

Hydrotech's Blue Roof Assemblies

The Roof as a Stormwater BMP

Climate change continues to create challenges for municipalities and building developers who need to handle increasing amounts of stormwater. To prevent increasing amounts of rain water from overwhelming sewers, more municipalities are requiring developers to detain larger volumes of stormwater on their sites temporarily for a 24 to 48 hour period after rain events. Because traditional BMP (best management practice) methods (e.g. bioswales, cisterns, etc.) are becoming more expensive and require valuable at-grade or below-grade space, owners and designers are looking for cost effective storm water solutions.



While its primary function is to keep the building dry, the roof can be a valuable resource for effective stormwater management. Hydrotech's Garden Roof® assemblies have been deployed for this reason in many cities. Hydrotech's Blue Roof is the next step in high performance, rooftop-based stormwater management.

How do Blue Roofs work?

Normal roof drainage is designed to ensure the rapid removal of rainwater from the rooftop via the roof drains and associated plumbing.

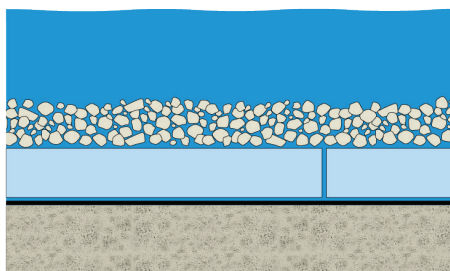
In a blue roof, the roof drains incorporate a restrictor to dramatically slow down the water flow off the roof. This restrictor often takes the form of standpipe with an orifice in the base that is bolted into the drain body at a prescribed height. The orifice is sized to allow water to leave the roof at a prescribed flow rate.

In normal, light rain events, the orifice allows water to easily drain at the membrane level. In heavier rain events, the large amount of water will overwhelm the orifice in the standpipe and the water will back up to a predetermined depth. This restricted flow helps prevent the receiving sewer system from overflowing and causing common issues like flooded basements, streets, and other problems.



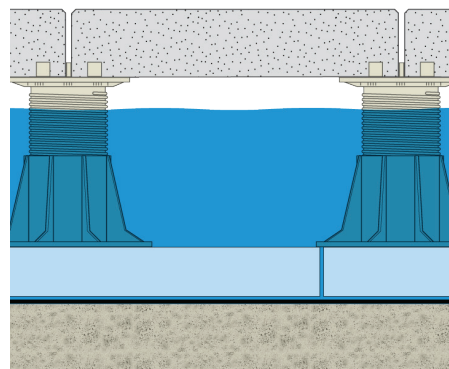
Taking Stormwater to the next level

Hydrotech has taken a time-tested idea and adapted it to address today's stormwater issues in three unique blue roof assemblies.



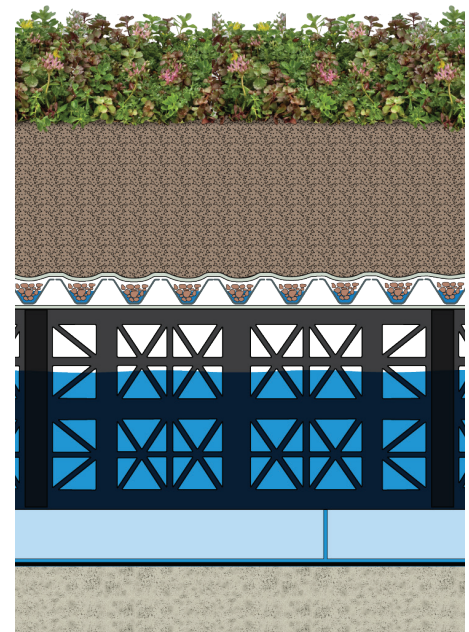
PMR Assembly Blue Roof:

A blue roof can be created on a typical Hydrotech PMR (Protected Membrane Roof) Assembly utilizing standard loose stone for ballast.



Ultimate Assembly® Blue Roof:

Void spaces that exist beneath concrete pavers in Hydrotech's Ultimate Assembly can now be used to temporarily store stormwater. Pavers are installed on pedestals in normal fashion but at an elevated height to generate the needed water storage volume.



