blueroof

A guide to the selection and specification of ABG blueroof stormwater attenuation system

abg creative geosynthetic engineering
Traditional roof drainage design says that water should be removed from the roof construction as quickly as possible. However as pressure on water management within new developments becomes more critical this concept is increasingly being challenged.

Blue roofs are explicitly designed to attenuate rainwater rather than drain it. Designed and implemented correctly they can form an integral source control and attenuation element within the SuDS design on modern developments.

The concept is not new with many examples recorded through history but they are starting to become more common place in modern development. This is being driven in part by the advancement in knowledge in the subject and the development of modern lightweight materials for use in the construction of blue roofs.

Implementing SuDS demands that water falling across a development site is not simply channelled into storm water drains and discharged into the local river. Instead the drainage is designed to mimic that found in nature where water is attenuated, treated and infiltrated through natural processes.

Blue roofs can significantly contribute to the SuDS requirements within a development by collecting and retaining rain fall within the actual roof structure before discharging at a controlled rate. This is particularly beneficial on sites where land take is tight, such as in urbanised areas, where installation of other attenuation techniques such as ponds or subterranean tanks are not feasible.
**blueroof**

**blueroof** provides attenuation capacity within the green roof or podium deck construction of a development. Utilising this space in this way means that the attenuation capacity required to meet SuDS best practice can be met without the requirement for land consuming ponds and retention basins or the challenges of constructing large subterranean geocellular storage tanks.

**blueroof** comprises a combined drainage and attenuation void within the roof structure and a roof outlet system designed to release the attenuated water at a controlled discharge rate as permitted in the planning consent of the site.

Designing a green roof in this way allows storage capacities suitable for up to a one in a hundred year storm event, plus an allowance (typically 30%) for the effects of climate change, to be achieved.

This stored water, as with a ‘traditional’ storage system, can be released at a controlled rate or even used as grey water or irrigation for the vegetation across the development.

The **ABG blueroof** System consists of two key components:

- A drainage geocomposite system with integral filter geotextiles and a series of restrictor chambers. Excess water not absorbed by the vegetation, filters through the green roof and builds up in to the drainage void formed by the geocomposite layers below.
- This water is gradually dispersed through the system to the restrictor chamber and discharged to the roof outlet at the rate permitted for the site.

The storm water attenuation requirements are met within the roof construction, therefore the need for underground storage can be eliminated. The benefits to the overall project include the removal of the excavated material, disruption on site, and the time and cost of installing an underground tank.

Placing the storage within the footprint of the building also has advantages in heavily urbanised developments where external space is at a premium and on site working space and materials storage is limited. This reduction in material movements also helps reduce the carbon footprint of the project.
Design Considerations

Design Factors

As part of the design process ABG will develop response calculations to model the behaviour of the roof during storm events. The information required is usually contained within the surface water run-off assessment for the specific site. The modelling looks at a number of key factors including:

- Required rate of discharge.
- Attenuation volume requirement.
- Time to completely discharge attenuated water from the roof structure.
- Roof type.

Rainfall depths for the specific site are calculated according to location, duration and return period (the number of times in set period a storm of that magnitude is likely to occur: 1 in 30 years and 1 in 100 years storms are usually considered). An allowance is also made for future climate change.

Rainfall and run-off should be considered simultaneously to give an actual representation of the blueroof behaviour under storm conditions.

Design Capacity

Should attenuation reach its maximum level the restrictor chamber has a built in safety mechanism designed to release excess water into the drainage system. Design capacity will always come with a factor of safety allowing for additional capacity.

In reality, provided the blueroof is designed and maintained properly, its designed storage capacity will never be exceeded.

Structural Considerations

The introduction of a blueroof may have loading implications for the structure of the building. It is vital to consult a structural engineer at an early stage especially when designing for a SuDS solution where water will be stored within the roof structure. This will enable you to determine any constraints you may be under, although this is not as onerous as may be expected.

Traditional structural loadings in roof design take into account the restrictor chamber’s load when fully charged. The roof will generate when fully charged.

When taking into account that there is no screed required and will continually drain throughout the storm event at the rate determined by the restrictor outlet.

Water Quality

Using the blueroof system has a positive impact on the quality of the water discharged. Before the water reaches the roof outlet it has already passed through several processes that remove particulates and pollutants including vegetation and growing medium (if the roof is green) and more importantly through at least two, in a basic system, layers of non-woven, needle punched geotextile whose filtration properties are well documented. The water is treated in such a degree that it reaches the level required in treatment train stage one allowing the water to be released from the roof directly into the river system.

