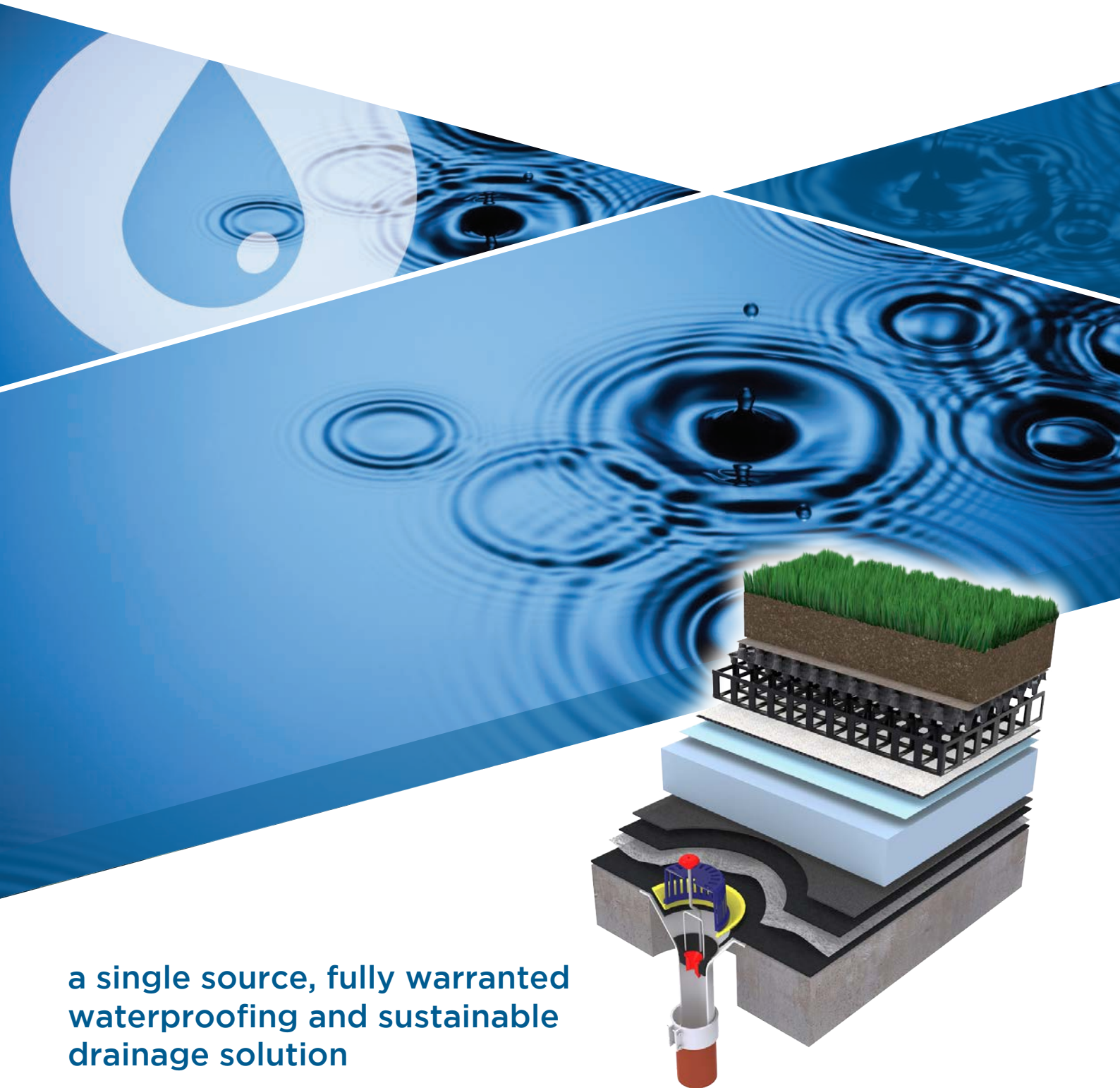


BluRoof Stormwater Management



a single source, fully warranted
waterproofing and sustainable
drainage solution

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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.



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 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



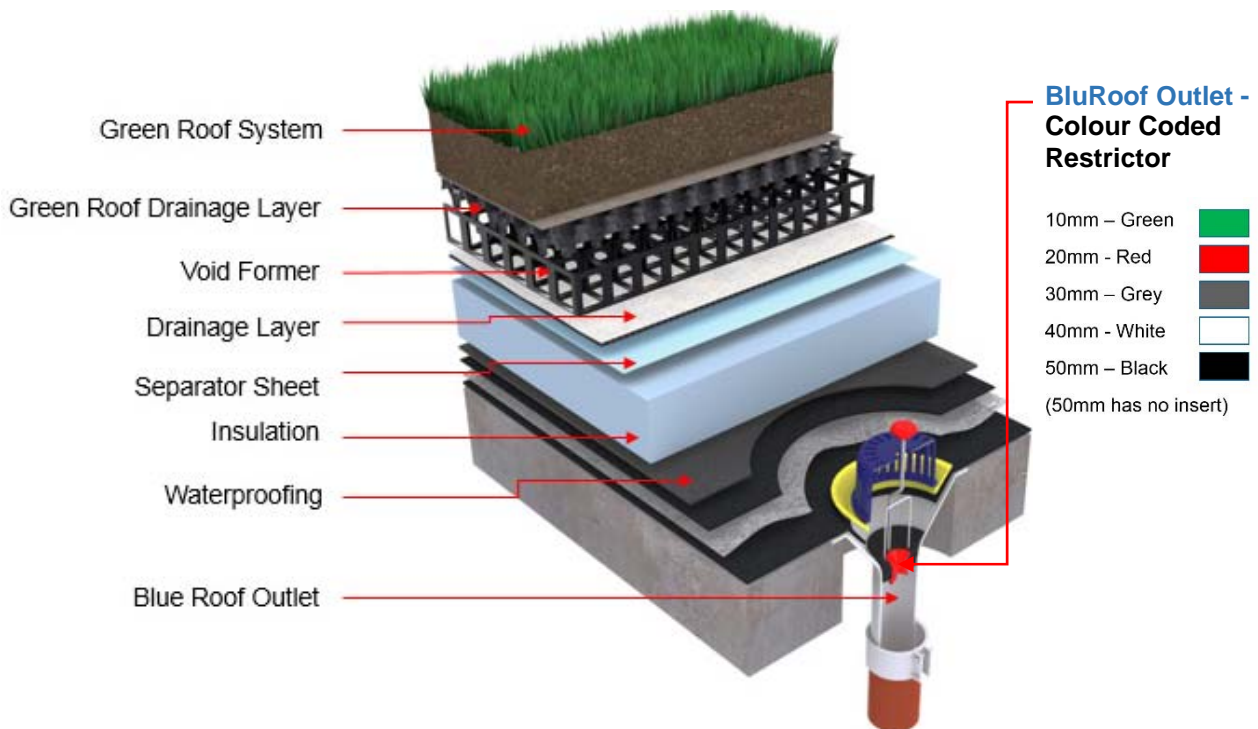
Blackdown green roof solutions are tailored to each project's specific requirements; with systems including:

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

BluRoof - Definition

BluRoof is a roof designed to alleviate flood risk by reducing and controlling the peak rate of discharge in compliance with design requirements; facilitating the detention of stormwater, up to a prescribed maximum hydraulic head, for subsequent discharge over an elongated period of time.

Blue roofs can include open water surfaces but can also be used in buried applications, such as raised deck surfaces or green roofs. Indeed, by combining the Alumasc Blackdown Green Roof with a Harmer BluRoof system, 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.



BluRoof – The System

Alumasc is a supplier of high performance roof drainage and waterproofing solutions in the UK. Over the past decade we have seen a marked shift in the performance expectations of modern roofs; requiring watertight, energy efficient envelopes that can attenuate stormwater, recreate local habitat and enhance indoor environmental quality with the most efficient use of resources. Alumasc's business strategy has been, and continues to be, well-aligned with these requirements; actively pursuing sustainable building products, systems, manufacturing processes and support services that provide Clients, Developers and Contractors with whole-life value and peace of mind.

The Alumasc BluRoof system benefits from the combined expertise associated with Alumasc Roofing Systems and Harmer Engineered Drainage Systems; allowing a truly single source BluRoof solution that is so integral to a system of this nature. The Alumasc BluRoof System comprises of 3 primary facets:

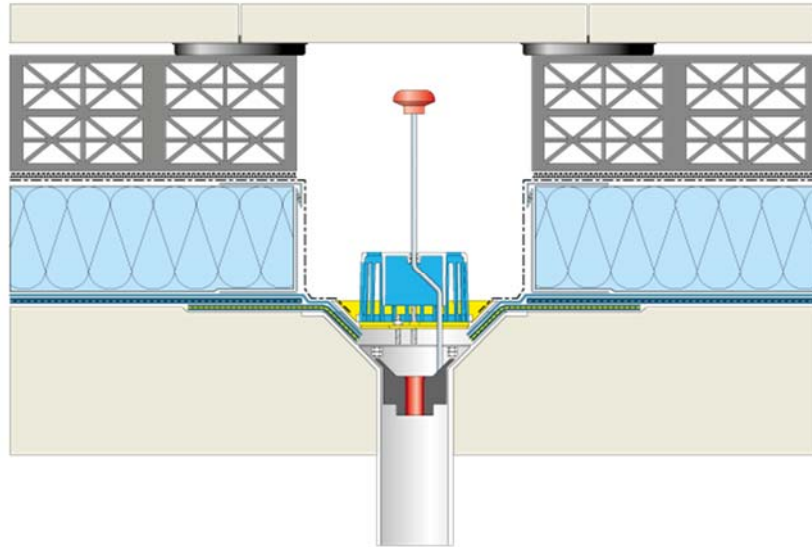
1. The engineered **Harmer BluRoof Outlet with Orifice Restriction Device** restricts the maximum permissible discharge of stormwater from the roof to predictable levels; accounting for the stage-discharge relationship. As a result, during more intense storm events, rainfall will exceed the rate of discharge, leading stormwater to temporarily back-up on the roof until such time as the Harmer Roof Outlet has the capacity to discharge it.

2. The **Alumasc BluRoof Waterproofing**; the specification, detailing and installation of which is integral to the success of a BluRoof system – protecting the building against water ingress. There are essentially 2 types of BluRoof; each with 2 typical variants:

a) Inverted Roof

A roof with the insulation situated above the primary waterproofing layer

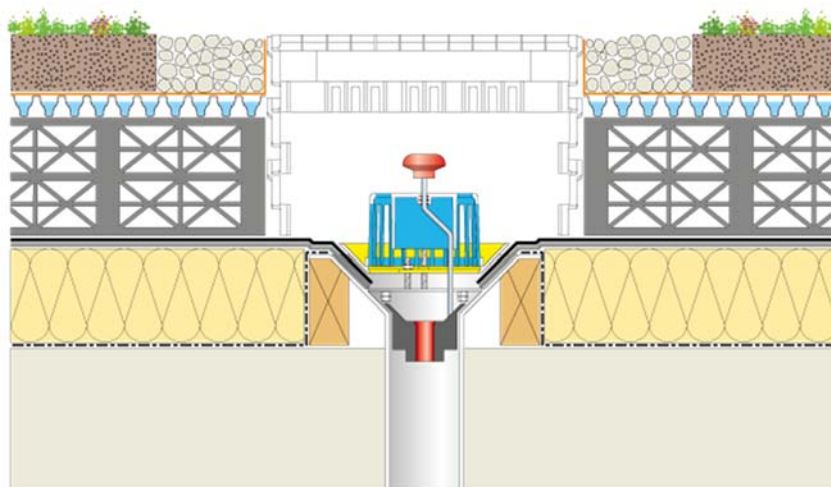
- **Podium** - surfaced with paving stones on supports
- **Green roof** - typically comprising vegetation, substrate and water management (or detention, drainage and filtration) layers



b) Warm Roof

A roof with insulation immediately below the primary waterproofing layer and above the independent vapour control layer

- **Open surface** - similar to a conventional flat roof; albeit with extended details to accommodate the higher-than-typical depth of water to be managed at roof level
- **Green roof** - typically comprising extensive green roof vegetation, substrate and water management (or detention, drainage and filtration) layers



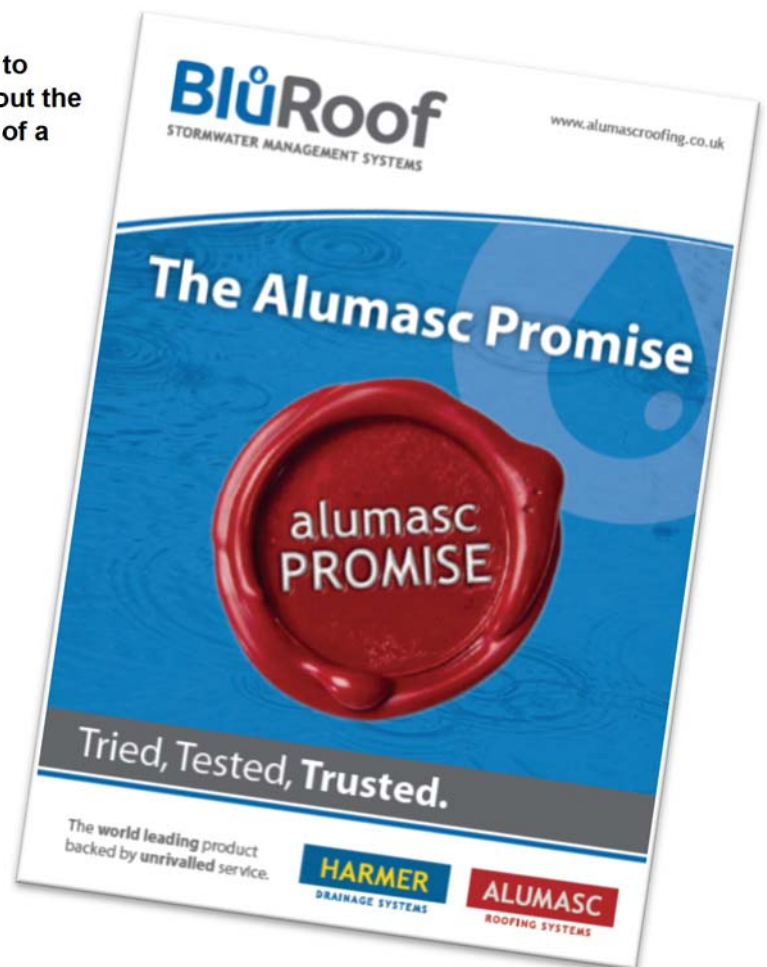
3. **'BluRoof – The Alumasc Promise'** – a service package that provides the client, specifier and the end user with complete confidence in the integrity of the waterproofing and drainage solution. Waterproofing solutions for flat roofs and podiums are widely specified. However, not all systems are equal and specifying the solution that has the product characteristics that are suited to the specific application is fundamental to delivering long-term value. Equally, flawed workmanship often results in system failures leading to leaks and costly repairs. This is avoidable if installation is carried out correctly and is guaranteed to last.

To address these issues Alumasc has introduced 'BluRoof - The Alumasc Promise' – developed exclusively by us to provide the assurances needed to reduce risk and ensure the long-term performance of your roof.

The package includes detailed technical guidance pertaining to the appropriate safety measures that must be in place (e.g. stormwater management calculations, provision of safety overflows, the adoption of a robust planned and preventative maintenance programme etc).

This Promise guarantees the integrity of your roof prior to, during and after installation and is designed to safeguard against the most common pitfalls. It gives you the security of expert installers, continual on-site supervision, expert testing and comprehensive post-installation support.

This document presents data and narrative to address the 10 key concerns expressed about the specification, installation and maintenance of a BluRoof system.



1. Structural stability and variable loadings

The loads imposed by a blue roof are checked against the capacity of the roof's structure by the project's structural engineer on a project-by-project basis. However, on the new-build projects that are specified with a BluRoof, these loads can typically be accommodated without issue:

- The load imposed by a BluRoof will depend upon the amount of water that has been detained on the roof at any given time.
- This load will be greatest during or after a significant storm event and will reduce during the dry weather period between events (typically within 24 to 48 hours).
- The maximum possible load is controlled by the height of the overflow measures. This governs the maximum permissible stage (which is a key input in the stormwater management calculations).
- Therefore, loads per square metre can be calculated as:

$$F = \frac{d \cdot m \cdot a}{1000}$$

Where:

F is the load (kN)
d is the depth, or stage (m)
m is the mass of water (1,000 kg/m³)
a is the acceleration constant (9.81 m/s²)

Example loadings imposed for different stages of detained water are highlighted in Table 1.

