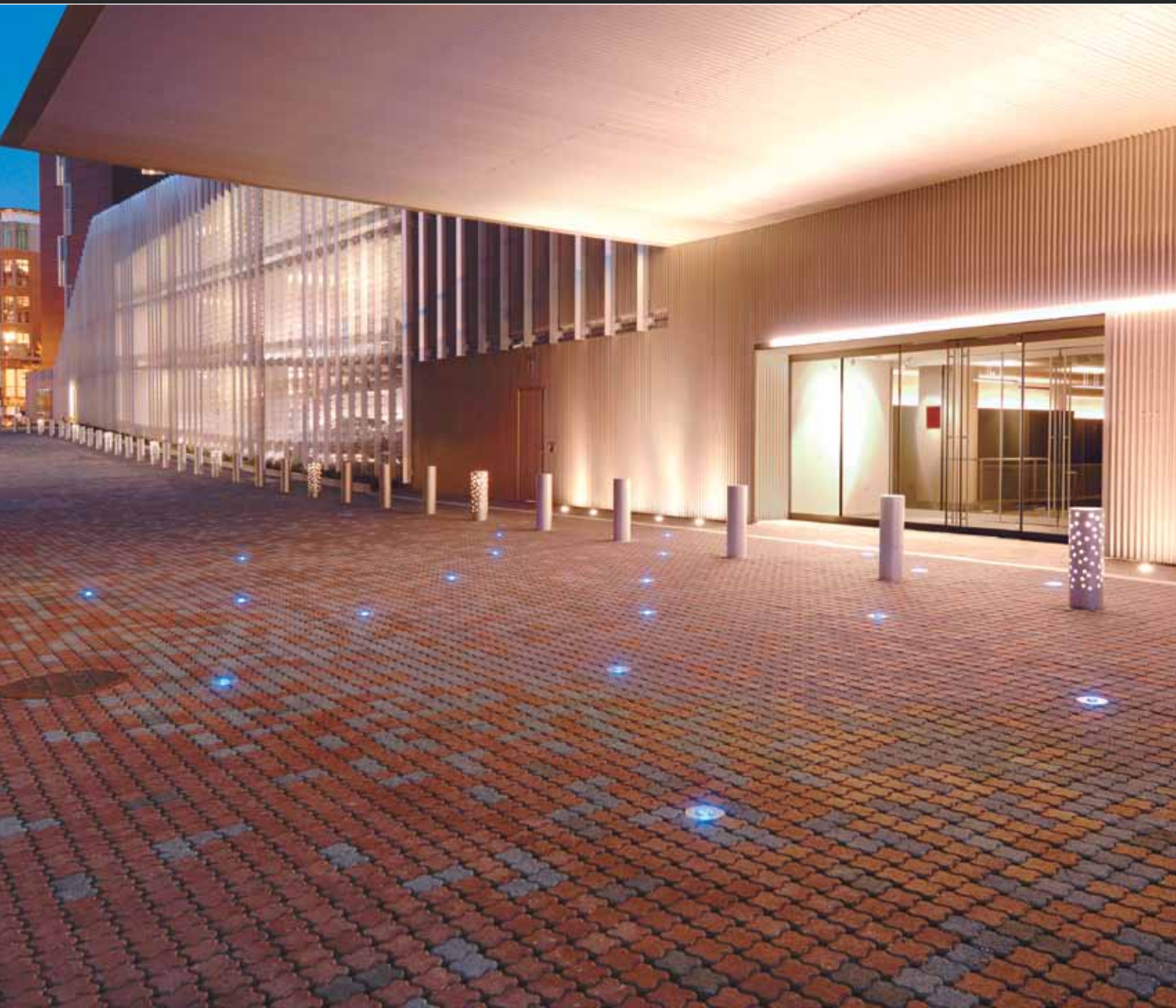




Hanover® Architectural Products | Permeable Paving Units





Permeable paving units were first presented to the industry in 1961 as hollow concrete building blocks positioned in the ground to support cars in overflow parking. Because of increasing paved areas such as streets, parking lots and sidewalks, rainwater has little opportunity to filtrate into the earth. The need for a pervious concrete paving unit that allows water to permeate the soil has become increasingly important.

Hanover's Permeable Paving Units allow for stormwater drainage and manage excessive runoff, as most municipalities now require. Several shapes and sizes are available in different colors and textures to suit any design requirement.



