# BluRoof

STORMWATER MANAGEMENT SYSTEMS

## a single source, fully warranted waterproofing and sustainable drainage solution

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ALUMASC ROOFING SYSTEMS

HARMER DRAINAGE SYSTEMS

# About Alumasc

Alumasc Exterior Building Products Ltd (Alumasc) provides single-source products and systems for building exteriors and drainage, backed up with high levels of technical expertise and project support.

The Company actively pursues sustainable building products, systems and manufacturing processes, offering a wide choice of long-term solutions. The company's commitment to making ongoing improvements and ensuring best practice is demonstrated through accreditation to ISO 14001:2004 and ISO 9001:2008.

In summary, Alumasc delivers Roofing, Drainage, Rainwater and Façade Systems comprising:

- **Premium Products**
  A constantly evolving range of proven products and systems, with BBA and ETA certification in excess of 30 years.
- **Technical Support**
  Extensive technical support on an individual project basis, achieving tailored specification solutions.
- **Registered Installers**
  A rigorously trained and monitored network of specialist installers, ensuring correct application on site.
- **System Warranties**
  A choice of comprehensive warranties, providing lifecycle reassurance for the building owner.

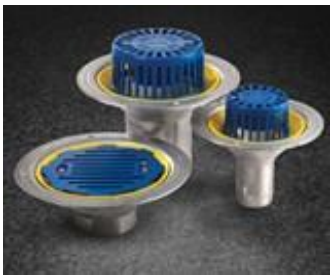
## BluRoof—A Single Source Solution

Alumasc has developed the BluRoof system that benefits from the combined expertise associated with Harmer Engineered Drainage Systems and Alumasc Roofing Systems. The result is that Alumasc is ideally positioned to offer a single-source solution that is integral to a system of this kind.

ALUMASC
ROOFING SYSTEMS

An innovative range of sustainable, high performance waterproofing and green roof systems. BBA and ETA certified roofing solutions are backed by an unrivalled service and support package.

- Flat Roof Membranes
- Hot-melt Waterproofing
- Cold-applied Liquid Roofing
- Single Ply Roofing
- Green Roofs



HARMER
DRAINAGE SYSTEMS

Harmer drainage solutions are designed to perform and engineered to last. Covering everything from soil drainage to internal water drainage, there's a system to suit all drainage needs.

- Roof Outlets
- Soil & Waste Drainage
- Floor & Shower Drains
- Channel Drains
- Deck Supports

blackdown
greenroofs

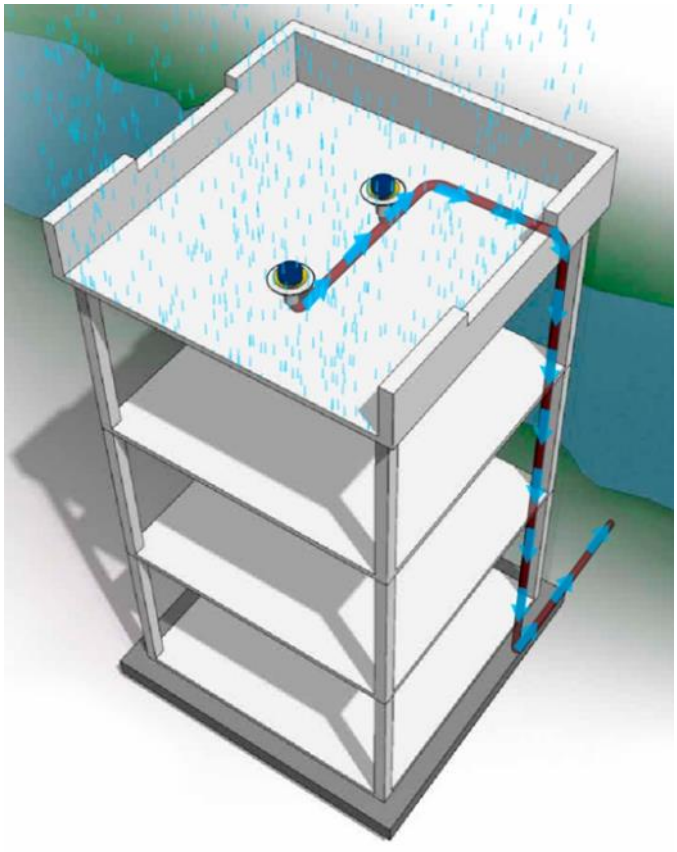
Blackdown green roof solutions are tailored to each project's specific requirements; with systems including:

- Extensive green roofs
- Biodiverse roofs
- Semi-intensive green roofs
- Intensive roofs and landscaping

# What is BluRoof?

Alumasc's BluRoof system is a fully warranted waterproofing and sustainable drainage solution. Exploiting the respective strengths of Harmer engineered drainage systems and Alumasc's high performance waterproofing solutions, stormwater discharge is controlled at source; providing a valuable flood risk mitigation tool.