Table 1: Loadings for Different Stages

Stage	Volume	Mass	Load
75 mm	0.75 m ³ /m ²	75 kg/m ²	0.74 kN/m ²
100 mm	1.00 m ³ /m ²	100 kg/m ²	0.98 kN/m ²
150 mm	1.50 m ³ /m ²	150 kg/m ²	1.47 kN/m ²

To contextualise these figures:

- Standard roof designs would generally include allowances of 0.6 kN/m² for snow loads
- A BluRoof with zero falls does not require a screed to be laid to falls (as is customary with roofs that are laid to 1:80). Such screeds can impose loads of between 1.2 and 4.8 kN/m²
- Design calculations for concrete decks will include significant tolerances that can often exceed the values stated in Table 1.
- Compressive strength of insulation is typically between 150 kPa and 300 kPa
- Compressive strength of the BluRoof void former has been tested (to ASTM D1621) to withstand 125,000 kg/m² (ultimate).

In summary:

- The loadings imposed by a BluRoof are a function of the maximum prescribed stage; a design parameter that can be sized to suit the structural capacity of the underlying substrate as well as the hydrologic performance requirement.
- Typically, the additional loads imposed by BluRoofs will be relatively small and structural requirements are unlikely to differ significantly from a conventional flat roof.

2. Long-term resistance to moisture and hydrostatic pressure

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 tried and trusted systems, with yet further enhanced specifications and service levels.

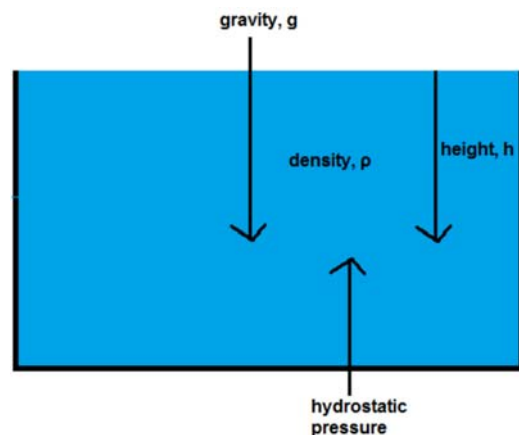
(a) Long-term resistance to moisture

For warm roof constructions, the dual-reinforced BluRoof Built-Up High Performance Membrane (Derbigum Black Anti-Root) is specified. The BBA certificate for this product (86/1593) stipulates a durability “in excess of 30 years.” This product is installed 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 that could otherwise be caused by loose mineral.

For inverted or cold roof applications, including podium specifications, Alumasc’s BluRoof Monolithic Membrane (Hydrotech MM6125) provides a self-healing waterproofing solution that is free from laps. The product has a proven track record, stretching back over 50 years, and can be specified as a roof waterproofing solution, or indeed as a damp-proofing system. According to the BBA certificate (90/2431), Hydrotech MM6125 “will provide an effective barrier to the transmission of moisture for the design life of the roof in which it is incorporated.”

(b) Resistance to hydrostatic pressure

The hydrostatic pressure applied to the waterproofing is a direct function of the hydraulic head (or stage). This will vary as a function of both the storm profile and the drainage characteristics. However, it is ultimately controlled, at design stage, through consideration of the maximum stage. Any attenuated water above this designed threshold would instantaneously discharge via the overflow outlets.



The hydrostatic pressure is calculated as:

$$p = h \cdot \rho \cdot g$$

Where:

p	=	pressure (n/m ² , Pa)
h	=	stage (m)
ρ	=	density of water, 1,000 kg/m ³
g	=	gravitational constant, 9.81 m/s

Therefore, for a maximum stage of 150 mm (N.B. a 1 in 100 year event of 6 hour duration in London, including 30% climate change factor, is 109 mm), hydrostatic pressure would be 1,471.5 Pa (or 1.4715 kPa).

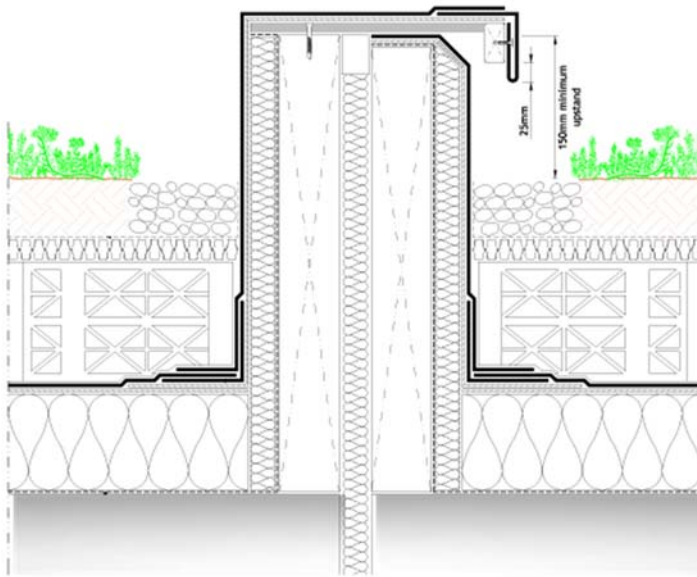
Such small pressure values can be accommodated by roof waterproofing solutions. To put this figure into context, the Hydrotech MM6125 product has been tested according to a draft ASTM standard (ASTM D-08.22 Draft 2), and found to resist 100 psi (which equates to 689 kPa).

3. Accommodating building movement

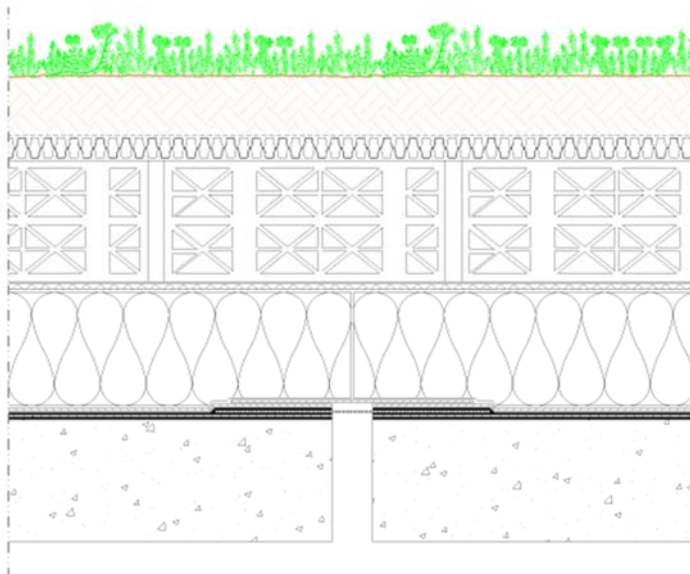
Clause 6.2 of both BBA certificates confirm that the products used in Alumasc BluRoof solutions are impervious to water and “capable of accepting minor structural movement without damage.”

Building movement in a BluRoof is accommodated using the same detailing required for a conventional flat roof system; namely in the form of an expansion joint detail. There are 2 typical methods of forming this type of detail. The following drawings refer (and can be found in Appendix 1):

- HBR 02 05 – Twin kerb warm roof expansion joint detail



- HBR 02 06 – Proprietary (Redline) inverted roof expansion joint solution



4. Interface details

The Alumasc BluRoof system offers a truly single source solution, comprising the waterproofing, outlets, void formers and green roof layers. As such, Alumasc provides a number of standard drawings that detail typical interfaces; referenced as follows (and located in Appendix 1):

Warm Roof with green roof

HBR 01 01 – Drainage outlet
HBR 01 02 – Upstand to parapet
HBR 01 03 – Penetration
HBR 02 05 – Expansion joint (twin kerb)

Inverted Roof with green roof

HBR 02 01 – Drainage outlet
HBR 01 05 – Upstand to parapet
HBR 02 03 – Penetration
HBR 02 06 – Expansion joint (twin kerb)

Inverted Roof with podium

HBR 03 04 – Drainage outlet
HBR 03 07 – Upstand to parapet
HBR 04 02 – Penetration
HBR 04 07 – Expansion joint (twin kerb)

On a project-by-project basis, Alumasc provides a bespoke specification and any additional project-specific details.

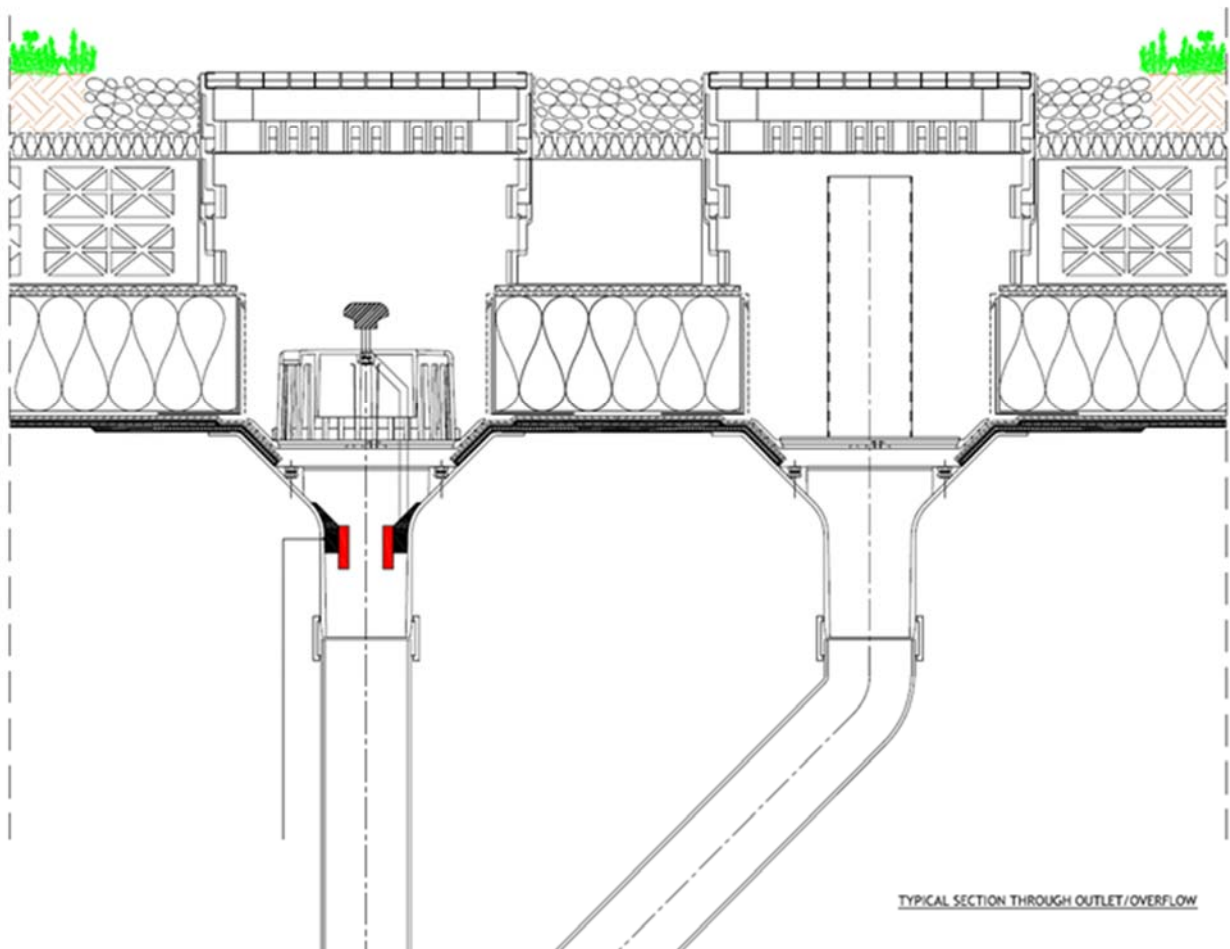
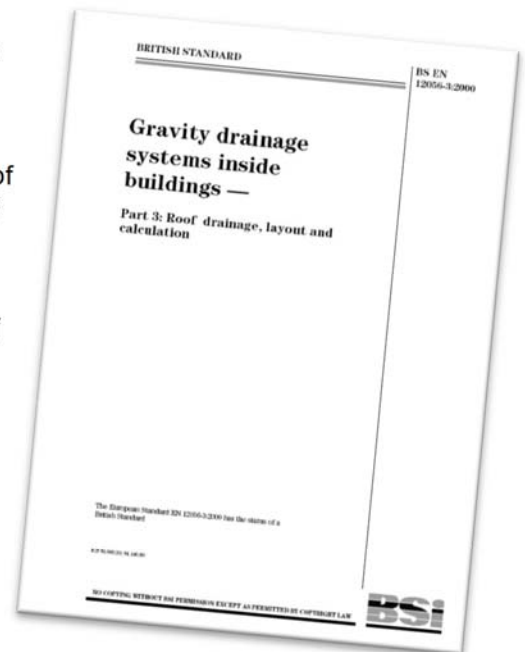


5. Overflow and level controls within the system

Each roof is designed to ensure that no overflow occurs for the prescribed design storm event. However, as a further precautionary measure, one Harmer weir overflow outlet is specified for each Harmer BluRoof outlet. In the event of a storm, or series of storm, that exceeds the design storm parameters, the overflow outlets will discharge stormwater in the same manner as a conventional flat roof (i.e. instantaneously). As such, overflows are designed to discharge stormwater that exceeds the BluRoof storage capacity in accordance with BS EN 12056-3:2000.

If applicable, and typically depending upon the operating function of the building (e.g. hospitals, data centres etc), further safety measures can be included through consideration of a doomsday scenario, i.e. the BluRoof outlet and overflow outlet cannot adequately drain the stormwater.

Additional chute overflows and designated surcharge paths are examples of such additional measures that can be considered at design stage.



6. Measures to control environmental effects of standing water

Stagnation, Pests & Vermin

BluRoof is a roof designed to alleviate flood risk by reducing and controlling the peak rate of discharge in compliance with design requirements; facilitating the detention of stormwater, up to a prescribed maximum hydraulic head, for subsequent discharge over an elongated period of time. The time for the design storm to discharge in its entirety is a key design consideration. In accordance with good SuDS practice, the BluRoof system should be entirely discharged within 48 hours.

The attenuated stormwater discharges at a controlled peak rate. However, discharge is continuous and water should therefore not be stagnant. In the event that stagnant water is observed, this would indicate that there is a blockage. The guidelines within the issued Operations and Maintenance Manual would mitigate the risk that this situation being perpetuated.

As the system is not designed to have stagnant water, the risk of pests or vermin is no greater than that which exists for a conventional flat roof.

Silting

Both of Alumasc's BluRoof waterproofing solutions are inherently resistant to acids, salt water, fertilisers and animal waste (see data sheet for details). Filtration layers within the BluRoof build-up mitigate the risk of silting. However, where localised silting does occur, routine periodic maintenance will ensure that this does not lead to blockages.

Freezing

The risk of freezing water on a BluRoof is lower than with a conventional flat roof. Firstly, a BluRoof is most typically specified as a buried system (i.e. below a green roof or podium). In this case, the additional thermal mass 'insulates' the underlying water. Secondly, the water is designed to discharge continuously. Kinetic energy of a moving mass further mitigates any risk of freezing. Thirdly, from a meteorological perspective, it would be atypical to simultaneously have a sizeable storm event and freezing temperatures.

However, in the extremely unlikely event of water freezing, such freezing would occur to the surface of the water body rather than the underside (i.e. the surface that is in contact with the waterproofing surface).

It is, however, pertinent to highlight that the BluRoof waterproofing solutions have excellent resistance to sub-zero temperatures:

- The BluRoof hot melt waterproofing system suffers no delamination, adhesion loss or cracking at -25 degrees Celsius (CGSB-37.50-M89).
- The BluRoof high performance membrane has excellent low temperature flexibility; suffering no cracking at -10 degrees Celsius after exposure to UV for 1,000 hours (MOAT No 30 : 1984 Special Directives for the Assessment of Reinforced Waterproof Coatings in Atactic Polypropylene (APP) Polymer Bitumen)

7. Maintenance

A Harmer BluRoof Operation & Maintenance Manual is provided as an integral part of the BluRoof system, as is an Alumasc induction meeting for the client; ensuring that the occupier/owner of the building is suitably aware of the pertinent issues and requirements.

