. These outlets should drain separately and not be part of a 'closed' system.

Maintenance access is important to allow for the clearing of any silt, debris, or leaf and plant matter that could block or restrict the flow of water through the emergency outlet. Maintenance is required quarterly.



6 Blue Roof Components

The waterproofing, insulation and the void-forming components of the blue roof must have the correct structural capacity to resist the permanent load of the required finish and any imposed loading. The void-forming components must meet the following requirements:

- Have the capacity to fully accommodate the predicted stormwater 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 to sit beneath the surface finish and bear the implied load of the plant or traffic applied to it

Bauder's STORMcell, STORMvoid and STORMsub systems deliver all the requirements for void forming on a blue roof.

7 Surface Finishes

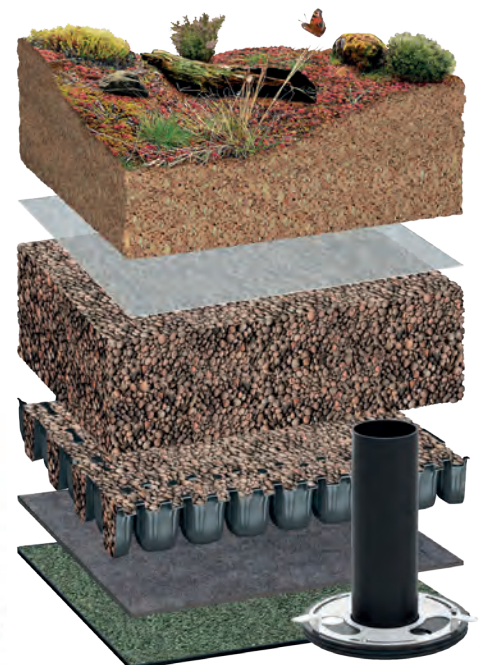
A BauderBLUE roof system always sits under the surface finish, whether that is hard or soft landscaping or a biosolar system. The surface finish should be able to freely drain into the attenuating void space.



BauderBLUE STORMcell



BauderBLUE STORMvoid



BauderBLUE STORMsub

8 Waterproofing Installation and Detailing

Roof specifications adhere to strict practices, with thorough inspections and integrity tests with the quality and longevity of the waterproofing system in mind.

Detailing

BauderBLUE roof specifications will follow all relevant British standards and codes of practice to ensure the appropriate solutions are delivered.

The minimum recommended height for constructing waterproofing details is 150 mm above the finished surface of the landscaping, surface decking, ballast or paving. All waterproofing detailing should incorporate a suitable termination to the building structure. In a warm roof construction, consideration may be given to a solution where roof penetrations are locally isolated to prevent any possible water ingress from contaminating the insulation. This is achieved by forming a secondary seal between the vapour control layer and the underlay or the underside of the waterproofing, set 250 mm back from any penetrations. Moreover, it is recommended that all isolated penetrations be minimised or otherwise have isolated flashing.

Installation inspections

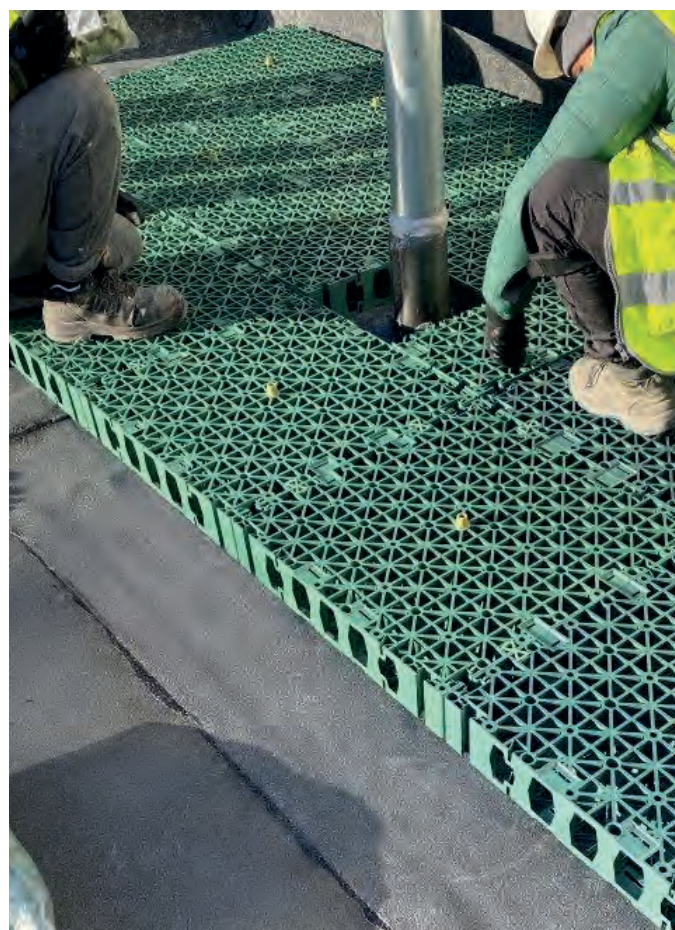
An electronic or suitable integrity test should take place on the completed waterproofing, prior to the installation of any blue roof void forming, or any landscaping components. The satisfactory waterproofing integrity certification must be retained, and the testing company must operate to the guidance issued by the Roofing and Waterproofing Testing Association (RAWTA).

As with all roofing components, the waterproofing, blue roof, green roof, and landscaping elements supplied by Bauder must be checked and signed off by a Bauder site technician. Interim inspections are carried out during the installation, followed by a full final inspection upon completion of the works. The site technician will produce individual reports confirming the installation of the system is in accordance with Bauder's recommendations and specification. Rigorous approval criteria are adhered to as part of the sign-off for the guarantee.

Maintenance

For maintenance advice for blue roof systems, please refer to the General Maintenance Blue Roof Systems guide, which can be found in the technical centre section on our website.

www.bauder.co.uk/technical-centre/installation-maintenance



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