Garden Roof® Assembly Blue Roof:

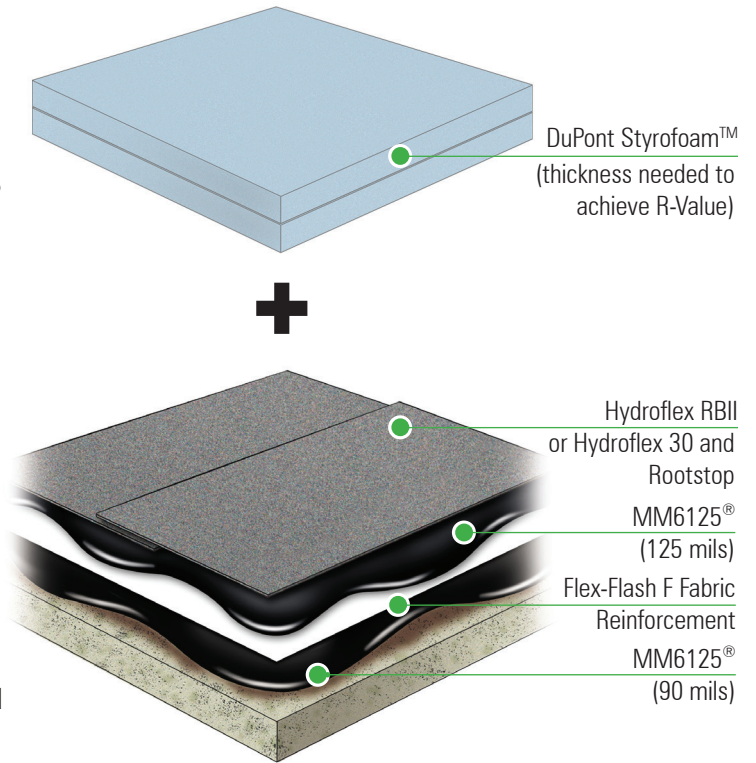
Elevating Hydrotech's Garden Roof Assembly by placing it on Permavoid®, a structural void component (available through Hydrotech) integrates the many advantages of a vegetated roof with the high water detention capabilities of a blue roof.

Hydrotech's Blue Roof Advantage

It starts with a superior roof membrane

For the past 55+ years, Hydrotech's Monolithic Membrane 6125®, the original hot fluid applied, rubberized asphalt waterproofing / roofing membrane, has been keeping buildings watertight worldwide.