Pre-Handover Checks:

- Provide the client with the full handover pack
- Brief the occupier's maintenance team on the BluRoof system
- Go through the O&M Manual with the building's occupier

Post-Handover Maintenance Actions:

- Regularly inspect waterproofing membrane for mechanical damage
- Periodic inspections & removal of debris or other items that represent blockage risks particularly in vicinity of the outlet
- After significant storm events, visually inspect the roof to confirm that the orifice of the outlet is not blocked
- Conduct any green roof maintenance in accordance with specification

8. Bespoke design detailing for each building

Alumasc tailors the design of the BluRoof system to suit the specific needs of each individual project. This includes:

- Detailed Alumasc BluRoof specification
- Project-specific drawings at interface details
- Stormwater calculations
- Regular site inspections
- Leak detection tests
- Single point warranty covering drainage and waterproofing

Alumasc BluRoof specification

A project-specific specification document is provided for each individual project, covering the roof waterproofing solution (including any specific detailing), outlets, detention layers and, where applicable, green roof systems.

Project-specific drawings

Where requirements exist for non-standard details, Alumasc Technical Services draft details that are bespoke to that requirement. Drawings are provided in AutoCAD or PDF format.

Stormwater Calculations

Calculations are provided for each roof area, accounting for both macro (i.e. location) and micro (i.e. roof area(s), load restrictions, height restrictions, Flood Risk Assessment requirements, etc) design requirements. See Appendix 2 for examples.

By adopting the Depth-Duration-Frequency model described in the Flood Estimation Handbook (FEH), it is possible to model the rainfall volume for different return periods (e.g. 1 in 30 years, 1 in 100 years) and distribute it temporally in accordance with different seasonal storm tendencies. Rainfall and runoff can then be modelled continuously and simultaneously to establish the runoff characteristics (e.g. maximum runoff rate, time delay, peak runoff rate reduction) and the volume and depth of water detained on the roof.

Site inspections

Every BluRoof project is installed only by Alumasc's BluRoof Registered Contractors and is allocated to a dedicated Alumasc Roofing site technician. The technician attends site at key "Hold" points of the installation to ensure that the system is installed in strict accordance with the project specification. Reports are completed and supplied to the contractor, highlighting any non-conformances and remedial actions, as well as forming part of the client's handover package.

This support service can be summarised as follows:

- **Only applied by Alumasc's BluRoof Registered Contractors.**
Ensures correct supervision and application by authorised contract managers and operatives.
- **A minimum of 2 Alumasc trained and carded Contracts Managers per BluRoof Registered Contractor.**
Ensures correct preparation, sequencing of works and warranty compliance.
- **A minimum of 2 Alumasc trained and carded BluRoof Operatives per gang of on site.**
Ensures consistent and correct application technique.
- **All carded BluRoof Operatives and Contracts Managers will have completed Alumasc training and will carry valid cards (i.e. within expiry date).**
Ensures continuity of each individual's BluRoof skills.

- **The BluRoof Registered Contractor must hold a copy of the relevant BluRoof project specification on site, available for reference by all parties.**
This ensures compliance and completeness.
- **Alumasc and the BluRoof Registered Contractor will attend a pre-start meeting. The Contractor will complete and supply a Project Information Form.**
This confirms availability of trained personnel, liaison with Alumasc, test providers and main contractors, proper sequencing and programming of works.
- **The BluRoof Registered Contractor will submit a (minimum) weekly site report to Alumasc, inclusive of photographs of works in progress.**
This confirms compliance of all working procedures and progress to date.
- **Alumasc will issue regular site reports to the client following inspection at all key stages of the project.**
This confirms compliance of all working procedures and progress to date.
- **The BluRoof Registered Contractor will hold (minimum) £1 million Professional Indemnity.**
This provides cover against the cost of any future remedial workmanship required.
- **All BluRoof Registered Contractors will be required to demonstrate creditworthiness in accordance with the size of BluRoof project concerned.**
This ensures project completion and satisfactory handover of project.

Leak detection tests

- **Waterproofing Integrity tests will be undertaken directly by Alumasc's specialists who will demonstrate a full understanding of the specialist integrity testing equipment and calibration and have appropriate levels of technical expertise.**
This ensures accurate and reliable test data is available for all waterproofed areas and eliminates the possibility of incomplete, inaccurate or misleading test reports. It also guards against test results being manipulated by the installing contractor and/or other third party.
- **Copies of the integrity test reports will be supplied with the Alumasc handover package (e.g. details of machine calibration, date of test, date passed and signed-off etc.).**
Possession of the reports gives the client complete confidence that all waterproofing has been successfully installed, fully tested and is free from leaks.
- **Alumasc will attend and sign-off all final integrity tests carried out.**
This ensures thorough and complete testing has taken place and that no areas have been omitted.
- **Integrity tests will be carried out on all horizontal and vertical surfaces.**
This ensures that no potential water entry pathways are missed.
- **All test equipment will be calibrated to take the waterproofing layer's characteristics into account.**
Failure to do this could result in actual damage to the waterproofing layer.

Single point warranty

The Alumasc BluRoof system is a fully warranted waterproofing and sustainable drainage solution. Comprehensive warranties provide reassurance to the building owner that the integrity of the solution provides optimum whole-life value.

9. Examination of technical risks and performance

Blue roofs are typically considered to be a new sustainable drainage measure. However, in practice, blue roofs have been adopted in the U.S.A. for over 50 years. Indeed, in New Jersey, blue roofs are the subject of a Senate Bill (# 52656), which:

“Requires certain state departments, divisions, commissions and authorities to consider use of green or blue roof in construction of certain new state buildings, facilities or structures.”

Alumasc has developed the BluRoof system with the benefit of its combined expertise associated with Harmer Engineered Drainage Systems and Alumasc Roofing Systems. As such, Alumasc is ideally positioned to offer a single-source solution that is integral to the management of the key risks and fulfilment of the objectives that are associated with a system of this kind. These key considerations are:

Loading

The structural considerations associated with a BluRoof have been extensively addressed in section (2) of this document. Briefly, however, the loadings imposed by a BluRoof are a function of the maximum prescribed stage; a design parameter that can be sized to suit the structural capacity of the underlying substrate as well as the hydrologic performance requirement. Typical loads imposed by BluRoofs will have small incremental requirements, relative to a conventional flat roof, and structural requirements are unlikely to differ significantly from a conventional flat roof.

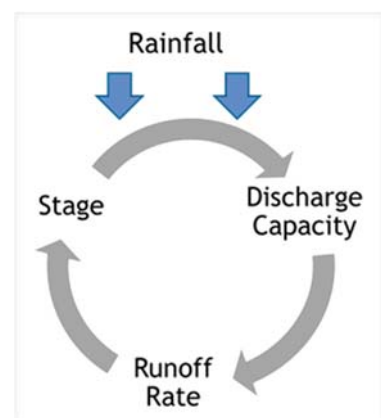
Surcharges

It is essential that any method employed for the sustainable detention of stormwater adopts a controlled approach and avoids neglecting important safety requirements. Firstly, the restriction of flow must be carefully estimated; establishing the peak rates of runoff and the associated depth (or stage) of water that forms on the roof surface. Secondly, the appropriate safety measures must be in place – from the provision of safety overflows (in the event of rainfall exceeding design storm criteria) to the adoption of a robust planned and preventative maintenance programme. And, thirdly, the roof’s waterproofing layer, and the detailing of it, is integral to the success of the BluRoof system; protecting the building against water ingress.

a) Unquantified/unknown performance

With Alumasc BluRoof system, time-series modelling is employed to predict the hydrologic response of the BluRoof system to any given design storm profile. 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.

As such, rainfall and runoff can be modelled simultaneously. Using the results of the tests conducted by an independent hydrological consultant, stage-discharge relationships were ascertained for different orifice sizes. The capacity of the BluRoof outlet therefore changes with hydraulic head, i.e. stage. As rainfall exceeds the capacity of the outlet, the stage (representing the detention effect) begins to increase. As rainfall becomes less than the discharge capacity, the stage starts to reduce as detained rainwater discharges in a controlled manner with the peak rate of runoff reduced and attenuated.



Examples of the time-series calculations are provided in Appendix 2.

b) Exceedance of design criteria

In the event that rainfall exceeds the design storm event used in the design of the BluRoof system, any surplus (i.e. over and above the maximum depth of the BluRoof detention capacity) will discharge through an overflow outlet instantaneously, as prescribed in BS EN 12056-3:2000. See section (5) for details.

c) Blockage

Maintenance requirements are stipulated to prevent the occurrence of a blockage. However, in the event that one outlet becomes blocked: (a) Alumasc's BluRoofs are always designed with more than one outlet per roof – meaning that the second outlet will be free from blockage; and (b) overflow outlets are also integrated within the system – ensuring that any surplus due to blockage is drained without detriment to the roof fabric.

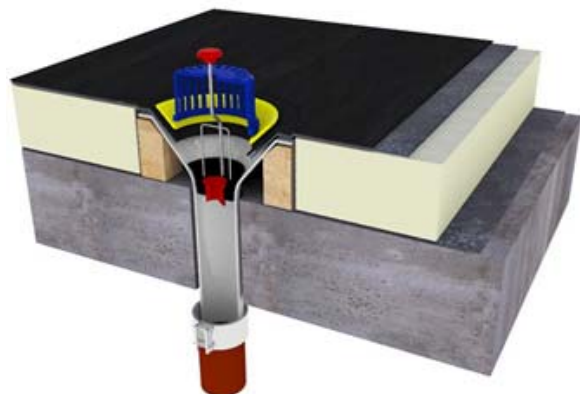
Leaks

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 tried and trusted systems, with yet further enhanced specifications and service levels.

Waterproofing of Warm Roofs

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.

- Alumasc's BluRoof High Performance Membrane has a 45 year track record of use, still using the original time-proven formulation from 1967; 40 years in the UK - more than any other modified bitumen product – with zero product failures on over 600 million square metres installed worldwide.
- Laps are sealed with a purposely developed 'Shoe-burner' torch and pressure-rolled. A visible bleed of bitumen is an indication that the lap is continuously sealed; whilst pressure rolling increases lap adhesion by more than 50%.
- APP (Atactic Polypropylene) polymer modification protects the membrane against ultra-violet degradation, which is one of the primary causes of ageing of bitumen membranes. SBS modified alternatives are not UV resistant and must be surfaced. This is not necessary with the BluRoof solution.
- The BluRoof membrane is dual glass/polyester reinforced. The glass fibre element of the product reflects heat and is resistant to shrinkage, whilst the polyester core provides high tensile strength and resistance to puncture.]
- The BluRoof Membrane has a high melt point ensuring stability of the membrane in the hottest weather. It has high tensile strength and its pliability ensures enhanced puncture resistance.
- The BluRoof Membrane has been cold bend tested to -20°C; showing that the membrane has excellent flexibility, which is of great benefit when carrying out detailing work.



Inverted & Podium Waterproofing

For inverted or 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.

- Alumasc's BluRoof Monolithic Membrane is a hot-applied, rubberised asphalt specially formulated from refined asphalts, synthetic rubber and inert clay filler for waterproofing and roofing applications. The BluRoof Monolithic Membrane is seamless, self-healing and bonds tenaciously to concrete surfaces. The product is the original hot melt and as such has an unsurpassed performance history.
- The BluRoof Monolithic Membrane is a thick, tough, flexible, self-healing membrane for use in waterproofing and roofing applications. Applied in a nominal 6mm thick assembly, this product has been successfully used worldwide by leading architects, developers, clients, main and installing contractors and engineers on all types of horizontal and vertical structures including plazas, car parks, planters, tunnels, bridges, foundation walls and roof areas...establishing an unbeatable 50 year track record.
- The membrane has been installed worldwide on over 186 million square metres on roof decks, plazas, vertical foundations, reflecting pools and other structures in over 45 countries.
- The BluRoof Monolithic Membrane solution is only sold to fully trained and registered contractors, to ensure quality of workmanship during installation. Each applicator must undergo a stringent training programme prior to obtaining registered status.
- An early strength of Hydrotech was its recognition by the architectural community to provide the ultimate moisture protection solution, particularly in concrete orientated buildings.
- Hydrotech MM6125 over the years has been copied, but the phrase "no known equal" still applies.

As highlighted in (8), Alumasc's BluRoof waterproofing solutions are installed by Registered Contractors that have sufficient trained operatives to ensure that the waterproofing is installed in accordance with the specification and manufacturer's requirements. Furthermore, the additional requirement for Alumasc to conduct the leak detection tests provides transparent evidence that attests to the integrity of the installed waterproofing system.



10. Investment in product development to minimise technical risk

The BluRoof system is a simple hydrological solution, based on the laws of physics and without any reliance on mechanical or electrical complications; very much replicating the approach that is adopted under conventional roof drainage solutions. Notwithstanding this, all risks must be considered and mitigated accordingly. The use of proven solutions for the 2 key elements of a BluRoof – namely the Alumasc waterproofing layer and the Harmer engineered drainage solution – is fundamental to Alumasc's approach. Technical support – at pre-construction, construction and post-construction stages – is equally integral to the successful implementation of the solution to achieve the intended performance objectives.

Outlet Performance - Independent technical assessment

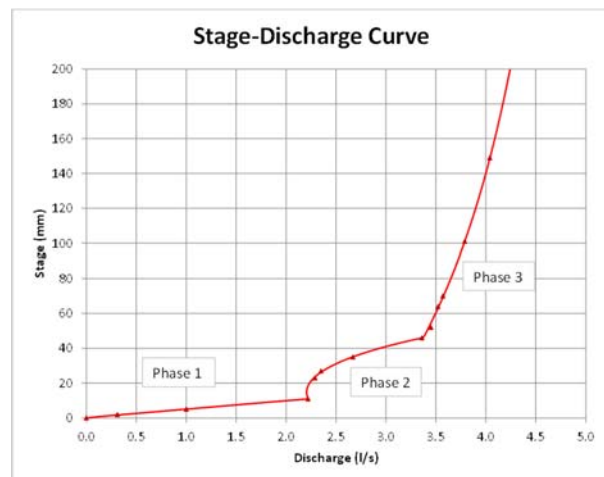
Alumasc engaged a leading independent hydrological consultant to test and evaluate the performance of the outlet at different prescribed hydraulic heads. The Harmer BluRoof Flow Restricting Device was extensively tested to establish flow rates through the device, when used in conjunction with the Harmer Roof Outlet.

These tests have identified the importance of the hydraulic head of water in determining the flow rate from the roof.

This relationship is integral to the hydrological model; allowing the discharge rates to be calculated as the depth of water builds up above the roof membrane.

When smaller BluRoof orifices were considered, the 3 phases of stage-discharge relationship were still evident:

- 1) Weir entry
- 2) Transition; and
- 3) Orifice-controlled

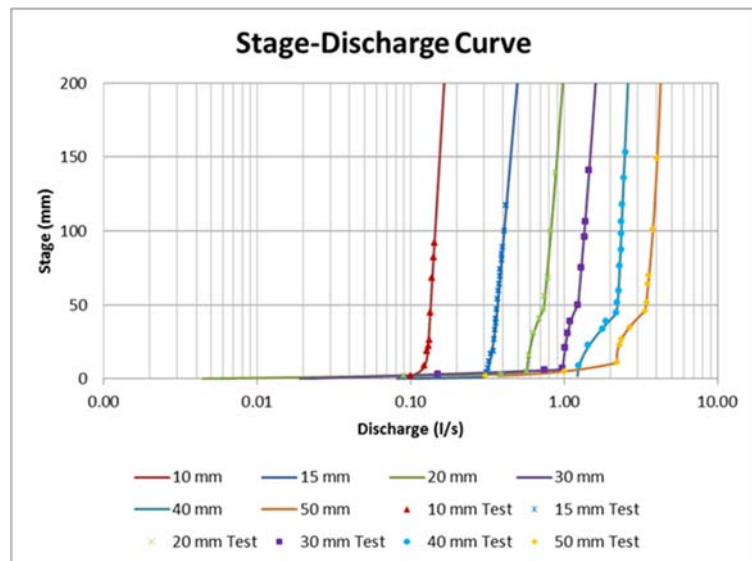


However, this relationship can no longer be calculated on the basis of the standard stage-orifice-discharge equation provided in BS EN 12056-3:2000:

$$Q = \frac{\phi^2 \times \text{stage}^{\text{index}}}{15000}$$

The smaller the orifice, the quicker the transition to the orifice-controlled phase. A series of data analyses were conducted to identify alternative equations that better match the observed test responses.