> *"BluRoof is designed to alleviate flood risk by reducing and controlling the peak rate of discharge in compliance with design requirements.*
>
> *This facilitates the detention of stormwater up to a prescribed maximum hydraulic head for subsequent controlled discharge over an elongated period of time."*



## Key Features & Benefits

Alumasc's BluRoof system has the following key features, providing an engineered solution tailored to individual project requirements.

- Restricts stormwater discharge rates
- Provides managed roof attenuation options

BluRoof is an excellent choice for urban areas where land excavation is at a premium. Considerable project cost savings can be achieved compared to underground excavation.

A range of options are available to suit the required roof build-ups and drainage outlet.

- **BluRoof Waterproofing**
  BluRoof high performance roofing solutions provide the requisite waterproofing integrity and are fully warranted.
- **BluRoof Drainage**
  Harmer BluRoof outlets restrict the maximum permissible discharge of stormwater by the inclusion of a restriction device that is removable for maintenance and adaptable to future climate change.
- **BluRoof Drainage Calculations**
  Validate response to design storm profiles.
- **BluRoof Sustainable Drainage**
  BluRoof applies an internationally-adopted sustainable drainage technique.

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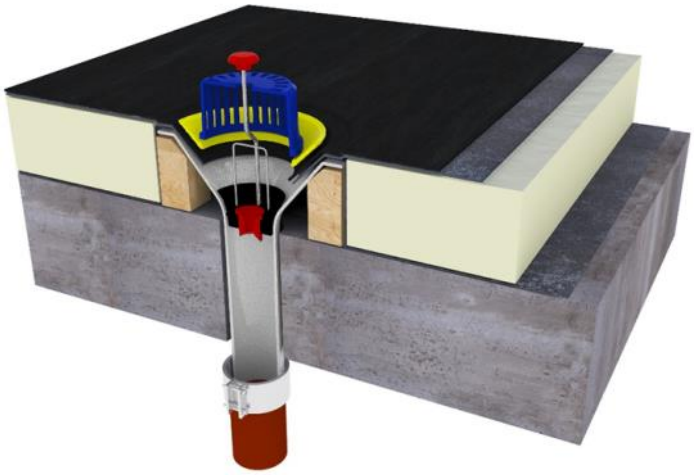
# BluRoof Overview

## BluRoof Applications

Blue roofs can include open water surfaces on roofs, but can also be used in buried applications, such as raised podium deck surfaces or green roofs.

Indeed, by combining the Alumasc's Blackdown Green Roof and BluRoof systems, the retention of stormwater in the green roof's layers, i.e. plants, substrate and drainage/ reservoir layer, complements the detention of stormwater by the blue roof to provide valuable additional drainage capacity.



## Warm Roof Solutions

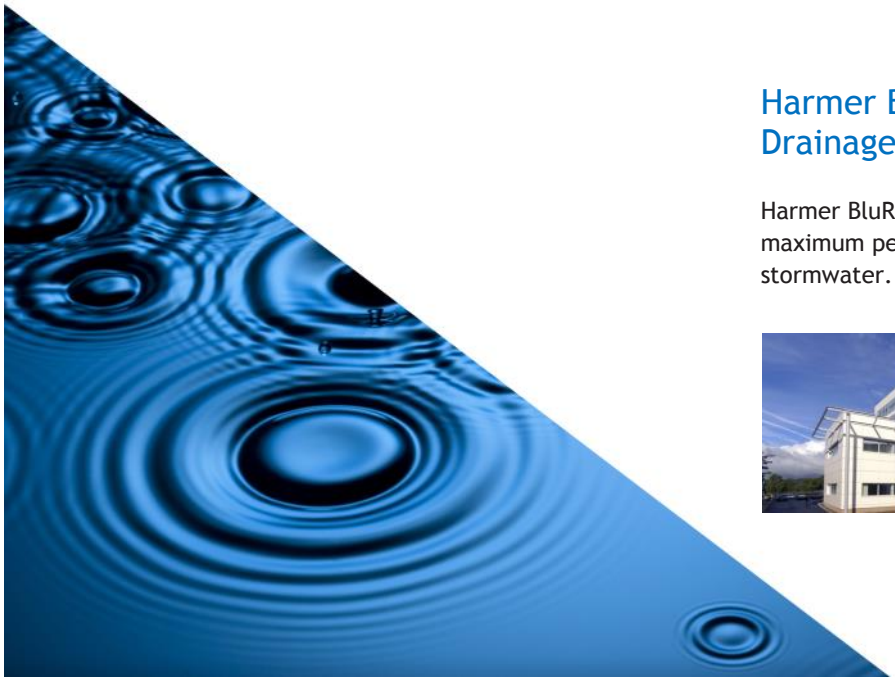
For insulated roof areas, the dual-reinforced BluRoof built-up high performance membrane is specified as a fully-bonded system, with extended and high pressure-rolled laps for excellent watertight integrity. The system offers a mineral-free surface which reduces the risk of blockages.