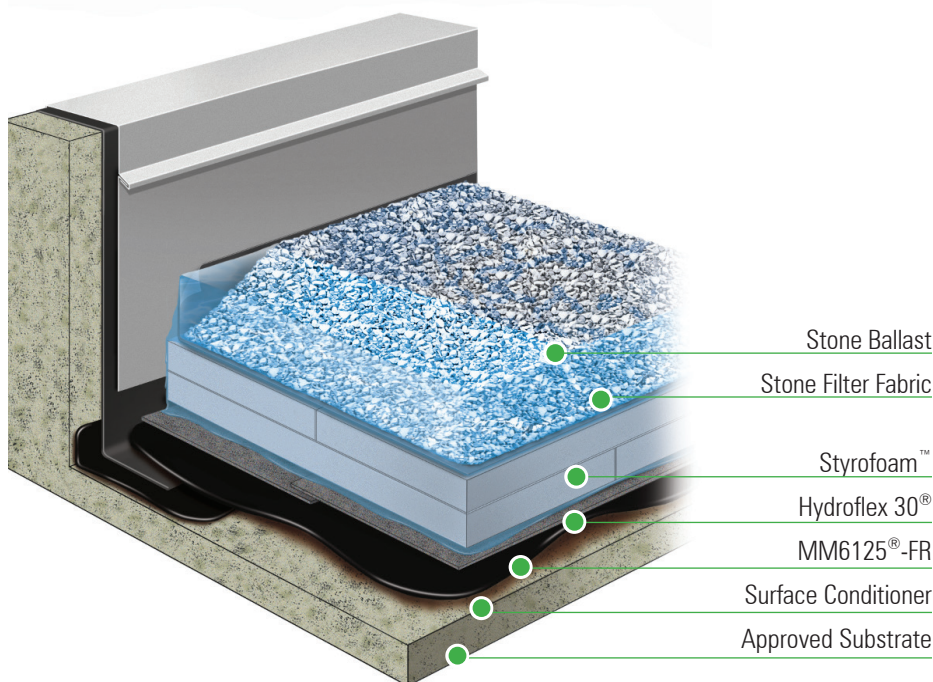
- Monolithic Membrane 6125 - Benefits and Features
 - Originally designed for waterproofing applications, MM6125® is perfect for wet or submerged applications such as planters, pools, water features, Garden Roofs as well as Blue Roofs.
 - MM6125 is a continuous, monolithic waterproof barrier for the roof so there are no seams that can fail.
 - MM6125 is ideal for dead level, flat deck applications which can maximize the stormwater capacity of a blue roof installation. Often owners save money with flat decks which are easier to construct than sloped decks.
- DuPont's Styrofoam - an extruded (XPS) polystyrene insulation - is highly resistant to water absorption which makes it ideal for the wet conditions in Garden Roof and Blue Roof Assemblies.
- Hydrotech can provide a full assembly warranty on flat deck and sloped deck installations, which includes thermal resistance, removal and replacement of the overburden materials supplied by Hydrotech and wind resistance of the DuPont Styrofoam™ insulation for up to 30 years.



Hydrotech's Monolithic Membrane 6125-FR (fabric reinforced) Assembly with DuPont Styrofoam

Contact Hydrotech for full details.

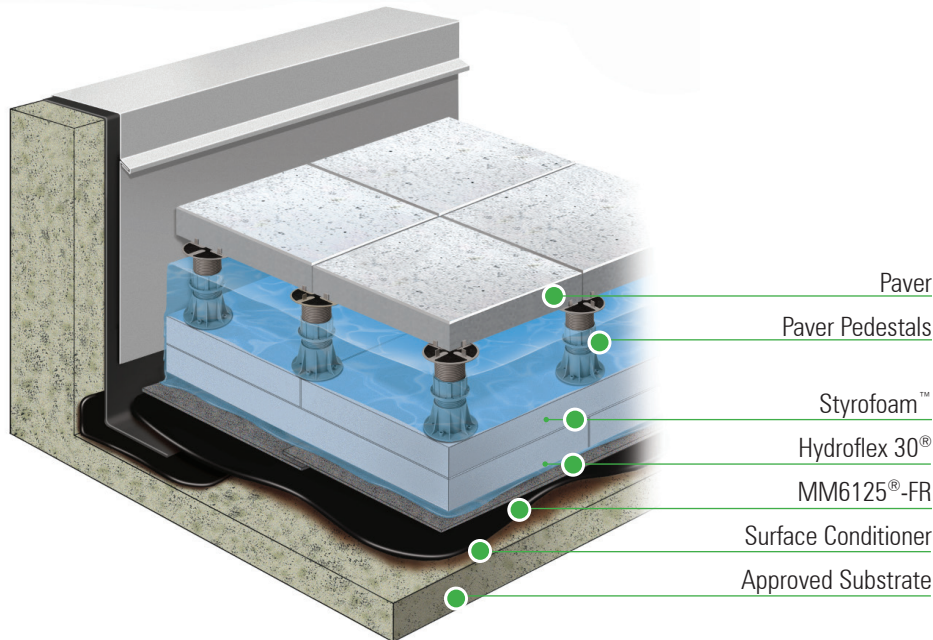
Hydrotech's PMR Assembly Blue Roof



Hydrotech's PMR Blue Roof is the simplest blue roof that can be created. Using standard stone ballast, the water in the blue roof is stored within the void spaces of the stone and to the required level above the ballast. A heavier-than-typical application of stone ballast is designed to keep the loose-laid Styrofoam™ insulation from floating during those rain events when the blue roof is in operation.