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Hanover® Permeable Paving Units facilitate the process of obtaining LEED Green Building certification

The Problem. With urban development comes excessive stormwater runoff. Runoff occurs in urban and suburban areas where impervious surfaces such as streets, parking lots and sidewalks prevent rainwater from absorbing into the soil. As water runs across these surfaces, it collects contaminants and deposits them into stormdrains or directly into receiving waters, such as rivers and lakes. As waters are polluted, they become unusable to people and a dangerous to fish and other aquatic life.



Under the Clean Water Act, developers must comply with the regulations for stormwater management which often means the loss of valuable land to build large, expensive retention ponds.

The Solution. Hanover's Permeable Paving Units allow for stormwater drainage and manage excessive runoff. This stormwater is directed through a series of natural filtration systems – through joints or voids in the pavers and into the subgrade below before entering streams or rivers, reducing groundwater pollution. The need for retention ponds is eliminated. The result is more flexibility in design options and more efficient use of the total building site, while maintaining an effective stormwater management system. Benefits of using permeable pavers are numerous. Permeable pavers have been proven to be very beneficial because:



- Erosion and stormwater runoff are reduced.
- Land-use is increased through more efficient use of the total building site.
- Water quality is improved.
- Project costs for drainage and retention systems are reduced.
- Access for underground repairs is permitted.
- Design options increase.
- Several attractive textures

Green Building trends are on the rise as large cities and small towns are making great strides toward managing runoff and creating environment-friendly developments. The need for Sustainable Design will continue as natural resources become increasingly scarce.

Hanover's Aqua-Loc® is available in a 4 1/2" x 9" x 3" unit with a score to appear as two 4 1/2" x 4 1/2" x 3" pieces. Aqua-Loc® interlocks for stability and provides open space for drainage aggregate. Aqua-Loc® will provide the project with 10.6% open space allowing water to be infiltrated at a rate of 7" to 8" per hour based on proper installation methods. Made to order in custom colors when quantities permit, Aqua-Loc® can be installed mechanically to save time and reduce costs.



When used in vehicular parking applications, Aqua-Loc® can work in conjunction with tight-jointed pavers. The tight-jointed pavers can be used to form pedestrian friendly areas such as handicap parking areas, walkways and ramps.



Above and Bottom Right Photos: Private Residence, Fenwick Island, DE; Size & Color: 4" x 8", Aqua-Loc®, South Mountain Sand, Charcoal; Finish: Natural

- Sized at 4 1/2" x 9" x 3"
- 10.6% open space
- Infiltration rate of 7" - 8" per hour
- Can be installed mechanically
- Supports moderate vehicular traffic



Sized at 11 3/4" x 11 3/4" x 4", Hanover® EcoGrid® provides the project with 39% open space for drainage aggregate. EcoGrid® has the largest percentage of open space in the industry, allowing the most opportunity for water to permeate into the sub-soil. EcoGrid® provides the maximum percolation that a normal drainage field system will accept. Hanover's EcoGrid® interlock for stability to support moderate vehicular traffic. Stocked in Hanover's Natural color with a Natural finish, EcoGrid® can also be made to order in custom colors when quantities permit.



Above Photo: Private Residence; Size & Color: EcoGrid®, Natural; Finish: Natural



Above Photo: Chelsea Townhomes, Charlotte, NC; Owner: Colville Company, Charlotte, NC; Size & Color: EcoGrid®, Natural; Finish: Natural

EcoGrid® can also be filled with soil for grass turf. In this system design, a typical cross section will consist of compacted sub base and a 3/4" - 1" setting bed adequate for intended loads, and soil-filled voids with planted vegetation.

- Sized at 11 3/4" x 11 3/4" x 4"
- 39% open space
- Stocked in Natural color
- Supports moderate vehicular traffic

The Permeable 4" x 9" is Hanover's newest concrete permeable paver. Produced with a 1/16" bevel and hidden spacers, the Permeable 4" x 9" meets standards set forth by the Americans with Disabilities Act (ADA). Minimal openings providing a comfortable walking surface while allowing for water percolation. The Permeable 4" x 9" will provide the project with 6.94% open space allowing water to be infiltrated at a rate of 7" to 8" per hour based on proper installation methods. The Permeable 4" x 9" can accommodate wheel chair traffic making it the perfect choice for high foot traffic areas such as walkways, plazas and entrance ways. With a 3" thickness and interlocking installation design, heavy low speed vehicular loads can be supported.