As a result, it was possible to fit curves to the test data in order to model the stage-discharge relationship for depths between 0 and 200 mm.



Whilst the component parts of the system are simplistic, Alumasc has invested heavily in the design, development and testing of its BluRoof system:

- **Shape of the Flow Restrictor Device**
The chamfered profile of the flow restriction device enhances the self-cleansing properties of the outlet; reducing the risk of blockage.
- **Range of Flow Restrictor Device sizes**
A range of orifice sizes were trialled to identify the discharge characteristics of each potential flow restrictor size in specific conjunction with the Harmer AV400 outlet.
- **Removable design of the Flow Restriction Device**
The restrictor can be removed from the outlet – using an integral handle – to allow maintenance to place and/or to adapt to any future change of use
- **Integral vent pipe & vent pipe protector as part of the flow restrictor**
The vent pipe ensures that the drainage system remains gravity-fed; facilitating air entry to avoid syphonic action.
- **Raised support of surface layers, such as a green roof or podium, with a 96% void**
Facilitates the detention of excess rainfall below, and without detriment to, the finished surface
- **Option to include a Blackdown Green Roof**
Elicits further ecological and/or amenity benefits, whilst supplementing the sustainable drainage performance of the roof. Additional detention capacity can be realised due to the time required for infiltration; whilst retention of rainfall within the green roof layers is of further benefit to stormwater management and the local microclimate.

Alumasc's ongoing investment in maintaining its team of Technical Surveyors to operate the training centre and conduct regular site surveys further demonstrates Alumasc's approach to risk management with BluRoofs; which is consistent with the risk averse nature of The Alumasc Group PLC in all of its operations.

Appendix 1

Warm Roof with green roof

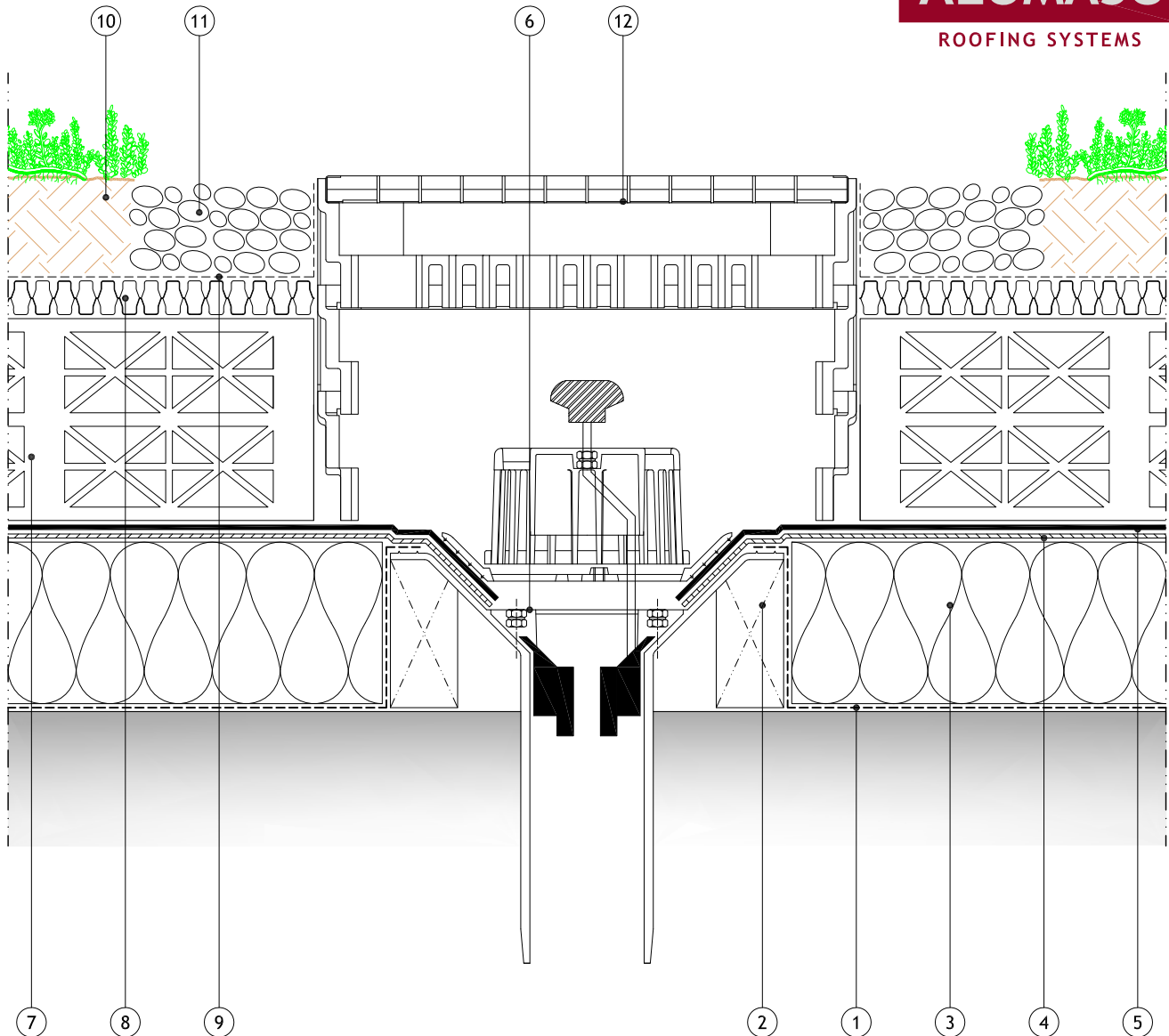
HBR 01 01 – Drainage outlet
HBR 01 02 – Upstand to parapet
HBR 01 03 – Penetration
HBR 02 05 – Expansion joint (twin kerb)

Inverted Roof with green roof

HBR 02 01 – Drainage outlet
HBR 01 05 – Upstand to parapet
HBR 02 03 – Penetration
HBR 02 06 – Expansion joint (twin kerb)

Inverted Roof with podium

HBR 03 04 – Drainage outlet
HBR 03 07 – Upstand to parapet
HBR 04 02 – Penetration
HBR 04 07 – Expansion joint (twin kerb)



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.

Notes:

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It may be necessary to modify this detail in whole or in part in accordance with specific project conditions, design or requirements.
2. Refer to the Alumasc project specification for product description and method of application.
3. Where applicable, any venting layer is not shown for clarity reasons.
4. Product data and safety data documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.

Title:

**BluRoof with Extensive Green Roof
Rainwater outlet with BluRoof Insert**

Drawing No:
HBR 01 01

Scale:
Not to Scale

Revision:
A

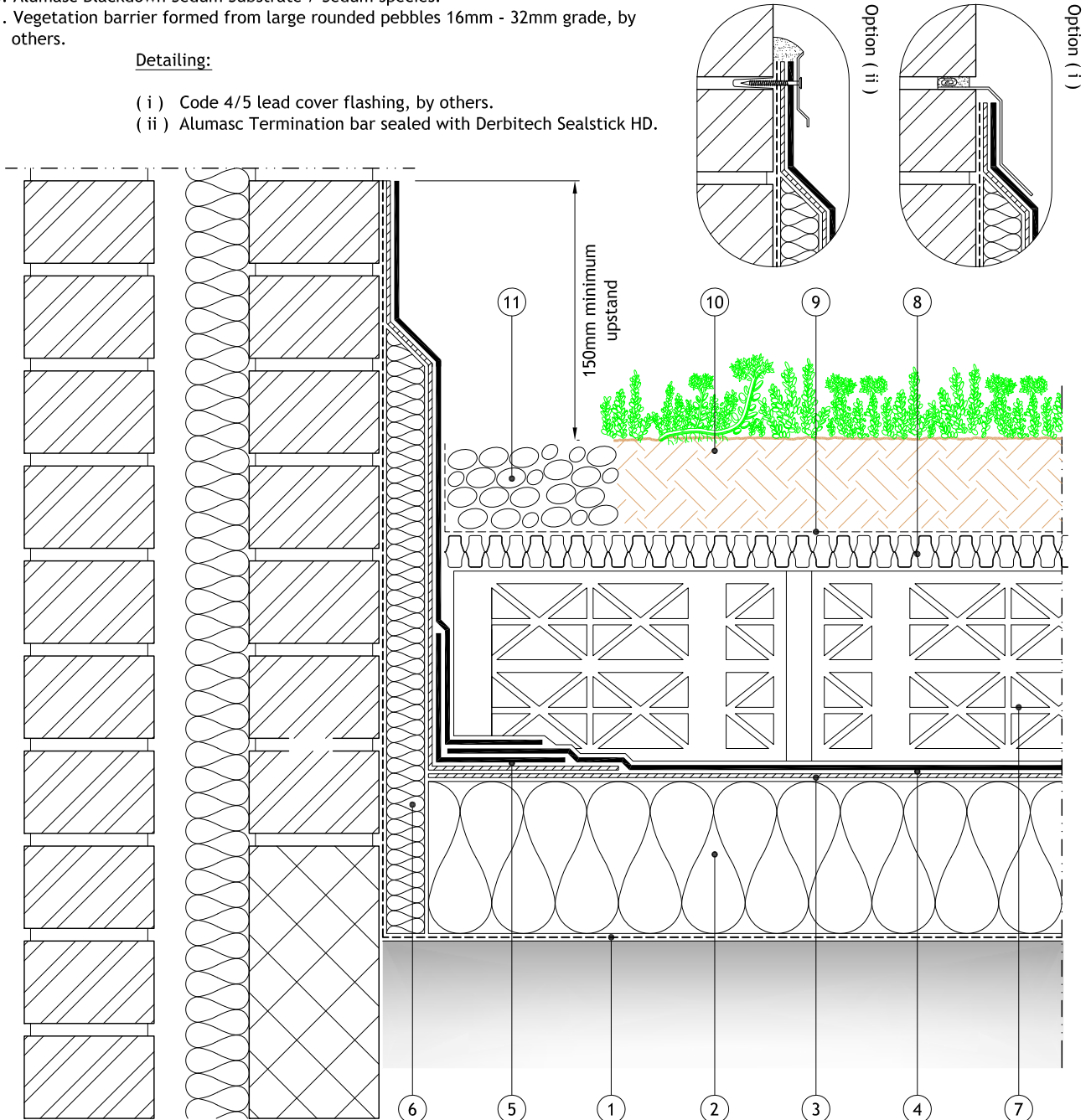
Date:
Nov 2013

Section Key:

1. Alumasc vapour control layer.
2. Alumasc thermal insulation, thickness determined to meet the U-value and dew point of the structure.
3. Alumasc underlay.
4. BluRoof cap sheet, fully bonded by gas torch.
5. Alumasc 100x100mm reinforcing strip into the angle, fully bonded by gas torch.
6. Alumasc thermal insulation to detailing, where applicable, to avoid a cold bridge as determined by the appointed design professional.
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.

Detailing:

- (i) Code 4/5 lead cover flashing, by others.
- (ii) Alumasc Termination bar sealed with Derbitech Sealstick HD.



Notes:

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 E-mail: roofing@alumasc-exteriors.co.uk

Title:

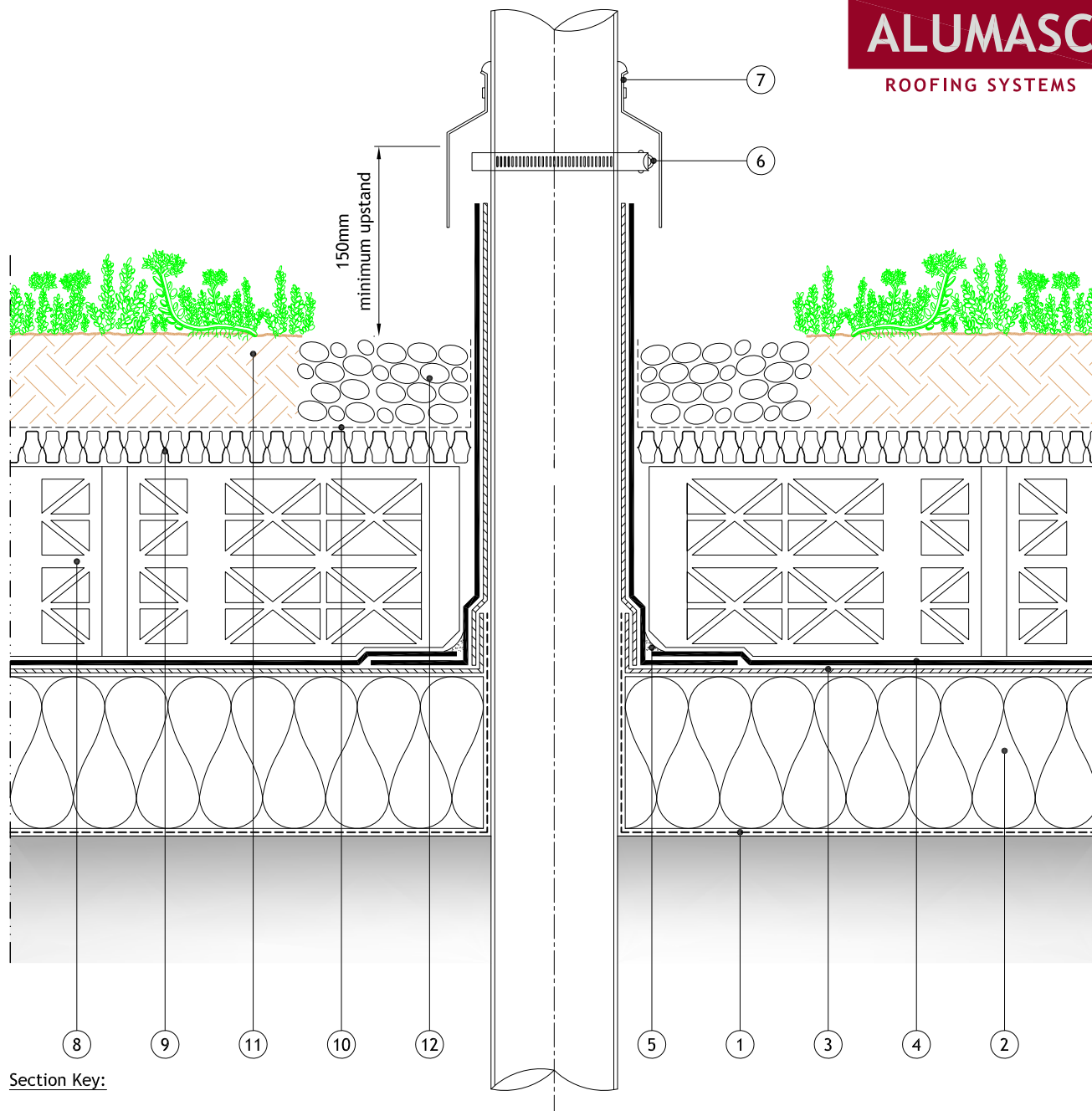
**BluRoof & Extensive Green Roof
 Brick abutment**