## Non-Insulated Solutions

For buried (non-insulated) systems, such as podium applications, Alumasc's BluRoof monolithic membrane provides a self-healing waterproofing solution that is free from laps and has a proven track record of over 50 years.

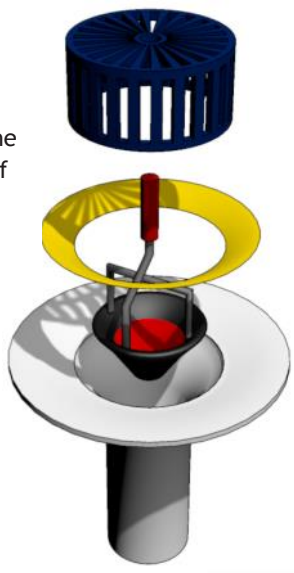
## Green Roof Solutions

A root-resistant version of the BluRoof bituminous membrane is also available, for compatibility with Alumasc's Blackdown Green Roof systems.



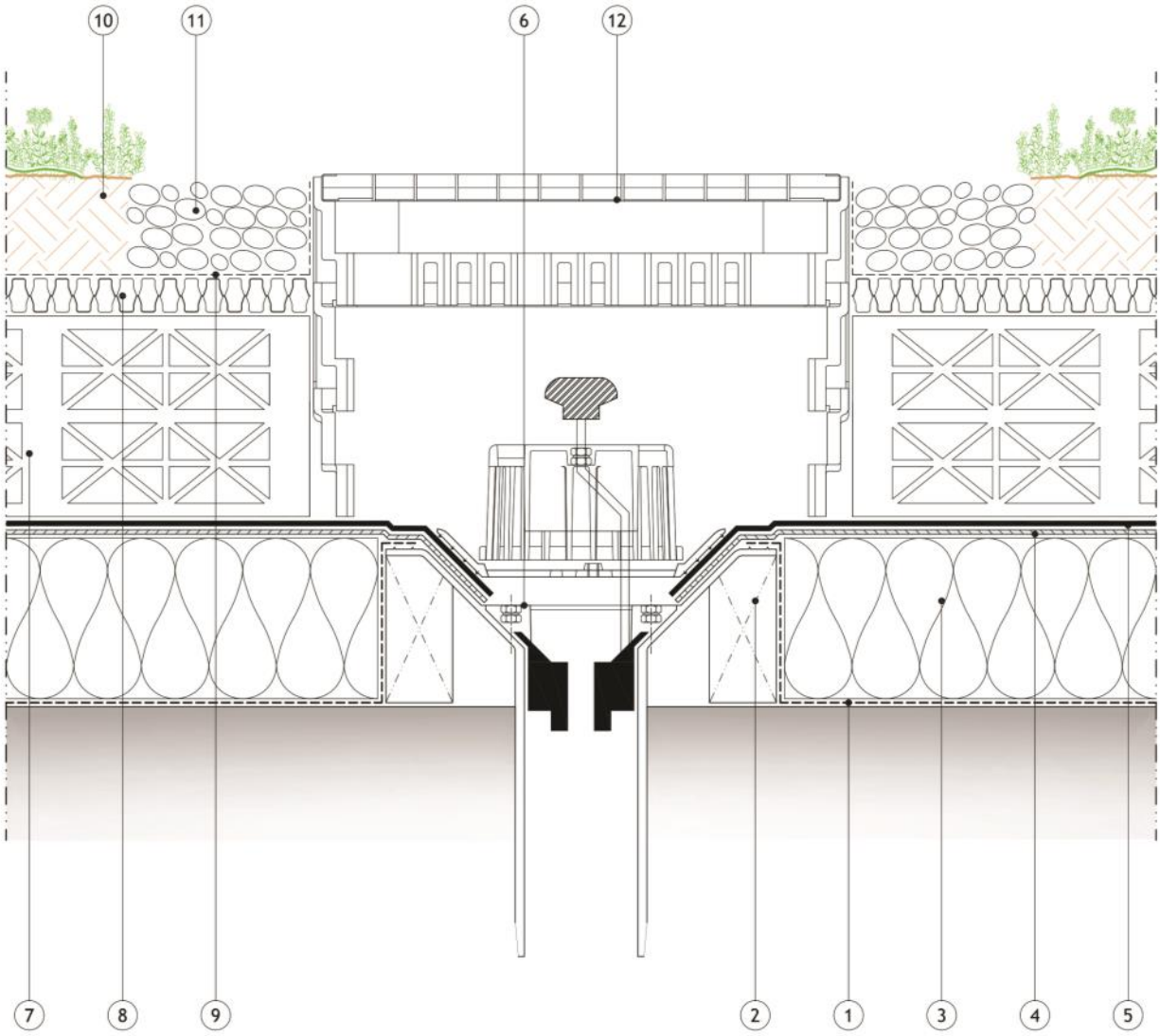
## Harmer BluRoof Drainage Outlet

Harmer BluRoof outlets restrict the maximum permissible discharge of stormwater.