Above Photo: Smithsonian's National Zoo, Washington, DC; Size & Color: Permeable 4" x 9", B91517, Charcoal; Finish: Tudor®, Natural



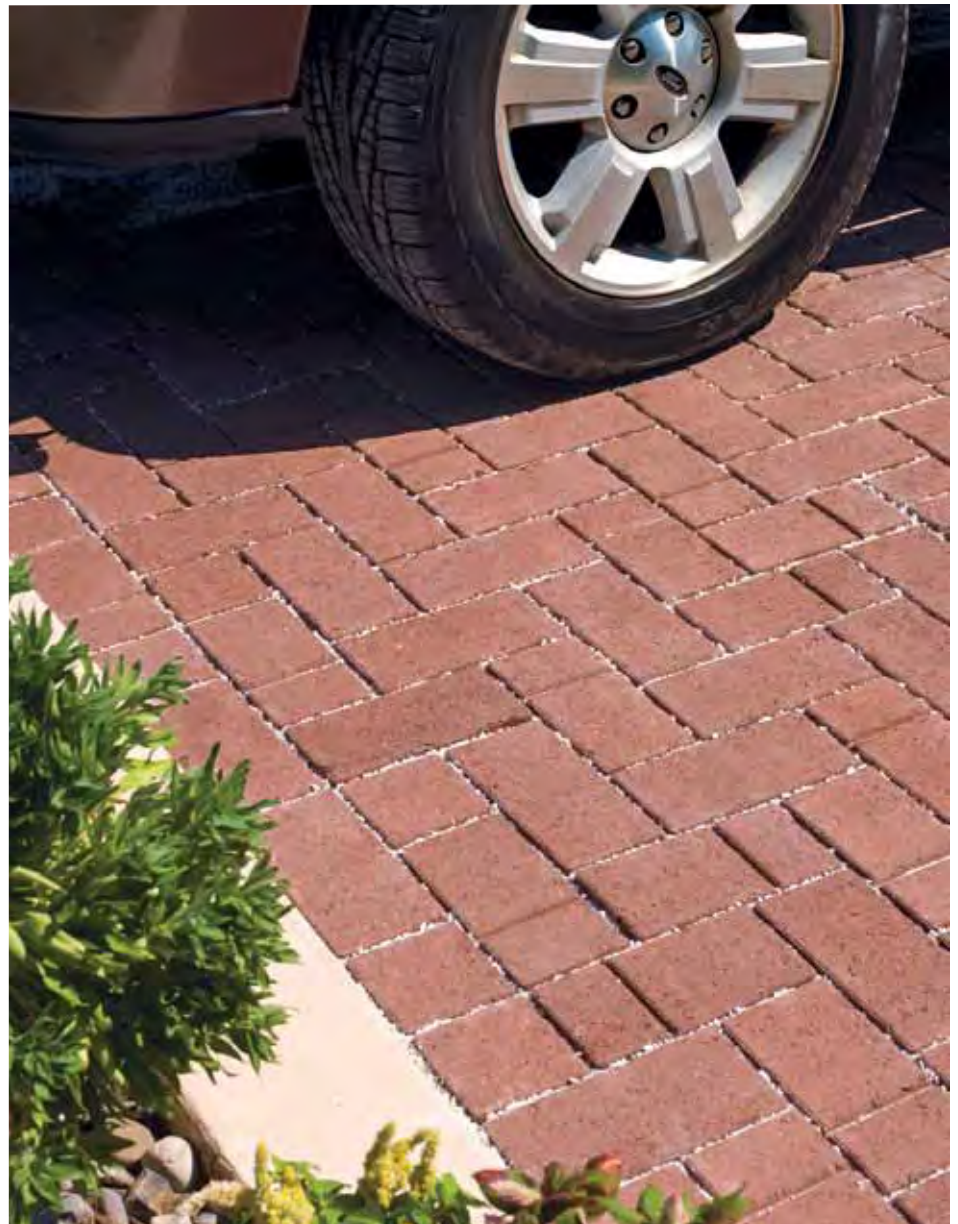
Above Photo: Office Building; Size & Color: Permeable 4" x 9", Limestone Gray; Finish: Natural

Sized at 4 5/8" x 9 1/4", the Permeable 4" x 9" is a true rectangle, providing the correct size ratio to create interlock stability. The 4" x 9" can be produced with a Natural, Tudor®, Tumbled or Chiseled finish and is available in Hanover's full range of colors. The Permeable 4" x 9" combines the beauty of an interlocking paver with the advantages of a permeable paving system.