Drawing No:
 HBR 01 02

Scale:
 Not to Scale

Revision:
 A

Date:
 Nov 2013

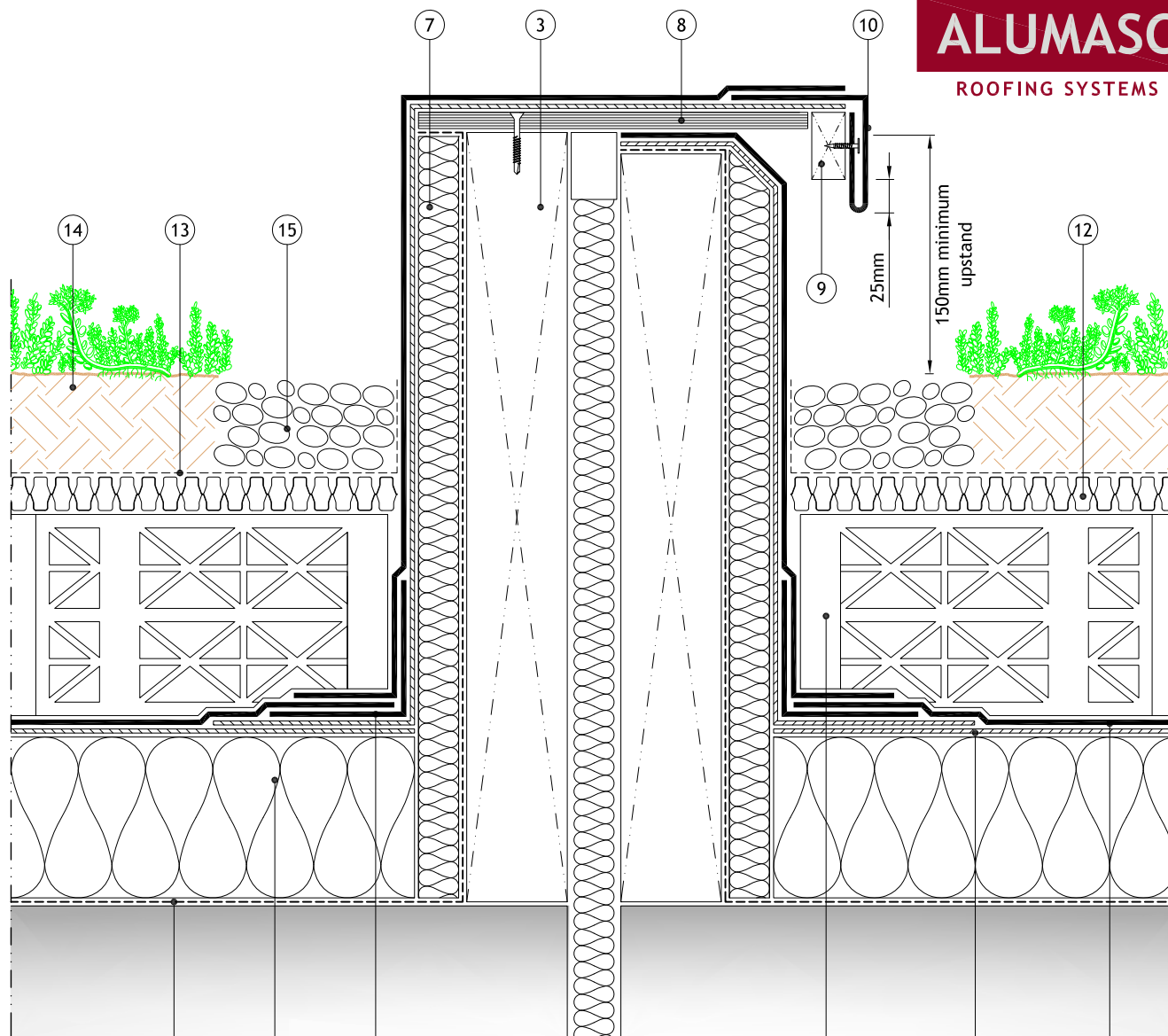


Section Key:

1. Alumasc vapour control layer.
2. Alumasc thermal insulation, thickness determined to meet the U-value and dew point of the structure.
3. Alumasc underlay.
4. BluRoof cap sheet, fully bonded by gas torch.
5. Alumasc Derbitech Sealstick HD mastic seal.
6. Stainless steel jubilee clip, by others.
7. Metal apron flashing, by others.
8. BluRoof Void Former.
9. Alumasc Blackdown 25 Drainage Layer.
10. Alumasc Blackdown Filter Sheet, loose laid over the drainage layer with 150mm unsealed laps.
11. Alumasc Blackdown Sedum Substrate / Sedum species.
12. Vegetation barrier formed from large rounded pebbles 16mm - 32mm grade, by others.

Notes:

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Section Key:

1. Alumasc vapour control layer.
2. Alumasc thermal insulation, thickness determined to meet the U-value and dew point of the structure.
3. Treated timber batten/s, by others.
4. Alumasc base layer/s.
5. Alumasc BluRoof High Performance Membrane, fully bonded by gas torch.
6. Alumasc 100x100mm reinforcing strip into the angle, fully bonded by gas torch.
7. Alumasc thermal insulation, requirement is to be determined by the appointed design professional.
8. Timber cavity bridge fixed to one side only, by others.
9. Treated timber batten approx. 50x25mm, by others.
10. Alumasc BluRoof High Performance Membrane to form welted drip detail.
11. BluRoof Void Former.
12. Alumasc Blackdown 25 Drainage Layer.
13. Alumasc Blackdown Filter Sheet, loose laid over the drainage layer with 150mm unsealed laps.
14. Alumasc Blackdown Sedum Substrate / Sedum species.
15. Vegetation barrier formed from large rounded pebbles 16mm - 32mm grade, by others.

Notes:

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2. Refer to the Alumasc project specification for product description and method of application.
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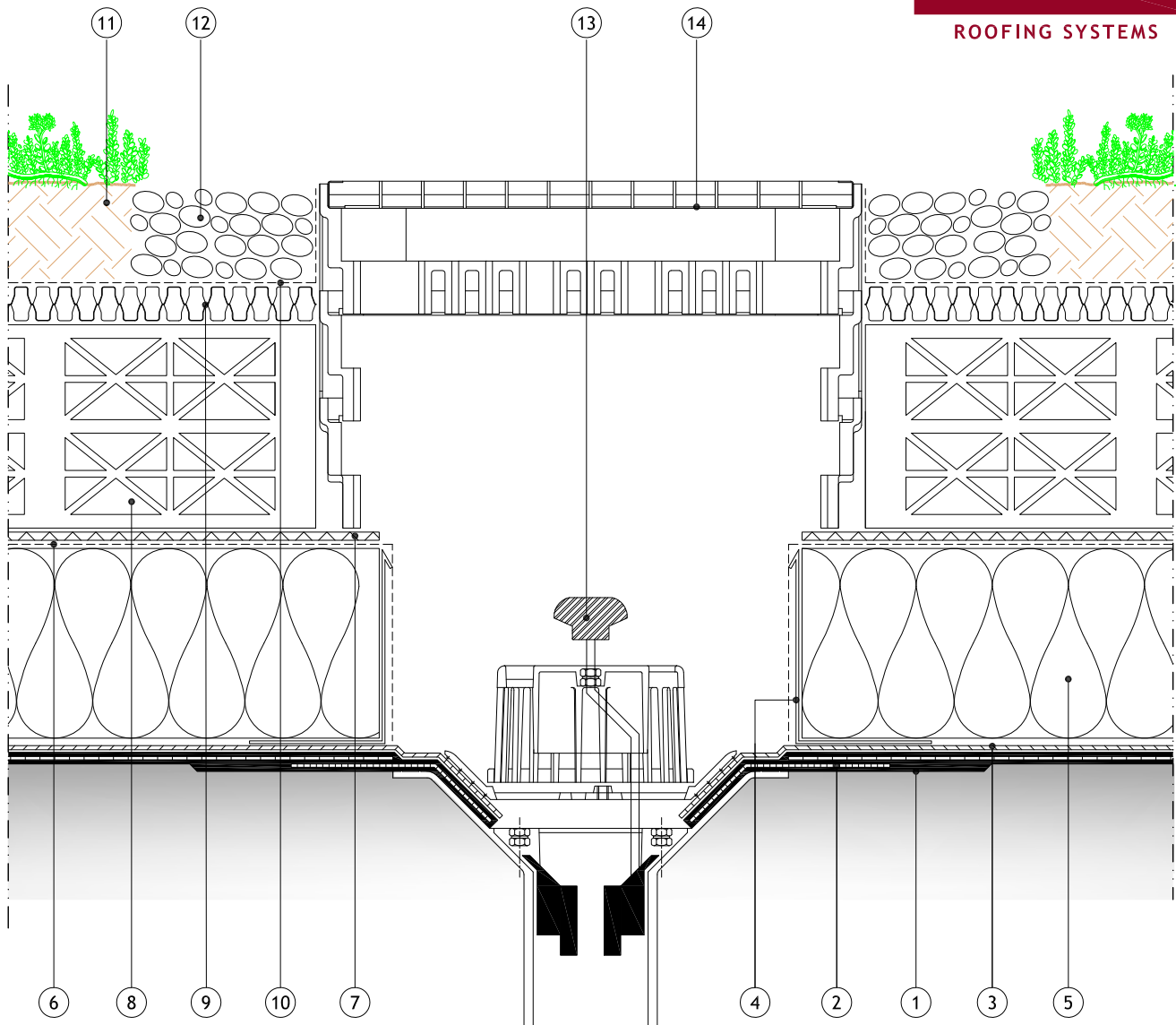
Title:
**BluRoof & Extensive Green Roof
 Twin kerb expansion joint**

Drawing No:
HBR 02 05

Revision:

Scale:
Not to Scale

Date:
Sept 2014



Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. FlexFlash UN uncured neoprene rubber reinforcement.
3. BluRoof protection sheet.
4. Alumasc BluRoof Aluminium Chamber.
5. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
6. Alumasc Polyethylene Separator Sheet.
7. Hydrodrain FC6 Drainage Layer.
8. BluRoof Void Former.
9. Alumasc Blackdown 25 Drainage Layer.
10. Alumasc Blackdown Filter Sheet, loose laid over the drainage layer with 150mm unsealed laps.
11. Alumasc Blackdown Sedum Substrate / Sedum species.
12. Vegetation barrier formed from large rounded pebbles 20mm - 40mm grade, by others.
13. Harmer AV outlet with Harmer BluRoof Insert, incorporating a clamping ring and domical grate.
14. Harmer Modulock Access Cover with Access Chamber Extension Pieces.

Notes:

1. This detail was prepared to serve as a guideline representing typical detailing conditions and illustrate the correct application of Alumasc products only. It may be necessary to modify this detail in whole or in part in accordance with specific project conditions, design or requirements.
2. Refer to the Alumasc project specification for product description and method of application.
3. Where applicable, any venting layer is not shown for clarity reasons.
4. Product data and safety data documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.

Title:

**BluRoof - Inverted Extensive Green Roof
Rainwater outlet with BluRoof Insert**

Drawing No:
HBR 02 01

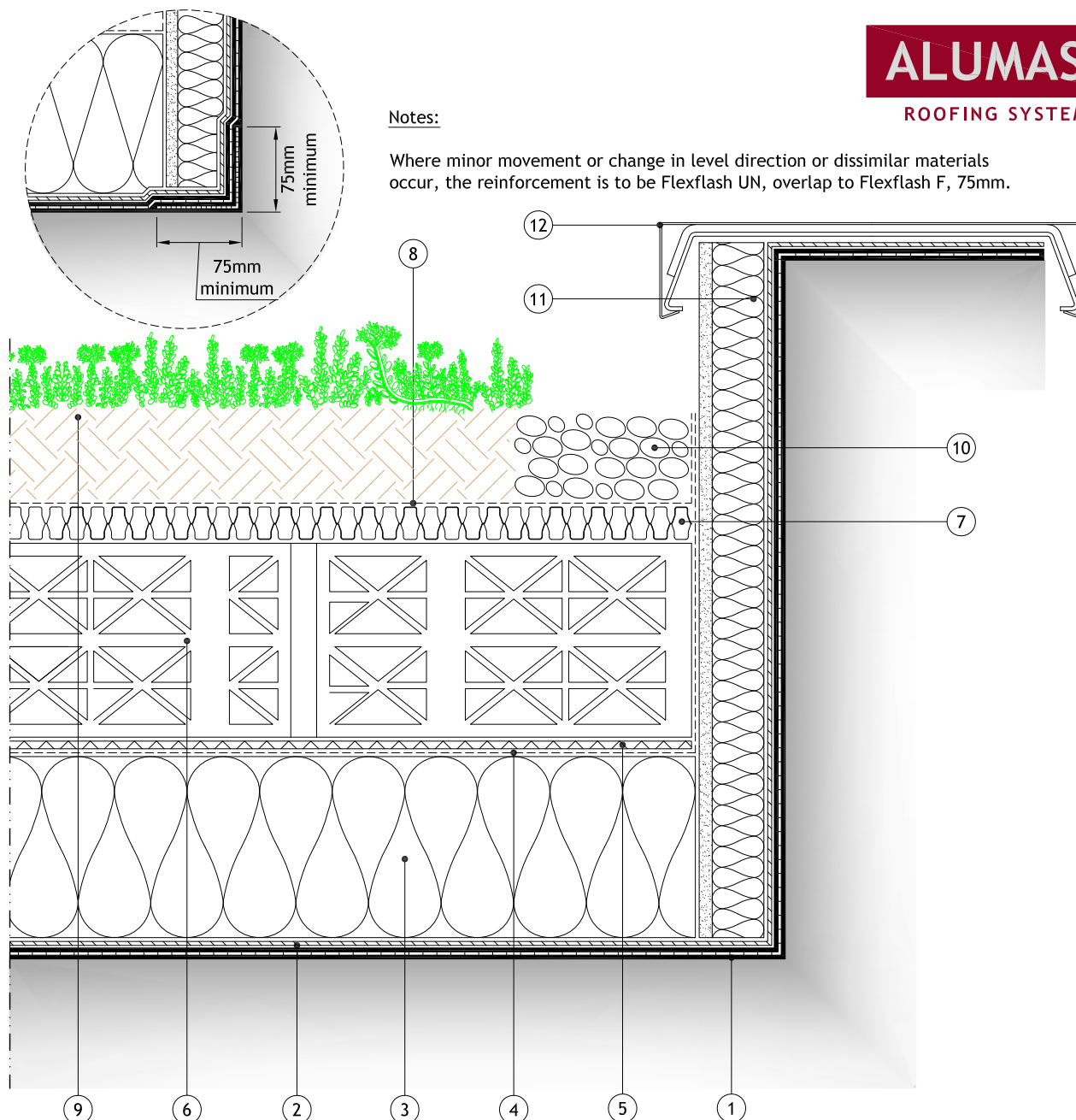
Scale:
Not to Scale

Revision:
Sept 2014

Date:

Notes:

Where minor movement or change in level direction or dissimilar materials occur, the reinforcement is to be Flexflash UN, overlap to Flexflash F, 75mm.



Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. BluRoof protection sheet.
3. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
4. Alumasc Polyethylene Separator Sheet.
5. Hydrodrain FC6 drainage layer.
6. BluRoof Void Former.
7. Alumasc Blackdown 25 Drainage Layer.
8. Alumasc Blackdown Filter Sheet, loose laid over the drainage layer with 150mm unsealed laps.
9. Alumasc Blackdown Sedum Substrate / Sedum species.
10. Vegetation barrier formed from large rounded pebbles 20mm - 40mm grade, by others.
11. Alumasc Extruded Polystyrene Upstand Board to detailing, where applicable, to avoid a cold bridge.
12. Alumasc non-penetrating coping system (Product Ref: Skyline coping shown), installed in accordance with Alumasc fixing instructions.

Notes:

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2. Refer to the Alumasc project specification for product description and method of application.
3. Product data and COSHH documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.