# Indicative BluRoof System

## BluRoof Warm Roof Build-up
## with optional Extensive Green Roof




Section Key:

1. Alumasc vapour control layer.
2. Treated timber batten, by others, to be of reduced thickness to avoid creating a step in the waterproofing.
3. Alumasc thermal insulation, thickness determined to meet the U-value and dew point of the structure.
4. Alumasc underlay.
5. BluRoof cap sheet, fully bonded by gas torch.
6. Harmer AV outlet with Harmer BluRoof Insert, incorporating a clamping ring and domical grate.
7. BluRoof Void Former.
8. Alumasc Blackdown 25 Drainage Layer.
9. Alumasc Blackdown Filter Sheet, loose laid over the drainage layer with 150mm unsealed laps.
10. Alumasc Blackdown Sedum Substrate / Sedum species.
11. Vegetation barrier formed from large rounded pebbles 16mm - 32mm grade, by others.
12. Harmer Modulock Access Cover with Access Chamber Extension Pieces.

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# Engineered Solutions

## Stormwater Management

The Harmer BluRoof restriction device, part of the roof drainage outlet, is fully engineered to control water flowing through the outlet opening. This restricts the maximum permissible discharge of stormwater from the roof.

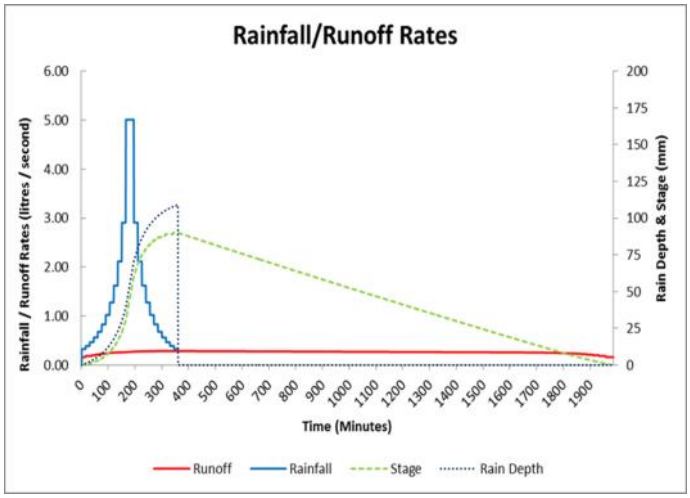
During more intense storm events, rainfall will exceed the rate of discharge, leading stormwater to temporarily back-up on the roof. By avoiding instantaneous discharge from the roof into the subterranean drainage or waterways in this way, the probability of sewer overflow and localised flooding is significantly reduced. This is particularly important where sewers carry both waste and storm flows, due to the added health risks of a surcharge.

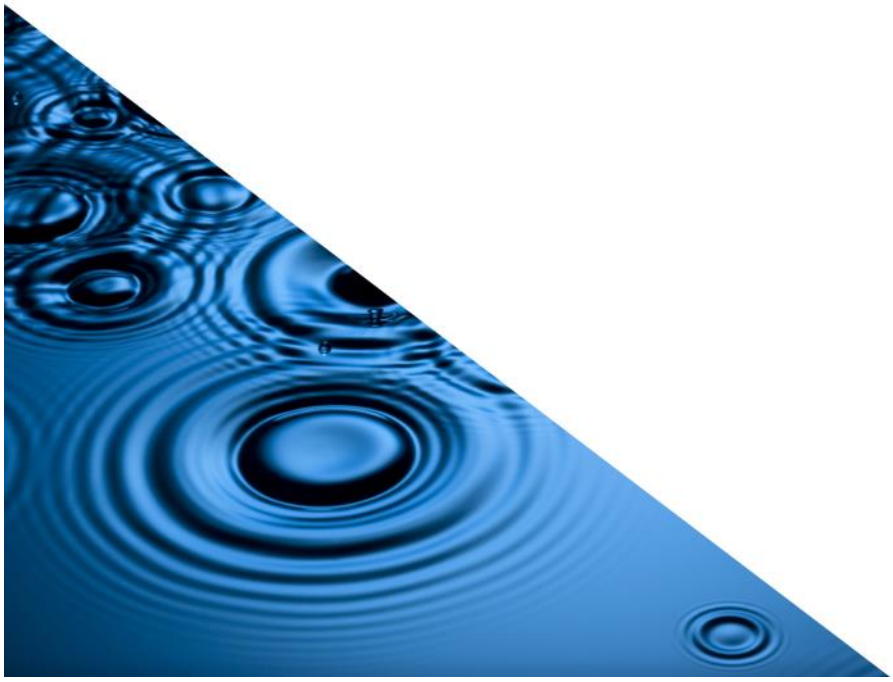
## Source Control at Roof Level

BluRoof is a highly efficient sustainable drainage technique - occupying otherwise redundant roof space without extending beyond the building's footprint into additional ground space. BluRoof can have a major beneficial impact upon the attenuation of significant storm events:

A storm event with a return period of 1 in 100 years produces 109 mm of rainfall depth with a peak intensity of 5.01 l/s. With BluRoof, the peak discharge is reduced by 94% to 0.285 l/s by allowing 90 mm of water to be detained and slowly discharged over a period of 27 hours.

| Project Details | | | |
|---|---|---|---|
| Location: | London | Outlet Size: | 10 mm Ø |
| Roof Area: | 284 $m^2$ | No. Of Outlets: | 2 no. |
| Max. Upstand: | 150 mm | | |
| **Design Storm Inputs** | | | |
| Return Period: | 100 years | Intensity Profile: | 50% Summer |
| Duration: | 6 hours | Climate Change Factor | 30% |
| **Design Storm Characteristics** | | | |
| Rainfall Depth: | 109.04 mm | Peak Rainfall Intensity | 0.018 $l/s/m^2$ |
| Peak Rainfall Rate | 5.01 l/s | | |
| **Blue Roof Response** | | | |
| Peak Runoff Rate: | 0.285 l/s | Peak Runoff Reduction | 94.31% |
| Attenuation Time: | 1627 minutes | Max. Stage: | 90 mm |
| Detention Volume: | 25560 litres | Overflow Volume: | 0.00 litres |



# Technical Performance

## Design Considerations

BluRoof is an engineered drainage approach that addresses wider aspects than the reduction of the BluRoof outlet opening size to restrict flow. Considerations include:

**Flow-restricted Outlet Performance**

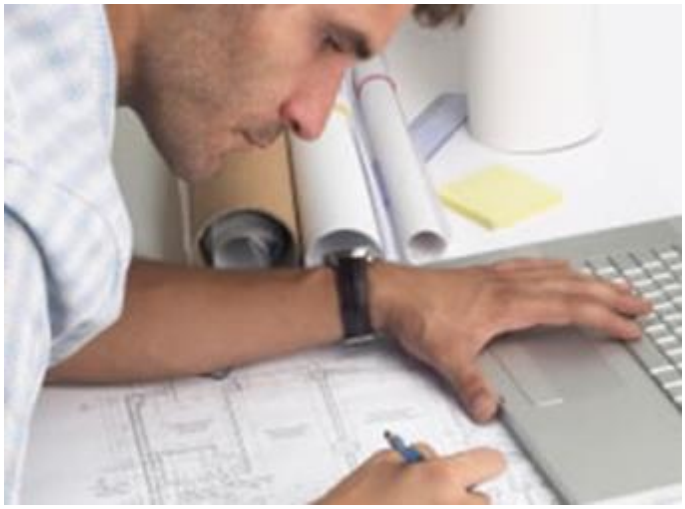
- Extensively tested outlet performance at different hydraulic heads.
- Size of the orifice is tailored to match the project's performance requirements and the availability of space for a BluRoof solution.

**Structural Design**

Dead loads depend upon the maximum depth that can occur before overflow measures are triggered. To put this into perspective, a storage void that can detail 100mm of water will have a load of 1.0 kN/m2 (and up to 60mm of detained water would fall within the typical snow load allowances of 0.6 kN/m$^2$). When tolerances and the absence of the need for screed to falls are factored into the equation, any additional loading will typically be negligible.

**Hydraulic Design**

Overflow outlets are designed in accordance with BS EN 12056-3:2000 to ensure adequate drainage should rainfall exceed design storm criteria or as a further safety measure, to the point that the stage reaches its maximum level.



**Response Calculations**

Robust response calculations validate the BluRoof's reaction to design storm events in terms of:

- Maximum rates of discharge.
- Associated depth of water that is temporarily detained on the roof surface.
- Detention lag for run-off to occur (and regeneration of capacity ahead of a subsequent storm event).

**Waterproofing Integrity**

Alumasc's warranted waterproofing systems protect the building against water ingress:

- **Warm Roof Specifications**
  Include a high performance bituminous membrane with a track record of over 40 years.

- **Cold Roof/Podium Specifications**
  Rely on a hot-melt waterproofing solution with a track record of 50 years as both a roof and a structural waterproofing solution.

**Operational Considerations—Maintenance Programmes**

Pre-Handover, the occupier's maintenance team will be briefed and provided with an O&M Manual on the BluRoof system. This will detail important Post-Handover Maintenance Actions, such as regular inspections of the waterproofing membrane for mechanical damage, periodic removal of debris or other blockage risks, visual inspections of the roof and outlet after significant events etc.

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# BluRoof Waterproofing

## Tried, Tested & Trusted Solutions

The temporary storage of water at roof level requires the highest confidence in the waterproofing solution. Alumasc Roofing Systems has developed its BluRoof solutions based upon proven systems, with yet further enhanced specifications and service levels.