In a truly holistic design consideration should be given to using the attenuated water for secondary uses such as the irrigation of gardens and washing paths etc. The water could also be considered for grey water reuse applications although it may need to undergo a further treatment stage in order to do so.

Waterproofing Design

A key element of any roofing system is the waterproofing. blueroof is compatible with all modern waterproofing materials (ABG recommend monolithic bonded systems). The system in which waterproofing type is down to the type of roof construction and, to a degree, personal preference. As a concept blueroof is compatible with both warm and inverted roof constructions.

Once installed it is recommended that the waterproofing layer be electronically tested for integrity before being covered installation of the blueroof components commences.

Care should be taken during installation of subsequent layers however once the insulation is installed the waterproofing system is covered and protected from damage from further works during normal operations.

As with other roof types the waterproofing should be detailed to a height of 150mm higher than the final fill level.

ABG work with leading manufacturers and installers of waterproofing systems and can offer project specific advice and guidance to ensure the optimum solution is selected.

Outlet Design

Traditional roof design tends to have a conservative approach when designing the rainwater outlets with usually more outlets installed than actually required. When designing a blue roof the restrictor chambers are an integral component in controlling the discharge of water from the roof and as such the number required is calculated exactly. Typically this may mean that less outlets are required, less outlets means less penetrations, less detailing and greatly reduces the potential of leaks occurring. The reduction in outlets also has a positive impact on both the construction time, costs and service risers running through the building meaning the construction saves both time and money.

Thermal Performance

blueroof needs to meet the building regulations required to achieve the thermal performance. At the moment, as with green roofs, the blueroof build up cannot be considered as part of the roof build up when calculating thermal performance so insulation specification must be done as per a traditional roof design.

It is recommended that the insulation material be extruded polystyrene (XPS) and not expanded polystyrene (EPS). EPS in contact with water degrades which will result in the roof losing thermal performance ultimately leading to the requirement for an expensive rerouting operation.

Geography

Geographical location and orientation are an important part of designing a blueroof. Which area of the country, the amount of average rainfall in that area and the prevalent wind direction all affect the design and must be considered.

When using a vegetated finish the geographic location impacts the species selection with many species suitable for green roofs being specific to a region.

Final Finishing

blueroof can be designed beneath all green roofs types including extensive, intensive and biodiverse (brown). It is also suitable for use beneath paved or trafficked areas such as frequently used on podium decks. Suitable surfaces include permeable block paving, rubberised asphalt, ballasted etc. blueroof is also suitable for use with photovoltaic cells (PV).

The options are endless and comes down to the clients requirement for the final finish of the roof.

ABG Technical department are able to advise and assist with project specific design guidance to help meet the clients requirements.
Like green roofs blue roofs are suitable for use on a wide range of substrates and are compatible with most modern waterproofing systems.

They are also flexible when it comes the roof build up being equally as effective on an uninsulated podium construction as they are within a warm or inverted roof construction.

The illustrations on the left represent some of the more common roof build ups with which the blueroof system can be used but they do not define its entire extent. The highly modular nature of the blueroof components mean that a system can be designed for most flat roofs and podium decks. Specific advice and guidance on individual project requirements is available through the ABG Technical Team who are happy to review your scheme and determine suitability.
About ABG

ABG is a market leader in the design, development, manufacture and technical support of high performance geosynthetic systems for use in a wide range of civil engineering, environmental and sustainable building projects.

Formed in 1988, based in Meltham, in the heart of the Pennines, ABG have developed an excellent reputation for developing quality products and delivering outstanding service. The ability for rapid product development ensures that the most innovative, up to date and cost effective solution can be found for many engineering problems.

ABG’s involvement in roof drainage goes back over twenty five years and we have a complete range of products developed specifically for use in this technically demanding application.

Technical support is provided by our trained and experienced staff, many of whom are Chartered Civil Engineers. This extensive support extends to full design, design validation, feasibility studies, cost advice and advice on meeting regulatory requirements.

Part of this technical support includes developing and driving knowledge within our active markets including working with both international and local regulatory bodies on developing guidance and best practice in the use of innovative geosynthetics to solve complex engineering issues.
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