A Hydrotech PMR Blue Roof is ideal for those utilitarian roofs that are not designed for tenant use.

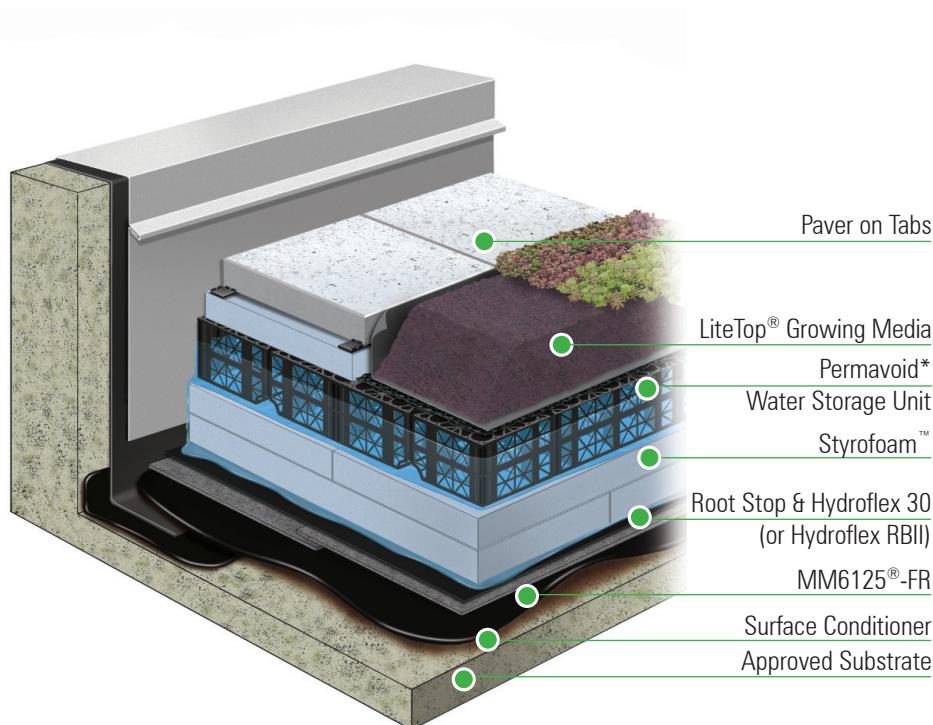
Hydrotech's Ultimate Assembly® Blue Roof



Hydrotech's Ultimate Assembly® Blue Roof utilizes concrete pavers set with pedestals over the Styrofoam™ insulation. The void space created under the pavers is an ideal location to store large quantities of storm-water. The paver weight is designed to keep the loose-laid Styrofoam™ insulation from floating during those rain events when the blue roof is in operation. As a result, heavier, thicker pavers are typically required.

A rooftop terrace would be an ideal application for this blue roof assembly. Because the pedestals supporting the pavers are adjustable, this blue roof assembly may be ideal for roof decks with some roof slope where the goal is to create a level, paved finished surface.

Hydrotech's Garden Roof® Assembly Blue Roof



This version of Hydrotech's blue roof assembly combines the performance of the Garden Roof Assembly and free water detained in a voided space into a high performance stormwater management solution. The core of this assembly is the water storage unit - Permavoid®.

Permavoid provides a lightweight structural foundation with 95% void space. Units are formed by polymer columns reinforced with arched webbing surrounded by a robust exoskeletal matrix. This creates a platform onto which any number of Garden Roof and Ultimate Assembly components can be installed.