> *"Alumasc's BluRoof Solutions are installed uniquely by a network of specially-trained contractors and are underpinned by a single point Alumasc warranty covering waterproofing and drainage. The is supported by an enhanced service offer, BluRoof—The Alumasc Promise"*

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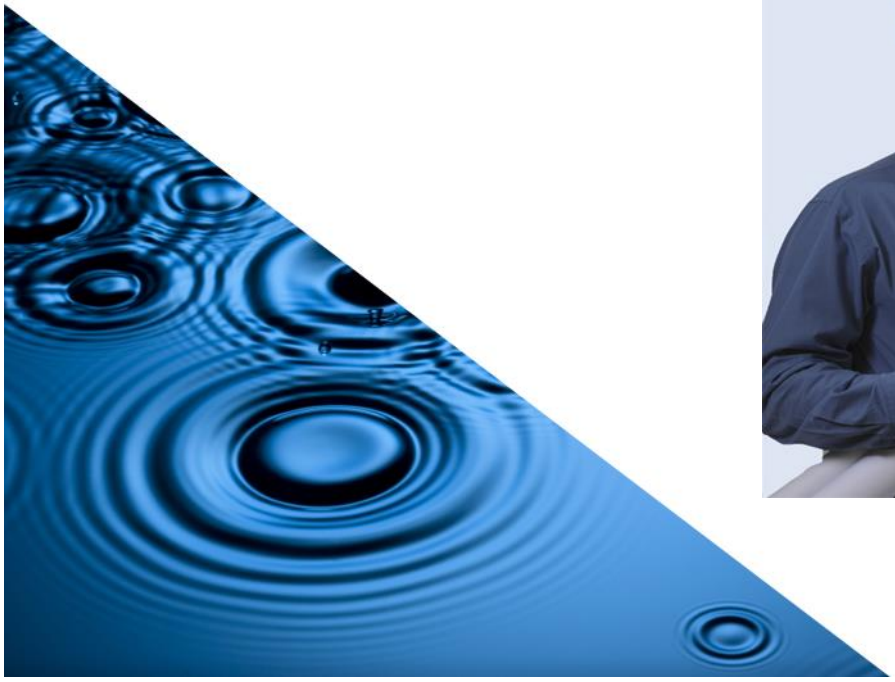
## BluRoof—The Alumasc Promise

'BluRoof – The Alumasc Promise' is an innovative service and support offer. The Promise provides Clients, Architects, Engineers and Contractors with complete confidence and long-term peace of mind in the BluRoof system specified on their project.

## Elements of The Alumasc Promise

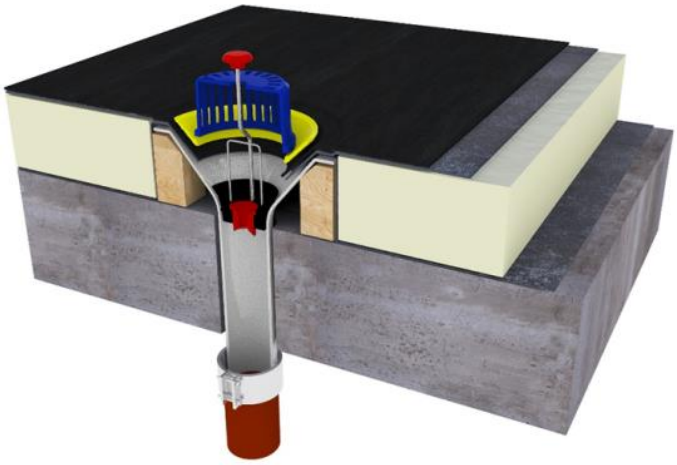
- Detailed BluRoof Specification
- Installation by Alumasc-trained Contractors
- Regular, Interim Site Inspections by Alumasc
- Leak Detection Tests carried out by Alumasc
- Final Inspection of BluRoof Waterproofing by Alumasc
- Single Point Alumasc BluRoof Warranty
- Maintenance Inspections by Alumasc

# Applications

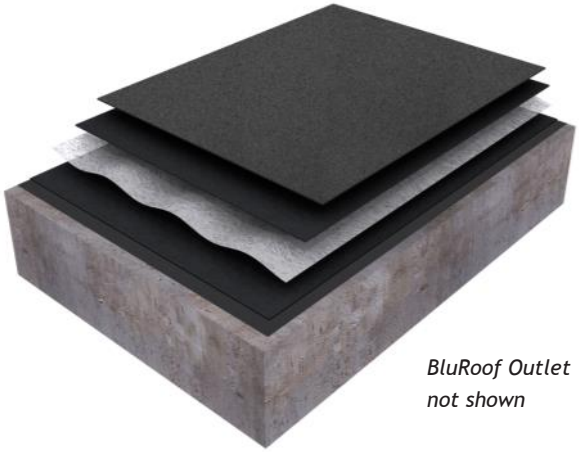
## BluRoof Warm Roof Solutions

For insulated roof areas, the dual-reinforced BluRoof Built-Up High Performance Membrane is specified as a fully-bonded system, with extended and high pressure-rolled laps for excellent watertight integrity. The mineral-free surface reduces the risk of blockages, whilst a root-resistant version is also available, for compatibility with Alumasc's Blackdown Green Roof systems.