Title:

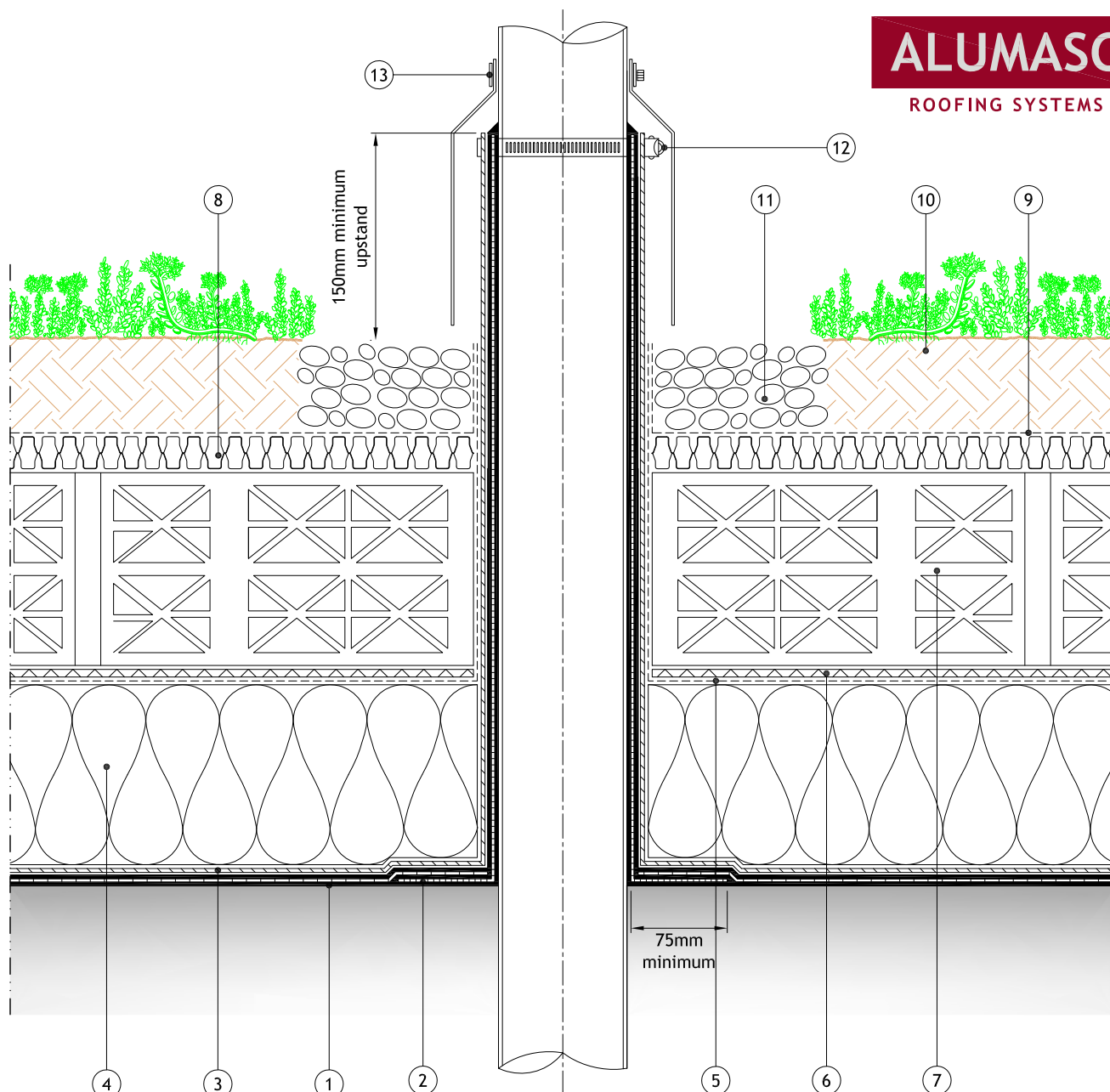
**BluRoof - Inverted Extensive Green Roof
Abutment with aluminium coping**

Drawing No:
HBR 01 05

Scale:
Not to Scale

Revision:

Date:
Sept 2014



Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. FlexFlash UN uncured neoprene rubber reinforcement.
3. Hydrogard protection sheet.
4. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
5. Alumasc Polyethylene Separator Sheet.
6. Hydrodrain FC6 drainage layer.
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 20mm - 40mm grade, by others.
12. Stainless steel jubilee clip, by others.
13. Weather collar secured to pipe, by others.

Notes:

1. This detail was prepared to serve as a guideline representing typical detailing conditions and illustrate the correct application of Alumasc products only. It may be necessary to modify this detail in whole or in part in accordance with specific project conditions, design or requirements.
2. Refer to the Alumasc project specification for product description and method of application.
3. Product data and COSHH documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.

Title:

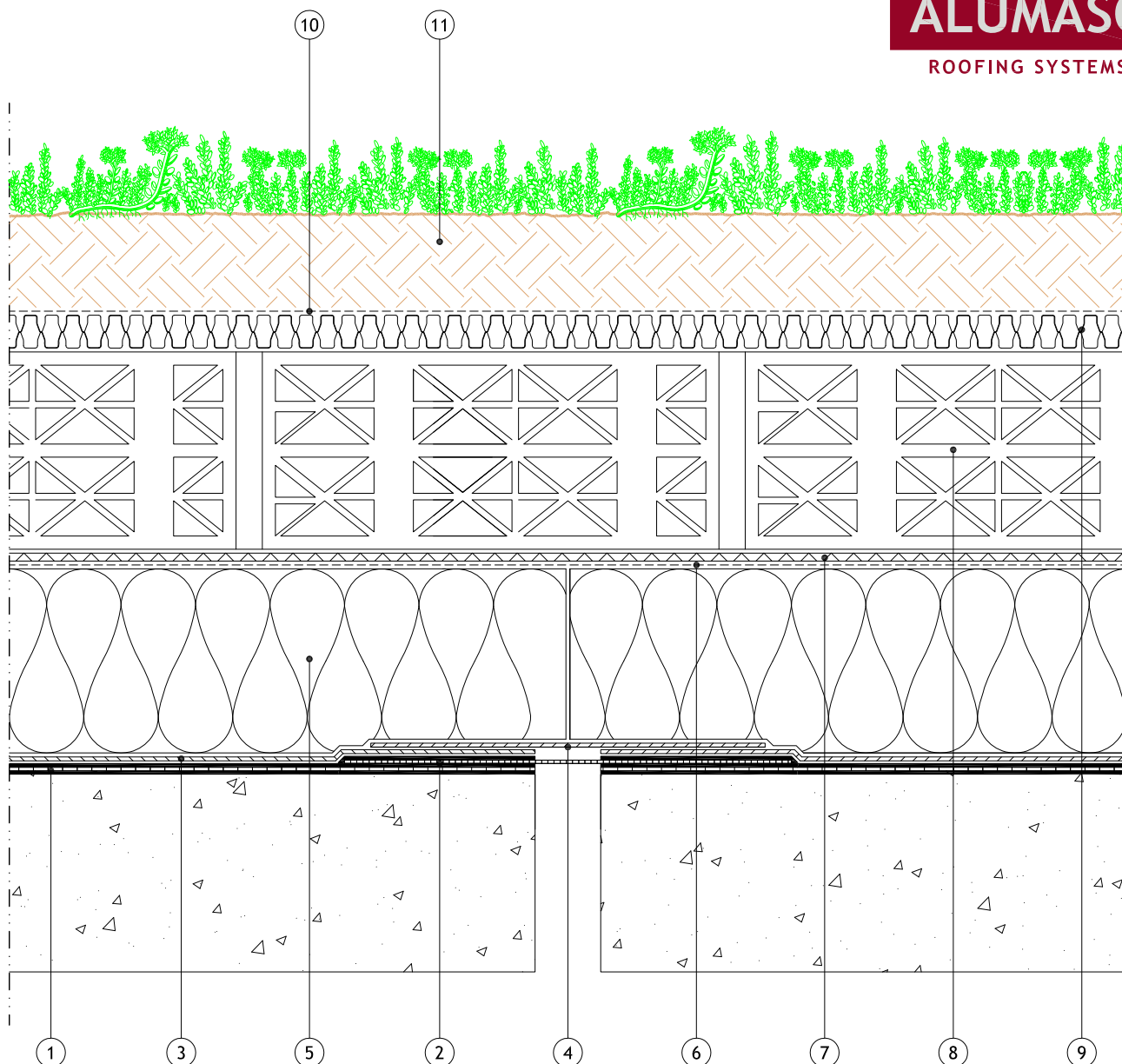
**BluRoof - Inverted Extensive Green Roof
Skirting to cold pipe penetration**

Drawing No:
HBR 02 03

Revision:

Scale:
Not to Scale

Date:
Sept 2014



Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. RoofPro RedLINE Expansion Joint.
3. BluRoof protection sheet.
4. BluRoof protection sheet flashing, torch bonded on one side of the expansion joint only.
5. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
6. Alumasc Polyethylene Separator Sheet.
7. Hydrodrain FC6 drainage layer.
8. BluRoof Void Former.
9. Alumasc Blackdown 25 Drainage Layer.
10. Alumasc Blackdown Filter Sheet, loose laid over the drainage layer with 150mm unsealed laps.
11. Alumasc Blackdown Sedum Substrate / Sedum species.

Notes:

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2. Refer to the Alumasc project specification for product description and method of application.
3. Product data and COSHH documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.



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 E-mail: roofing@alumasc-exteriors.co.uk

Title:

**BluRoof - Inverted Extensive Green Roof
 RedLINE Expansion Joint**

Drawing No:

HBR 02 06

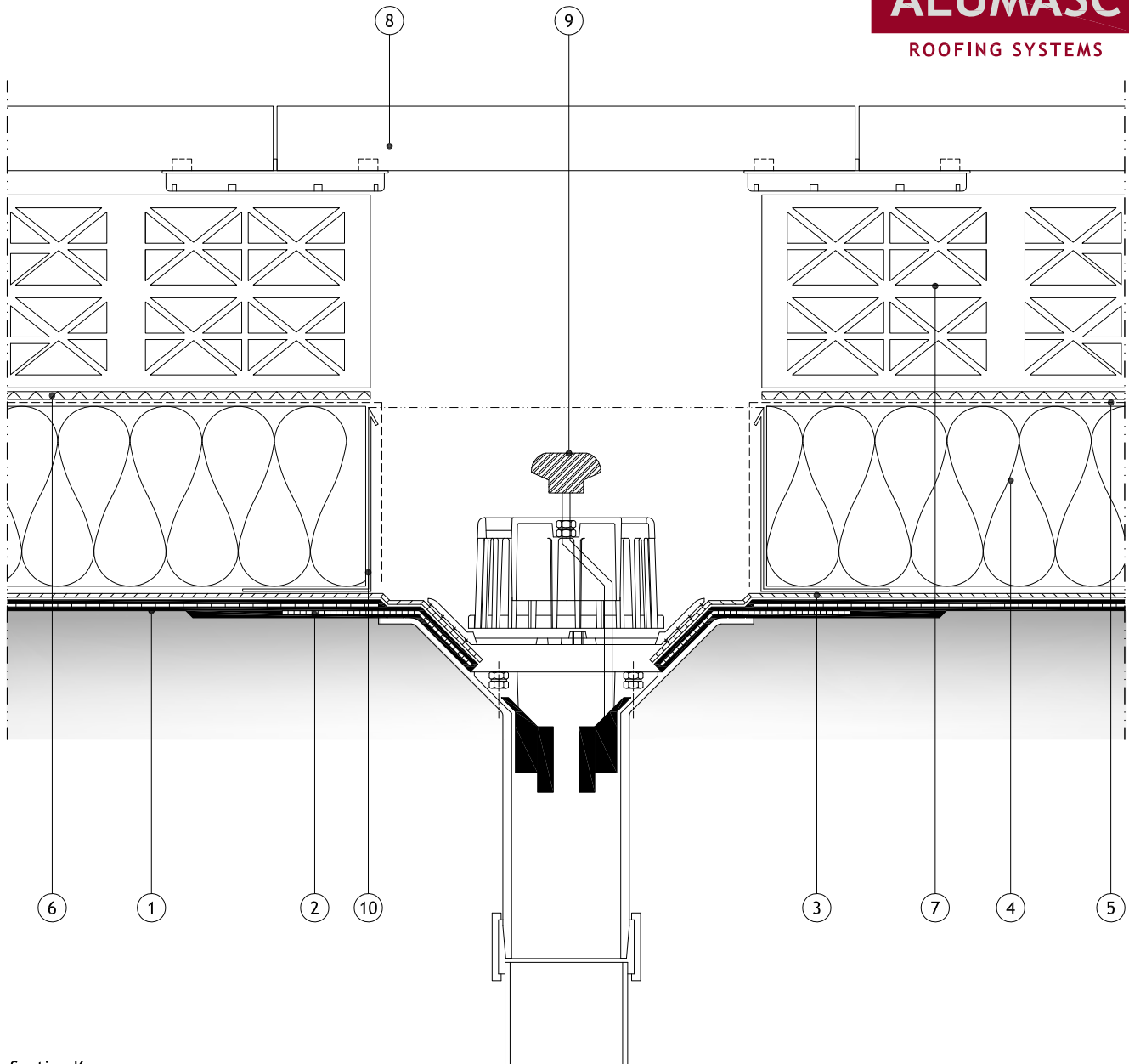
Scale:

Not to Scale

Revision:

Date:

Sept 2014



Section Key:

1. AlumasC BluRoof Hot Melt Waterproofing.
2. FlexFlash UN uncured neoprene rubber reinforcement.
3. BluRoof protection sheet.
4. AlumasC Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure
5. AlumasC Polyethylene Separator Sheet.
6. Hydrodrain FC6 drainage layer.
7. BluRoof Void Former.
8. Precast concrete paving slabs, by others, seated on Harmer Uni-Ring flat roof paving supports.
9. Harmer AV outlet with Harmer BluRoof Insert, incorporating a clamping ring and domical grate.
10. AlumasC BluRoof Aluminium Chamber.

Notes:

1. This detail was prepared to serve as a guideline representing typical detailing conditions and illustrate the correct application of AlumasC products only. It may be necessary to modify this detail in whole or in part in accordance with specific project conditions, design or requirements.
2. Refer to the AlumasC project specification for product description and method of application.
3. Where applicable, any venting layer is not shown for clarity reasons.
4. Product data and safety data documents are available for download from <http://www.alumascroofing.co.uk> for all relevant AlumasC products.

Title:

**BluRoof - Inverted Roof
Rainwater outlet with BluRoof Insert**

Drawing No:
HBR 03 04

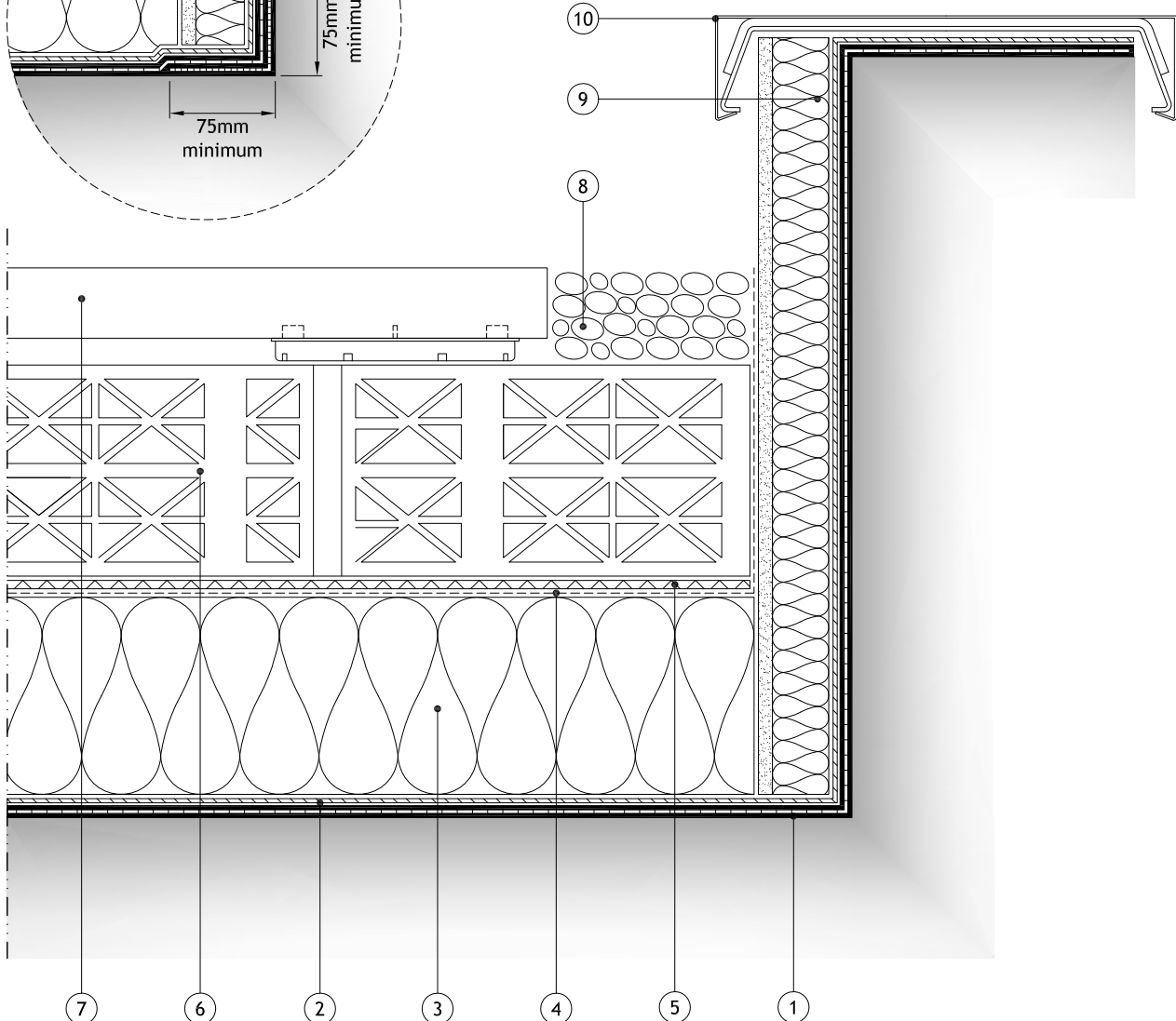
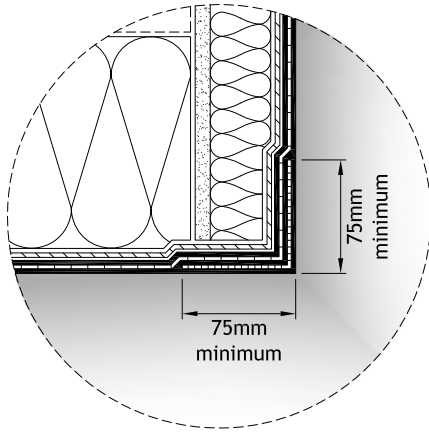
Scale:
Not to Scale

Revision:
Rev 1

Date:
Sept 2014

Notes:

Where minor movement or change in level direction or dissimilar materials occur, the reinforcement is to be Flexflash UN, overlap to Flexflash F, 75mm.



Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. BluRoof protection sheet.
3. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
4. Alumasc Polyethylene Separator Sheet.
5. Hydrodrain FC6 drainage layer.
6. BluRoof Void Former.
7. Precast concrete paving slabs, by others, seated on Harmer flat roof paving supports (Product Ref: Uni-Ring shown).
8. Large rounded pebbles 20-40mm grade, by others.
9. Alumasc Extruded Polystyrene Upstand Board to detailing, where applicable, to avoid a cold bridge as determined by the appointed design professional.
10. Alumasc non-penetrating coping system (Product Ref: Skyline coping shown), installed in accordance with Alumasc fixing instructions.

Notes:

1. This detail was prepared to serve as a guideline representing typical detailing conditions and illustrate the correct application of Alumasc products only. It may be necessary to modify this detail in whole or in part in accordance with specific project conditions, design or requirements.
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3. Product data and COSHH documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.

Title:

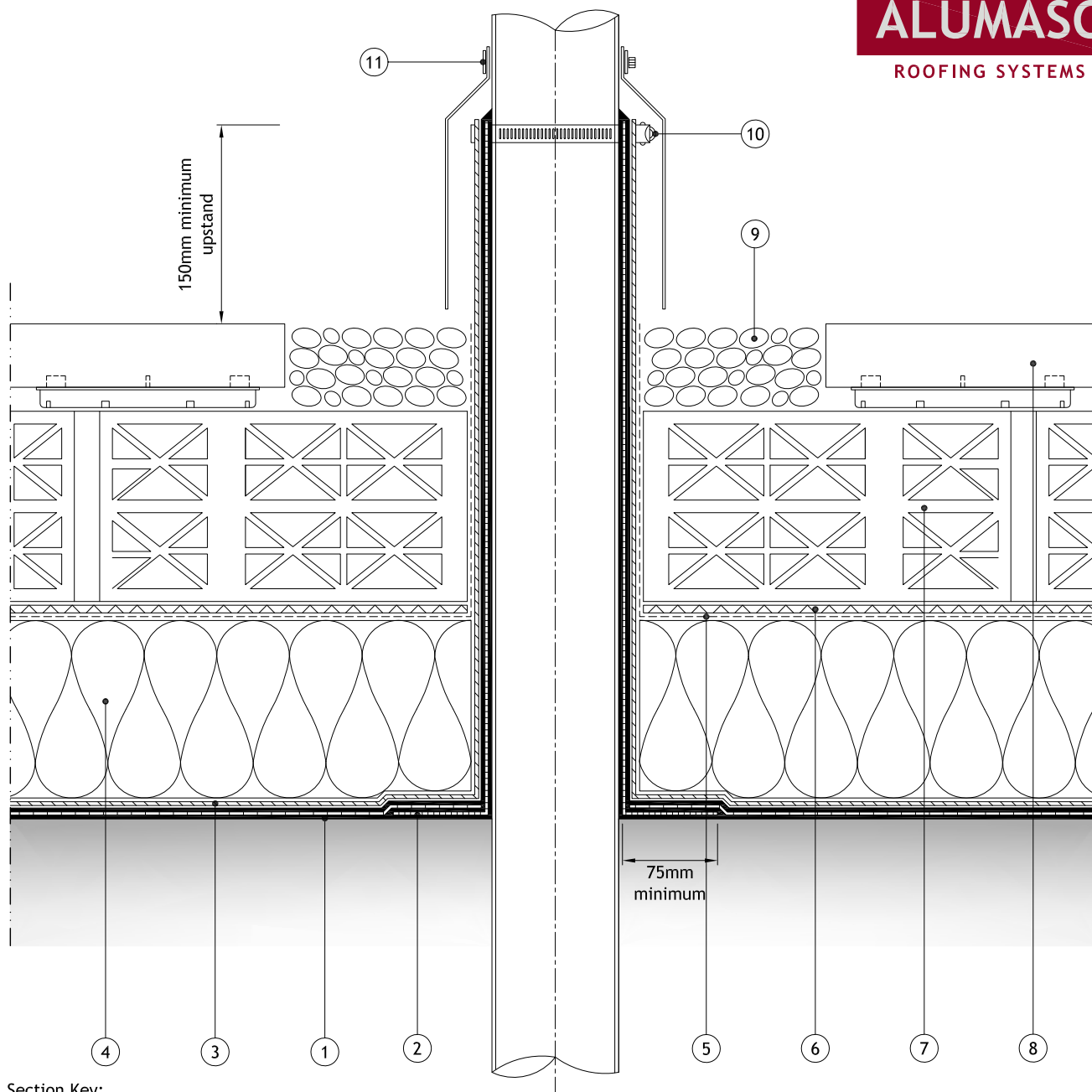
**BluRoof - Inverted Roof
Abutment with aluminium coping**

Drawing No:
HBR 03 07

Revision:

Scale:
Not to Scale

Date:
Sept 2014

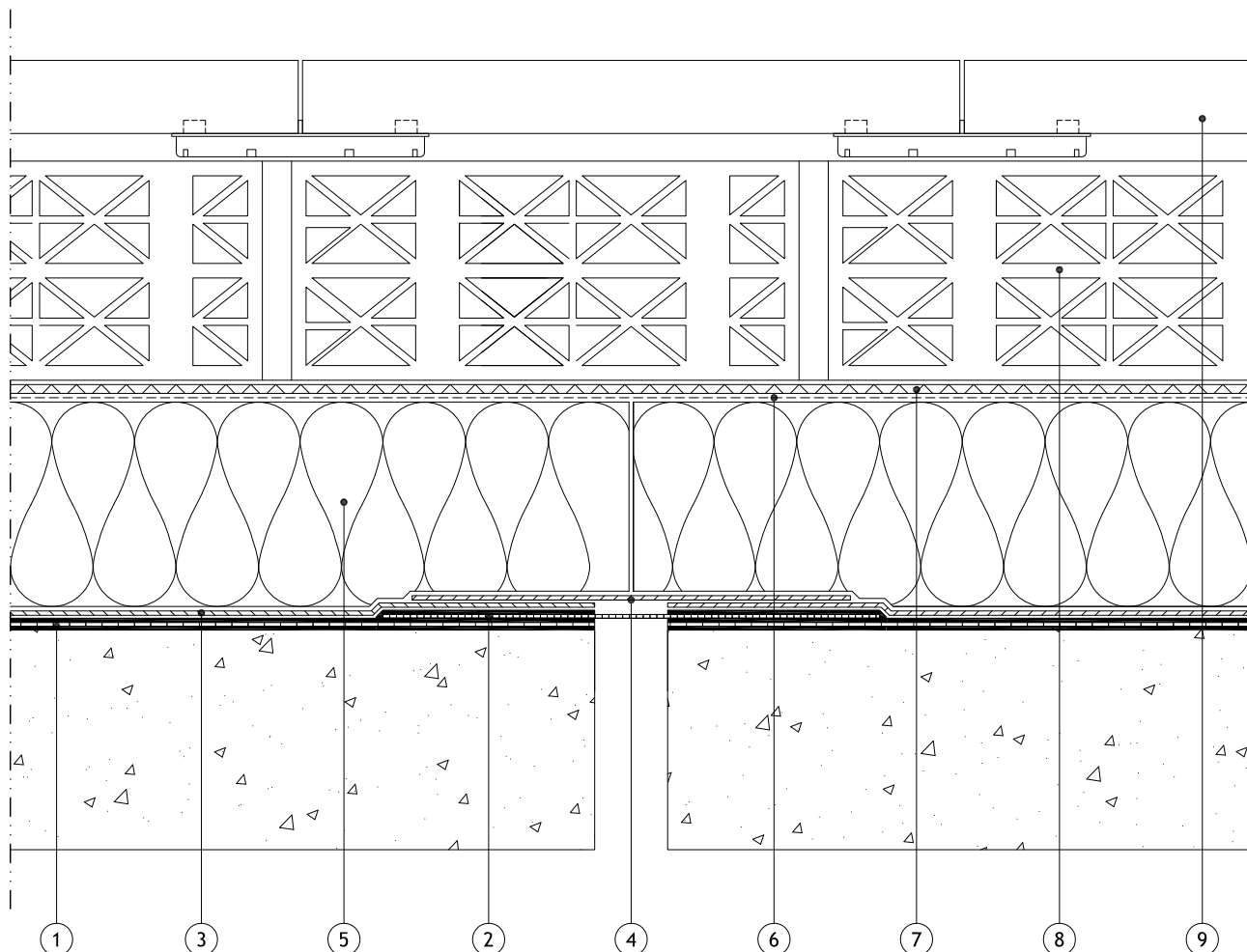


Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. FlexFlash UN uncured neoprene rubber reinforcement.
3. Hydrogard protection sheet.
4. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
5. Alumasc Polyethylene Separator Sheet.
6. Hydrodrain FC6 drainage layer.
7. BluRoof Void Former.
8. Precast concrete paving slabs, by others, seated on Harmer flat roof paving supports (Product Ref: Uni-Ring shown).
9. Large rounded pebbles 20-40mm grade, by others.
10. Stainless steel jubilee clip, by others.
11. Weather collar secured to pipe, by others.

Notes:

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2. Refer to the Alumasc project specification for product description and method of application.
3. Product data and COSHH documents are available for download from <http://www.alumascroofing.co.uk> for all relevant Alumasc products.



Section Key:

1. Alumasc BluRoof Hot Melt Waterproofing.
2. RoofPro RedLINE Expansion Joint.
3. BluRoof protection sheet.
4. BluRoof protection sheet flashing, torch bonded on one side of the expansion joint only.
5. Alumasc Extruded Polystyrene thermal insulation, thickness determined to meet the U-value and dew point of the structure.
6. Alumasc Polyethylene Separator Sheet.
7. Hydrodrain FC6 drainage layer.
8. BluRoof Void Former.
9. Precast concrete paving slabs, by others, seated on Harmer flat roof paving supports (Product Ref: Uni-Ring shown).

Notes:

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 E-mail: roofing@alumasc-exteriors.co.uk

Title:

**BluRoof - Inverted Roof
 RedLINE Expansion Joint**

Drawing No:
HBR 04 07

Revision:

Scale:
Not to Scale

Date:
Sept 2014

Appendix 2

Example Stormwater Calculations

- 100 Year Return Period; 6 hour duration; 30% climate change factor. Summer profile; 500 m²
- 100 Year Return Period; 6 hour duration; 30% climate change factor. Winter profile; 500 m²
- 30 Year Return Period; 6 hour duration; 30% climate change factor. Summer profile; 500 m²
- 30 Year Return Period; 6 hour duration; 30% climate change factor. Winter profile; 500 m²

Blue Roof Calculation

Ref: EXAMPLE-BRC1

Project Details

Location:	London	Outlet Type:	Harmer BR15
Drainage Area:	500 m ²	No. Of Outlets:	2 no.
Blue Roof Area:	500 m ²	Max. Upstand:	120 mm

Design Storm Inputs

Return Period:	100 years	Intensity Profile:	50% Summer
Duration:	6 hours	Climate Change Factor:	30%

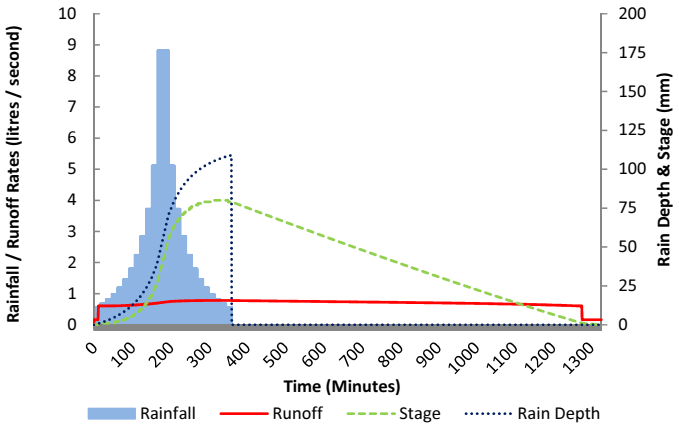
Design Storm Characteristics

Rainfall Depth:	109.04 mm	Peak Rainfall Intensity:	0.018 l/s/m ²
Peak Rainfall Rate:	8.82 l/s		

Blue Roof Response

Peak Runoff Rate:	0.78 l/s	Peak Runoff Reduction:	91.13%
Attenuation Time:	16 hours	Max. Stage:	80 mm
Detention Volume:	40 m ³	Overflow Volume:	0 m ³

Blue Roof



Blue Roof Calculation

Ref: EXAMPLE-BRC2

Project Details

Location:	London	Outlet Type:	Harmer BR15
Drainage Area:	500 m ²	No. Of Outlets:	2 no.
Blue Roof Area:	500 m ²	Max. Upstand:	120 mm

Design Storm Inputs

Return Period:	100 years	Intensity Profile:	75% Winter
Duration:	6 hours	Climate Change Factor:	30%

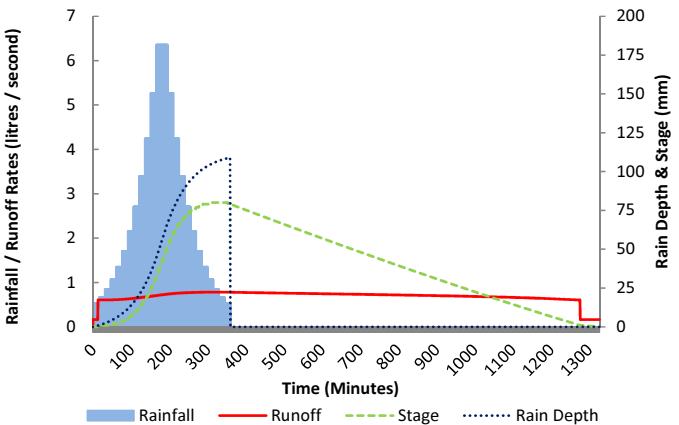
Design Storm Characteristics

Rainfall Depth:	109.04 mm	Peak Rainfall Intensity:	0.013 l/s/m ²
Peak Rainfall Rate:	6.36 l/s		

Blue Roof Response

Peak Runoff Rate:	0.78 l/s	Peak Runoff Reduction:	87.70%
Attenuation Time:	16 hours	Max. Stage:	80 mm
Detention Volume:	40 m ³	Overflow Volume:	0 m ³

Blue Roof



Blue Roof Calculation

Ref: EXAMPLE-BRC3

Project Details

Location:	London	Outlet Type:	Harmer BR15
Drainage Area:	500 m ²	No. Of Outlets:	2 no.
Blue Roof Area:	500 m ²	Max. Upstand:	120 mm

Design Storm Inputs

Return Period:	30 years	Intensity Profile:	50% Summer
Duration:	6 hours	Climate Change Factor:	30%