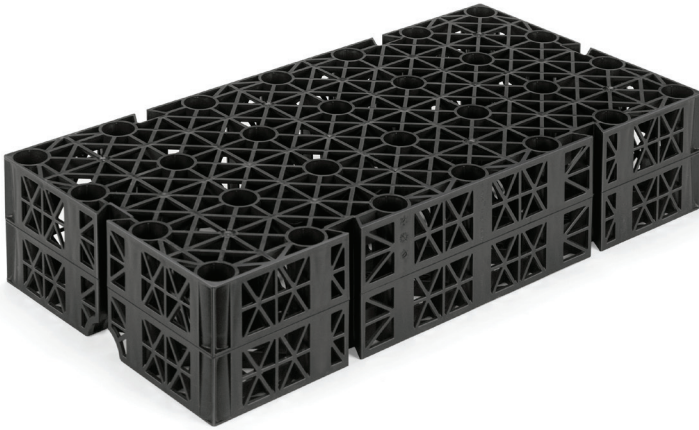
Architectural pavers can be installed to create pedestrian spaces and to provide access to roof parapets and mechanical equipment. Garden Roof components can be used to create extensive and intensive green roofs on top of the Permavoid units. Additionally, LiteTop within the Garden Roof Assembly can increase the water holding capacity of this composite Blue Roof assembly.

*ABT Plastic's Permavoid® product, as marketed by American Hydrotech, Inc.

Hydrotech's Blue Roof Assemblies

Permavoid®

Hydrotech has an collaborative relationship with ABT Plastics and its Permavoid® product. The Permavoid units are easily assembled on the roof and securely connected with plastic dovetail connectors to form a solid base on which to work from and to construct the subsequent components in a Garden Roof Assembly.



Blue Roof Design Considerations:

- **Roof structure:** A structural engineer **MUST** be consulted early in the design of a roof involving a blue roof assembly. A blue roof will significantly increase the weight imposed on buildings both from detained and retained water and increased ballast weights. These roof structures must be properly designed to carry the full saturated weight of the blue roof, ballast, Garden Roof components and other elements.
- **Structural Deck considerations:** Hydrotech accepts properly designed structural decks for blue roofs, including:
 - Cast-in-place structural, monolithic concrete decks
 - Precast concrete decks with a concrete overlay
 - Cross laminated wood (CLT) mass timber decks with plywood sheathing
 - Wood decks with plywood sheathingContact Hydrotech for further information.
- **Roof Membrane:** It is critically important to choose a membrane that is designed to perform in the wet conditions created by a blue roof. Hydrotech's Monolithic Membrane 6125 is the best membrane for this purpose with over 55 years of proven performance.

- **Flat roof decks:** To optimize the amount of water stored on a roof, flat decks provide the optimum storage capacity. Often these decks are less expensive to construct and are allowed by numerous municipal codes. Monolithic Membrane 6125 is ideally suited for flat deck applications.
- **Flashing Heights:** It is extremely important to maintain flashing heights and terminations at elevations well above the potential water level that a blue roof will create. Minimum Flashing heights will vary depending on the blue roof assembly selected; contact Hydrotech for further information.
- **Coordination between the architect and municipality:** Hydrotech can provide assistance when discussing blue roofs with municipalities.
- **Mechanical coordination:** The flow control drain function requires considerations by the mechanical engineers to ensure proper water detention and release rates (including sizing the orifice).

Frequently asked questions:

- **Water storage for longer periods?** Hydrotech and DuPont (the manufacturer of Styrofoam™ insulation) does not recommend detention periods longer than 48 hours. This conforms with the longest period allowed by many municipalities although some may have shorter time restrictions.
- **Best Insulation?** DuPont's Styrofoam is ideal for the wet conditions in Blue Roof and Garden Roof assemblies.
- **Storage for passive irrigation?** Contact Hydrotech for information on passive irrigation capabilities.
- **Additional weight?** Hydrotech can estimate the total weight of the assembly from the deck up through the overburden layers.
- **Freezing?** Since the stormwater is always moving and must drain completely in a short amount of time, it is very unlikely that a condition will occur where the water freezes before it has a chance to drain.
- **Maintenance?** All roofs require regular maintenance to make sure all roofing components - flashings, drains, copings, ballast and vegetation - are performing as designed.
- **Warranty?** Hydrotech's standard warranty offerings are available in blue roof applications.

Contact Hydrotech for additional details on how to develop your next Hydrotech Blue Roof project.



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2023-STRM-BLUE-1-DY

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