- ADA Compliant
- Minimal openings for a comfortable walking surface
- 6.94% open space per unit
- Supports heavy low speed vehicular loads
- Sized at 4 5/8" x 9 1/4"
- True rectangular size ratio to achieve interlock stability



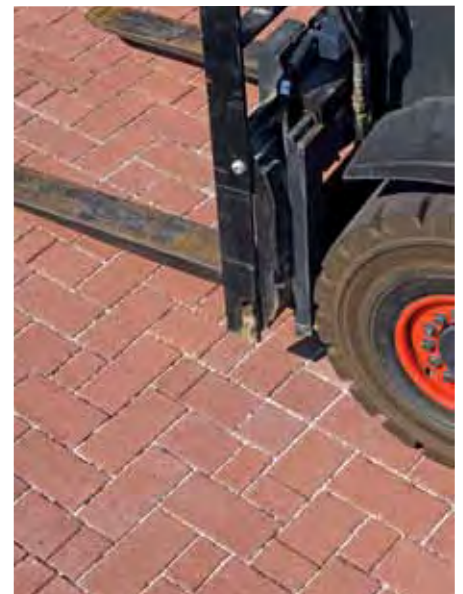
Hanover's NEW Permeable 4" x 9" Scored is perfect for large driveways, parking lots, roads and industrial applications. Because it is designed to be installed mechanically, installation time and costs are reduced. Pavers are laid layer by layer through the use of a machine increasing speed and efficiency. Each layer is composed of four different units to provide maximum interlock with a random appearance.



Above and Boltom Left Photos: Office Building; Size & Color: Permeable 4" x 9" Scored, Quarry Red; Finish: Natural



Produced with a 1/16" bevel and hidden spacers, the Permeable 4" x 9" Scored meets standards set forth by the Americans with Disabilities Act (ADA). Minimal openings allow for a comfortable walking surface while permitting water drainage to the ground below. Hanover's Permeable 4" x 9" with score is made to order in custom colors when quantities permit. Contact Hanover® for more information.



The U.S. Green Building Council (USGBC) provides standards for green building design and construction based on LEED Green Building Rating System. Building projects earn points for compliance with Sustainable Sites (SS) Credits. LEED (Leadership in Energy and Environmental Design) is a point rating system devised by the United States Green Building Council (USGBC) to evaluate the environmental performance of a building and encourage market transformation towards sustainable design. Understanding the LEED rating system will enable Hanover®, in collaboration with architects, specifiers and contractors, to respond to the market and develop more sustainable products and procedures.



Clipper Mill, Baltimore, MD; Owner/Developer: Struever Bros, Eccles & Rouse; Size & Color: EcoGrid®, Natural; Finish: Natural

Using concrete permeable paving systems can facilitate the process of obtaining LEED Green Building certification. There are two applicable LEED Site Credits that pertain to Hanover® Permeable Paving Units: Stormwater Management and EPA Best Management Practices.



Ferguson Township, State College, PA; Site Designer: Pennoni Associates Inc., State College, PA ; Size & Color: Aqua-Loc®, Red/Charcoal Blend; Finish: Natural

Stormwater Management

LEED awards 1 point for measures taken to manage or reduce stormwater runoff. Permeable paving systems reduce runoff by allowing infiltration of rain into the subsurface. LEED has a simplified calculation to demonstrate compliance based solely on the runoff coefficient of site surfaces. The runoff coefficient relates the amount of runoff to the amount of precipitation received. The coefficient of runoff (c value) for level permeable pavements installed over recommended drainage coarse base elements has been proven to be 0.15. In comparison, asphalt, a non-permeable pavement, is 0.98 using the rational method. For unit paver installations, a minimum 1% grade is suggested, creating a c value of 0.25. It is suggested the design value be established at 0.40 to allow for 50% clogging of the permeable joints in the first 5 years. It is likely that permeable paving systems will need to be combined with additional measures like green roof assemblies or rain water harvesting to fully comply with this LEED credit.