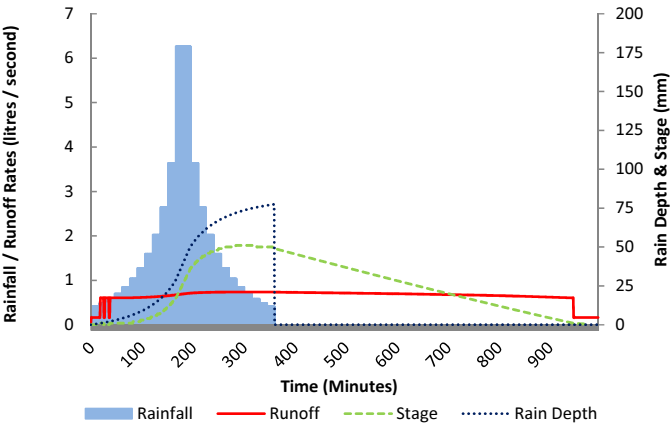
Design Storm Characteristics

Rainfall Depth:	77.44 mm	Peak Rainfall Intensity:	0.013 l/s/m ²
Peak Rainfall Rate:	6.26 l/s		

Blue Roof Response

Peak Runoff Rate:	0.74 l/s	Peak Runoff Reduction:	88.22%
Attenuation Time:	11 hours	Max. Stage:	51 mm
Detention Volume:	25 m ³	Overflow Volume:	0 m ³

Blue Roof



Blue Roof Calculation

Ref: EXAMPLE-BRC4

Project Details

Location:	London	Outlet Type:	Harmer BR15
Drainage Area:	500 m ²	No. Of Outlets:	2 no.
Blue Roof Area:	500 m ²	Max. Upstand:	120 mm

Design Storm Inputs

Return Period:	30 years	Intensity Profile:	75% Winter
Duration:	6 hours	Climate Change Factor:	30%

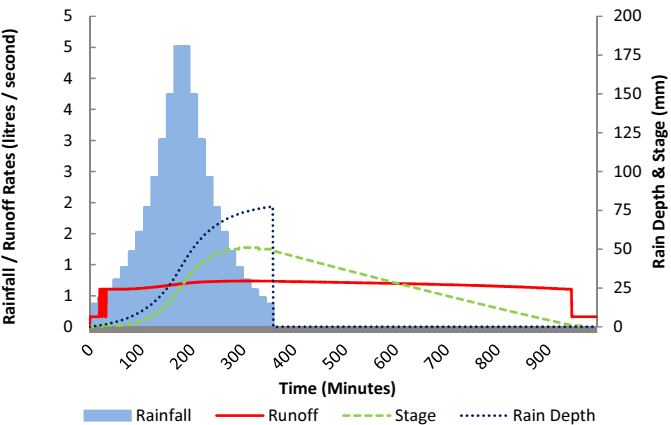
Design Storm Characteristics

Rainfall Depth:	77.44 mm	Peak Rainfall Intensity:	0.009 l/s/m ²
Peak Rainfall Rate:	4.52 l/s		

Blue Roof Response

Peak Runoff Rate:	0.74 l/s	Peak Runoff Reduction:	83.66%
Attenuation Time:	11 hours	Max. Stage:	51 mm
Detention Volume:	25 m ³	Overflow Volume:	0 m ³

Blue Roof



Alumasc Case Study

Priory Road Lecture Theatre, Bristol

ALUMASC
ROOFING SYSTEMS

As part of a three-year growth plan, The University of Bristol commissioned the construction of a brand new 450 seat lecture theatre for its Faculty of Social Sciences & Law. It was a planning stipulation that there should be no increase in the amount of excess water discharged into the existing drain infrastructure, therefore a Blue Roof solution, combined with a Bio-Diverse Green Roof was specified to meet this condition.

Alumasc developed a BluRoof specification to provide the stormwater attenuation performance required to obtain planning approval from a drainage perspective. The solution was also able to ensure that the attenuation measures were not visible; being concealed by a bio-diverse green roof, designed, supplied and installed by Blackdown.

Alumasc's BluRoof Stormwater Management System comprised a BluRoof bituminous waterproofing membrane, Harmer BluRoof outlet and stormwater attenuation crates; finished with a Blackdown Bio-Diverse Green Roof. The project is unique, being the first Alumasc BluRoof system that has been installed in the UK.

Dr Andrew Clay of WSP Group points out:

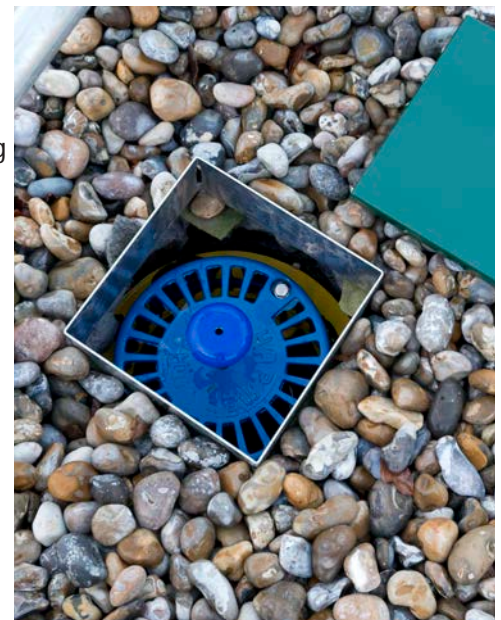
"This is an effective, although little-used solution for stormwater management, with this being the first blue roof in the South West of England. Without the blue roof solution, the proposed development was unlikely to be viable."

The waterproofing is a critical element of a successful BluRoof. The high performance, dual-reinforced waterproofing membrane had to be installed with extended and pressure-rolled lap joints. In addition, avoiding a mineral finish removed the likelihood of mineral loss leading to blockage of the BluRoof outlet.

The fact that Alumasc was able to offer a single source waterproofing, drainage and green roof solution was integral to the design of the BluRoof system, as was its installation by Alumasc Registered Contractor, M&J Flat Roofing Ltd.

Speaking about the project, M&J's Steve Roche, said:

"This was the first ever installation of the Alumasc BluRoof System in the UK and we were pleased to have been able to carry out this pioneering project. The fitting of both the waterproofing and the green roof element went very smoothly, and we were provided with full technical support from Alumasc through every step of the project."



BluRoof
STORMWATER MANAGEMENT SYSTEMS

blackdown
greenroofs

Project Name	Priory Road Lecture Theatre
Project Location	Bristol
Client	The University of Bristol
Alumasc Installer	M&J Flat Roofing Ltd
Alumasc System	BluRoof & Blackdown Green Roof

For more information, please call 03335 771 700 or visit www.alumascroofing.co.uk

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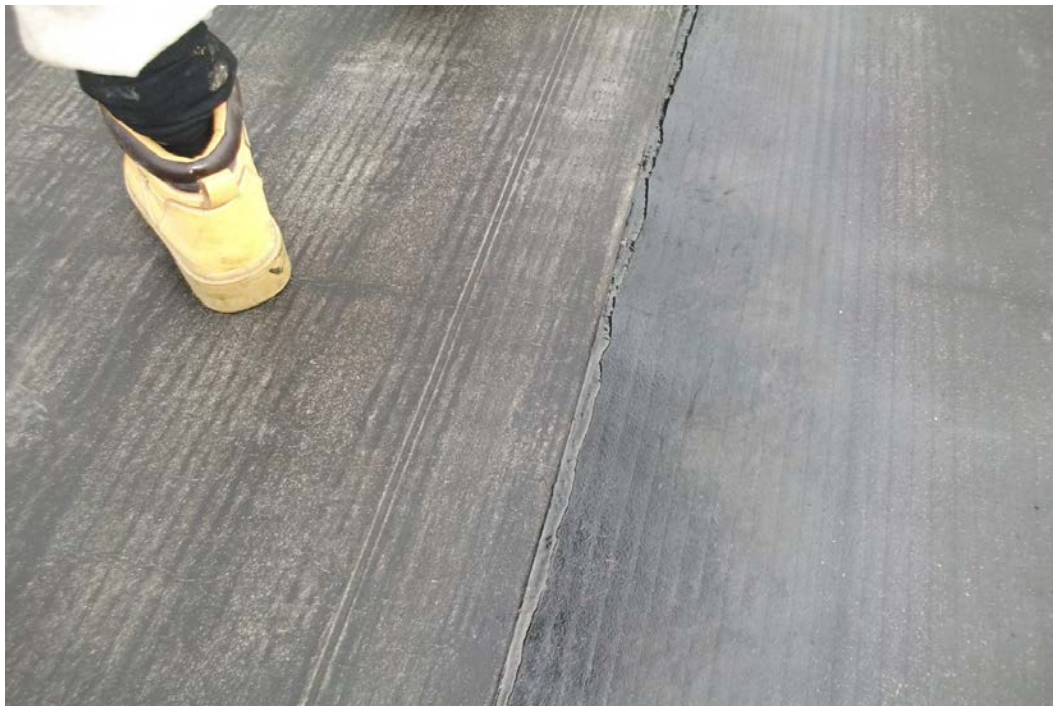
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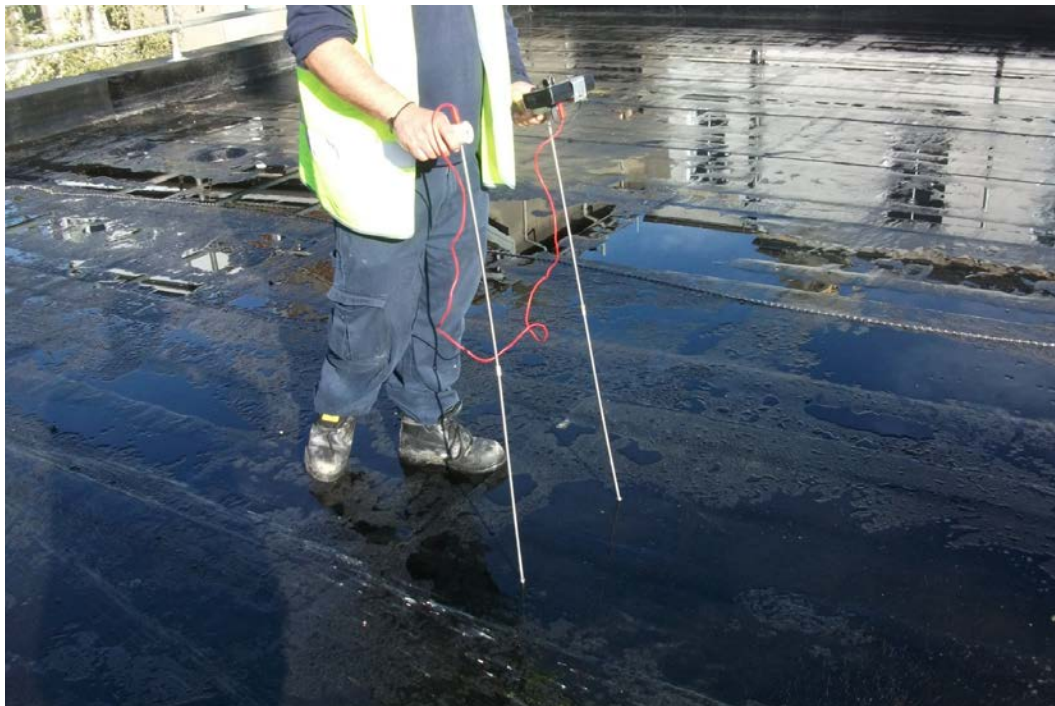
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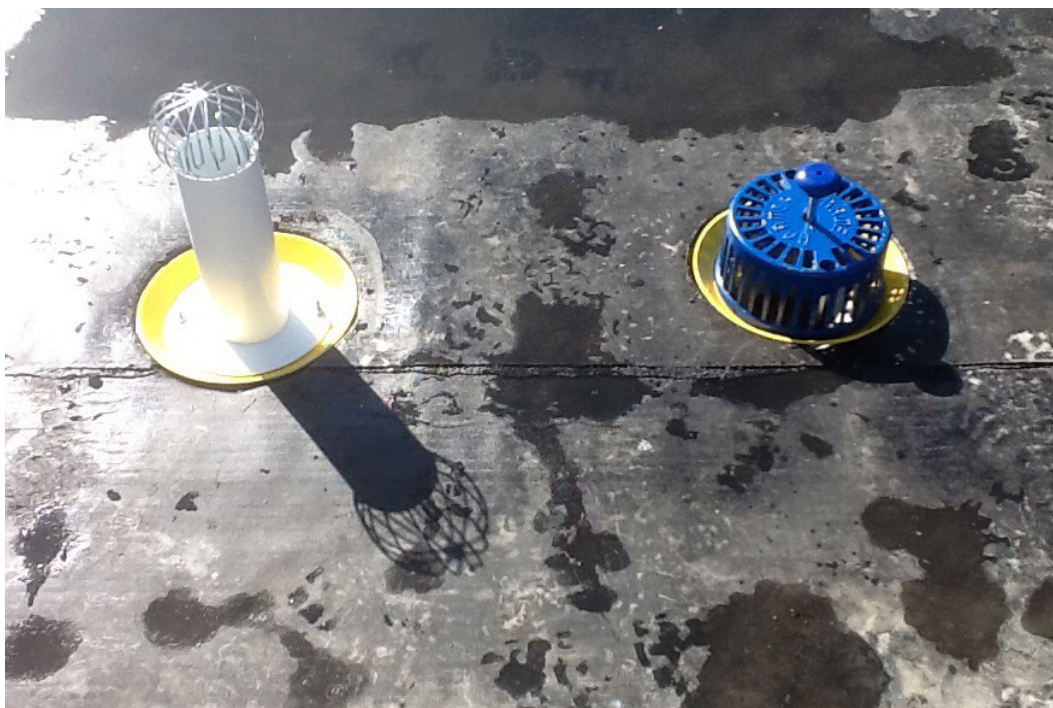
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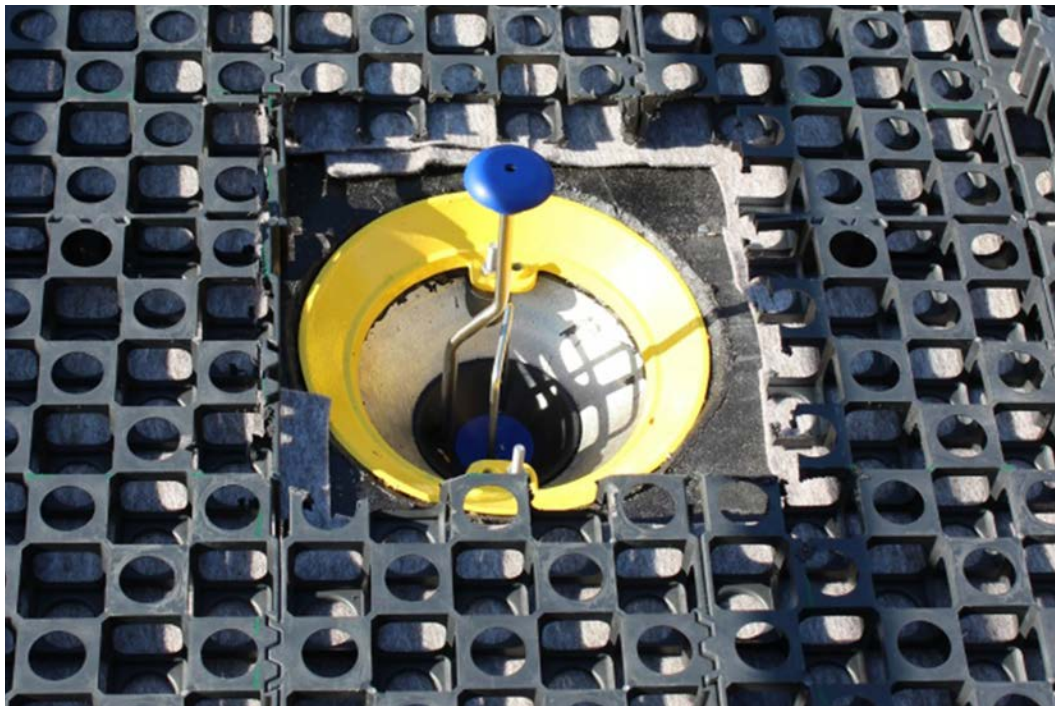
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BluRoof

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DRAINAGE SYSTEMS

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E: roofing@alumasc-exteriors.co.uk

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