## BluRoof Podium Solutions

For buried (non-insulated) systems such as podium applications, Alumasc's BluRoof Monolithic Membrane provides a self-healing waterproofing solution that is free from laps and with a proven track record of over 50 years.



*BluRoof Outlet not shown*

## Warm Roof Features

- BluRoof built-up high performance membrane
- Dual-reinforced
- Mineral-free surface
- Fully bonded
- Laps extended and high pressure rolled
- Installed by Alumasc-trained operatives
- Single point warranty for Waterproofing & Drainage

## Podium Features

- BluRoof monolithic high performance membrane
- Membrane has zero failures with over 50 years' use
- No laps
- Self-healing
- Mineral-free surface
- Fully bonded
- Installed by Alumasc-trained operatives
- Single point warranty for Waterproofing & Drainage

## Green Roof Options

- The Alumasc Blackdown green roof system is fully compatible with both warm roof and podium systems.

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# BluRoof Drainage

## Engineered Drainage Solutions

It is often said that the key to good design is simplicity; and the BluRoof system has adopted this governing principle.

The Harmer BluRoof Flow Restriction Device has been designed to ensure that the system is highly visible, and distinctive from conventional roof outlets. The device is removable, allowing regular maintenance to be conducted without compromising the drainage outlet. This makes possible change to the orifice size in the future (should climate change factors affect design parameters).

Important features have been designed as part of the Harmer BluRoof Flow Restriction Device:

- A vent pipe ensures that the drainage system remains fed by gravity by facilitating air entry.
- A vent pipe protector ensures that the system is visible and safe to access for maintenance.
- The chamfered insert reduces the risk of blockage.
- A handle allows quick removal for maintenance purposes.

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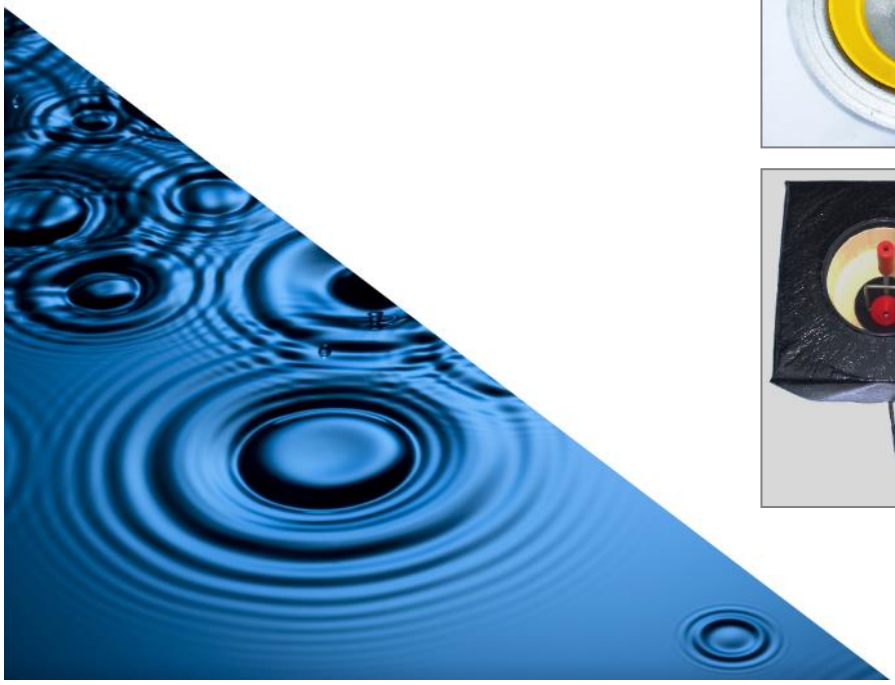
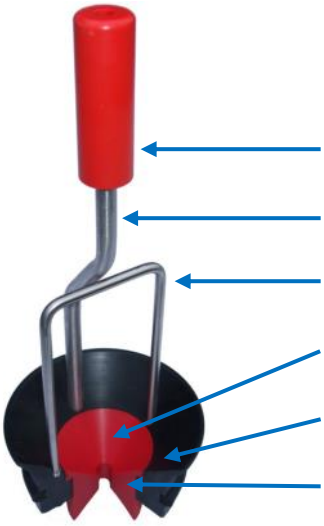


## BluRoof Harmer Flow Restrictor

The Harmer BluRoof Flow Restriction Device is compatible with both the Harmer AV400 aluminium outlet and the Harmer Insulated Outlet.