EPA Best Management Practices

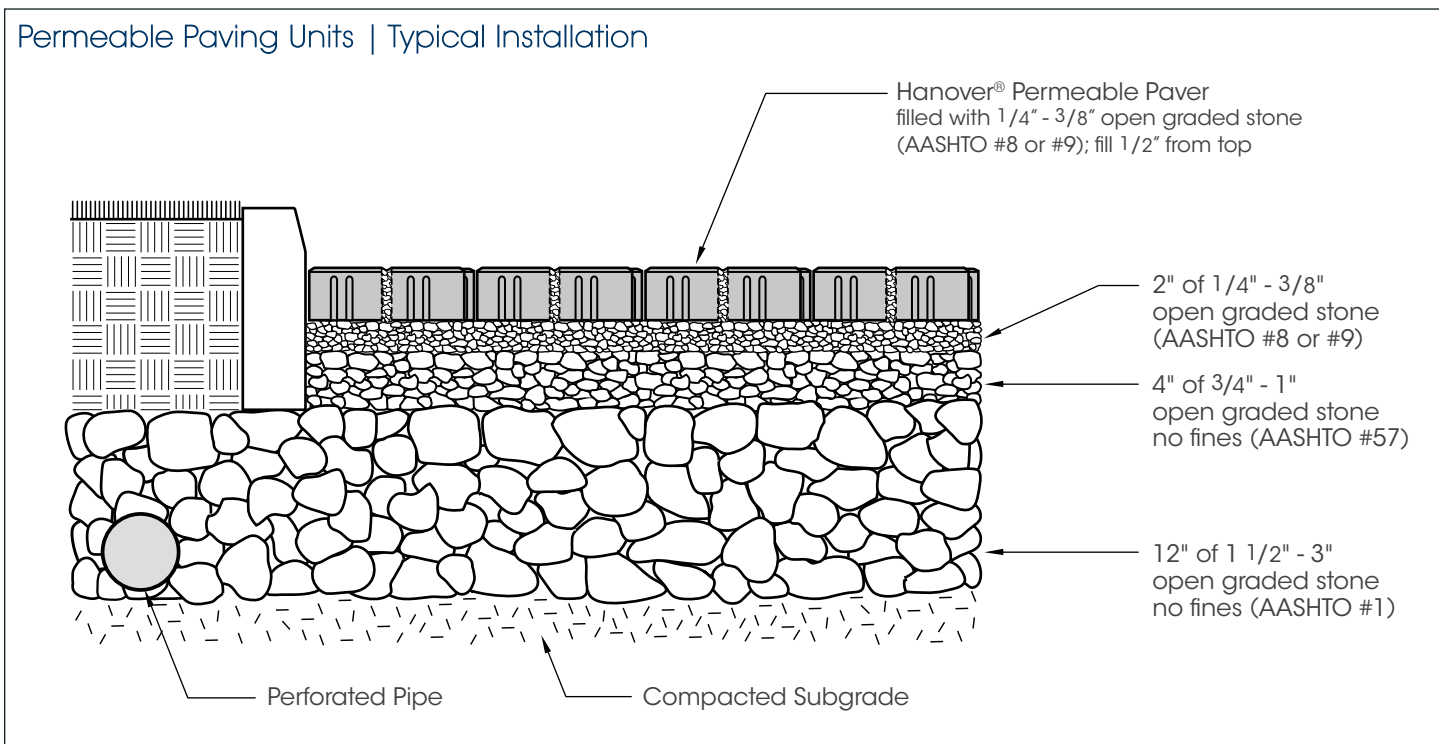
Permeable paving can also help a project earn a second LEED point within the stormwater management credit for stormwater treatment/quality control. For this point, LEED requires EPA Best Management Practices that effectively remove at least 80% of the total suspended solids (TSS) and 40% of total phosphorus (TP) from stormwater volumes leaving the site. As with the credit above, additional measures like infiltration basins may be required for a project to fully comply with this credit, but permeable paving systems do contribute toward compliance.



Office Building, Richmond, VA; Size & Color: 4" x 8", Aqua-Loc®, Red/Charcoal Blend, Antietam; Finish: Natural, Tudor®

Best Management Practices (BMPs) are defined by the EPA as a “technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of stormwater runoff in the most cost-effective manner.” In other words, they are techniques used to manage stormwater and improve water quality. LEED credits can be earned by complying with EPA Best Management Practices. The USGBC addresses stormwater management in two separate credits, one relating to the quantity of water that runs off a building site and other dealing with the quality of the water. For more information on LEED credits, refer to the page 9.




The detail shown below is an example of a typical permeable paver installation. Requirements and regulations are different for each municipality. Contact your municipality for specific installation instructions. An industry professional should be consulted to develop a specification for the individual project in accordance with the municipal requirements.



Please Note: Due to variations in native soil types, infiltration rates (Curve) may differ.

When EcoGrid® will be filled with planted vegetation, the installation detail shown is not adequate. If grass is intended, a typical cross section will consist of compacted sub base and a 3/4" to 1" setting bed.

The detail shown above is an example of a typical permeable paver installation. Requirements and regulations are different for each municipality. Contact your municipality for specific installation instructions. An industry professional should be consulted to develop a specification for the individual project in accordance with the municipal requirements.

Product	Actual Size	Thickness	s.f. per pcs.	s.f. per strap	pcs. per cube	s.f. per cube	cubes/s.f. per truck	lbs. per cube	Charcoal	Brown	Limestone Gray	Natural	Quarry Red	Red 15	Tan
 Aqua-Loc®	4 1/2" x 9"	3"	-	-	320	88.32	16/1413.12	2890							
 EcoGrid®	11 3/4" x 11 3/4"	4"	1	21	84	84	18/1512	2436				●			
 Permeable 4" x 9"	4 5/8" x 9 1/4"	3"	-	18.86	320	94.3	15/1414.5	3020.8							

 = Standard Paver Colors ● = Stocked Colors

Hanover® Permeable Paving Units | Pedestrian vs. Vehicular Applications

The chart below shows suggested Hanover® Permeable Paving Units for use in pedestrian and vehicular applications. Sizes and thicknesses vary depending upon the intended use. For vehicular applications, base materials must be engineered with the intended vehicular loading conditions in mind. Please contact the Hanover® sales staff for more information

Pedestrian vs. Vehicular Use Size Comparison				
	Definitions	Pedestrian Use	Light Vehicular Use	Moderate Vehicular Use
		use by persons on foot and any mobility impaired persons using a wheelchair	pedestrian use & low speed, low volume residential and light commercial vehicular use	pedestrian use & low speed, moderate volume residential and moderate commercial vehicular use
Permeable Paving Units	EcoGrid®	4"	4"	4"
	Aqua-Loc®	3"	3"	3"
	Permeable 4" x 9"	3"	3"	3"

Please Note: Not all sizes are stocked materials. Some are only available through special order and when quantities permit.

Product Installation : Each project and site conditions are unique. It is important to contact a Hanover® representative for product details and installation guidelines. An architect, landscape architect, and/or structural engineer should be consulted to develop a specification suited for the individual project. • Neither this catalog, nor any of the individual product catalogs from Hanover® Architectural Products, is intended to be a design manual. The projects pictured and the installation suggestions given in this catalog are only illustrations of Hanover® products. Each application and specification for installation should have the attention of an architect, landscape architect, and/or structural engineer. • As product use and site conditions are not within our control, Hanover® does not guarantee results from use of such products or other information herein: no warranty, express or implied is given. As government regulations and use conditions may change, it is the Buyers responsibility to determine the appropriateness of these products for the specific end uses.

Please Note: The color photos shown in this catalog were prepared with great concern for accuracy. However, it is suggested that actual samples be requested before specifying. Due to the natural variance of the raw materials used, products can be expected to differ slightly from sample to actual product. It is recommended that the products be cleaned after the installation is finished. Please contact our representatives for product suggestions.

Hanover® Architectural Products reserves the right to modify, alter or discontinue the texture, color, content, shape or size of its products or any product line at any time for any reason.

Contact Us for product details and information. We invite you to call us at 800-426-4242 to discuss your project, visit our web site www.hanoverpavers.com to download current catalogs and more detailed product information, or request our complete product brochures and samples.

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Aqua-Loc® is a trademark of Advanced Pavement Technology.

Cover Photos: Macallen Building, Boston, MA; Developer: Pappas Properties Inc., Boston, MA; Design Architect: Office dA, Boston, MA; Landscape Architect: Landworks Studio, Inc., Boston, MA; Size & Color: Aqua-Loc®, Charcoal, Quarry Red; Finish: Natural, Tudor®

Inside Cover Photos: Office Building, Richmond, VA; Size & Color: 4" x 8", Aqua-Loc®, Red/Charcoal Blend, Antietam; Finish: Natural, Tudor®

HANOVER®
Architectural Products

5000 Hanover Road, Hanover, PA 17331
717.637.0500 • fax 717.637.7145
www.hanoverpavers.com

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