** The Handle is removable for maintenance purposes*

## Compatible Harmer BluRoof Outlets

**Harmer AV400 Aluminium Outlet**

**Harmer Insulated Outlet**

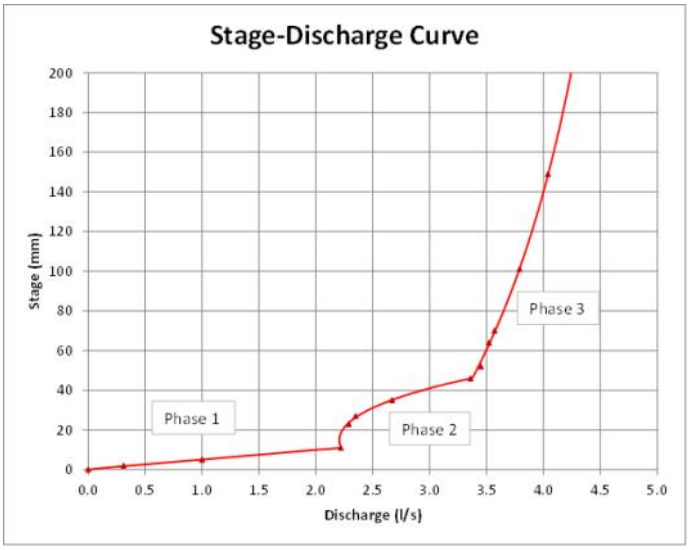
# Technical Performance Validation

Time-series modelling is employed to predict the hydrologic response of the BluRoof system to any given design storm profile:

**Harmer BluRoof Flow Restricting Device**
Extensive testing has been carried out to establish the relationship between discharge rates from the BluRoof outlet and the hydraulic head of water. The resulting test data underpins the stage-discharge modelling mechanism that is specific to the smaller BluRoof orifices.

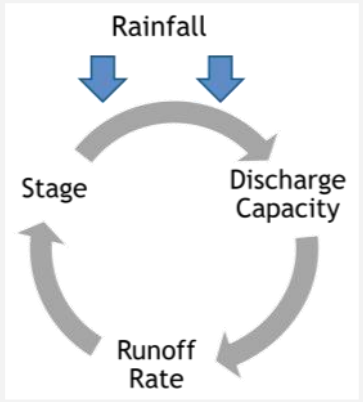
When smaller BluRoof orifices are considered, the 3 phases of stage-discharge relationship – (1) Weir entry, (2) Transition, and (3) Orifice-controlled - are still evident. However, relationship can no longer be calculated on the basis of the standard stage-orifice-discharge equation, as the smaller the orifice, the quicker the transition to the orifice-controlled phase.

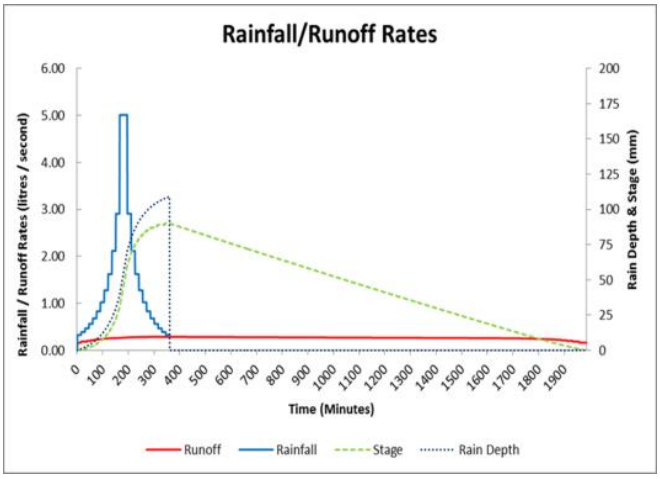
A series of data analyses have been conducted to identify alternative equations that better match the observed test responses.




## Storm Event Modelling

By adopting the Depth-Duration-Frequency model advocated in the Flood Estimation Handbook (FEH), rainfall depths are calculated accounting for location, duration and return period (e.g. 1 in 30 years, 1 in 100 years) and distributed temporally in accordance with seasonal storm tendencies. Rainfall and runoff are continuously and simultaneously modelled to establish the response of the BluRoof.




- Rainfall and runoff modelled simultaneously.
- Capacity of outlet changes with hydraulic head, i.e. stage.
- As rainfall exceeds capacity of outlet, stage begins to increase.
- At end of rainfall event, stage reduces as detained rainwater discharges in a controlled manner.

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# BluRoof

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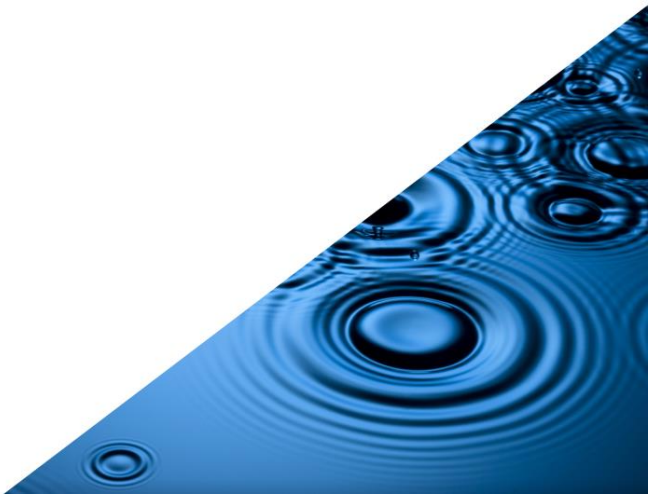

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