

HANOVER® ARCHITECTURAL PRODUCTS

VENTLOC®



INTERLOCKING LIGHTWEIGHT ROOF BALLAST

VENTLOC®

Taking into consideration the effect of roof pressures and wind uplift, Hanover® developed an improved ballast paver. Hanover's goal was to develop a roof paver which would perform at high wind speeds and bring improved ballast qualities to the roof industry.

After extensive research and wind testing, Hanover® is proud to announce the NEW & IMPROVED Ventloc® Paver. Ventloc® is the only ballast paver in the industry which enables the transfer of air pressures. Its patented design offers superior wind uplift resistance in a high quality concrete roof paver. Hanover's Ventloc® Paver is an extraordinary breakthrough in roof ballast pavers.

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NEW & IMPROVED VENTLOC®
LIGHTWEIGHT ROOF BALLAST
PAVERS PROVIDE SUPERIOR
WIND UPLIFT RESISTANCE.



Ventloc® provides superior wind uplift resistance at wind speeds up to 130 mph. Designed with tongue and groove sides and a patented venting edge that enables the rapid transfer of over paver to under paver pressures (known as pressure equalization*), this unique combination results in a significant enhancement of lightweight paver system wind uplift resistance. The patented interlocking tongue and groove design creates a monolithic paver surface in which an individual paver is no longer the weakest link.

Ventloc's high compressive strength provides a solid surface to withstand severe weather conditions, UV attack and physical abuse. A solid roof surface is maintained to provide the ultimate protection from extreme weather conditions.

Ventloc® can be installed on a protected membrane system up to and including a slope of 2" in 12". Multi-directional under

surface water drainage has been incorporated into the air vent design.

Sized at 11 3/4" x 17 5/8" x 2", Ventloc® is stocked in a Natural color with a Natural finish. Ventloc® is available in all of Hanover's standard colors as well as a Tudor® finish. Additional colors are available when quantities permit. When reflective properties are important, White is available.

Hanover's Ventloc® is stocked in two weights – Standard and Heavy weight. The standard weight



Shown in White with Natural Finish

Ventloc® is 15-17 lbs/sf and the heavyweight Ventloc® is 18-20 lbs/sf. Custom weights can be accommodated to meet specific design requirements. Weight is distributed evenly in comparison to stone ballast. With stone ballast, weight can shift and vary.



Shown in Natural with Natural Finish
U.S. Patent #5,887,397. Other patents pending.

- Vents enable rapid transfer of air pressures
- Patented tongue and groove design
- Limited pedestrian use
- Multi-directional under surface water drainage
- Stocked in Natural color with a Natural finish
- Available in Hanover's standard colors as well as Glacier White
- Fire Resistant Class A Rating
- Stocked in two weights with custom weight options available
- Uniform weight distribution

PLEASE NOTE: Hanover's Glacier White can vary slightly by product type because of raw material variation. It is suggested that actual samples be requested before making the final color selection.

*Pressure equalization – The newly designed slots (or vents) in the Ventloc® edges of adjacent pavers allow transfer of top surface pressures to the underneath side which results in a pressure equalization effect that reduces net paver wind uplift.

THE VENTS MAKE A DIFFERENCE.

Ventloc’s patented venting edge enables the rapid transfer of over paver to under paver pressures. The transfer of pressures through Ventloc’s vented edge has been tested and proven to provide the best lightweight paver wind uplift resistance in the industry.

Ventloc® was tested at Intertek ATI incorporating three different conditions - no parapet, 12” parapet and 24” parapet. Edge termination/containment was used on all three conditions. Wind speeds began at 40 mph and were increased to 130 mph at 30 second intervals. Wind was blown at the specimen both perpendicularly and parallel to the joint alignment. In all three conditions, for both the standard weight and the heavy weight, results were the same. No movement was observed.

Pressures were recorded at four different locations – top, bottom and both ends. Ventloc’s equalization was maintained at a near zero value from the top surface to the underneath side of the paver, clearly demonstrating that the vents are transferring pressures. Refer to Ventloc® Test Report 11.4.15. Ventloc’s ability to equalize pressures, along with its true interlocking design, provides a much more wind resistant installation than pavers without vents.

PROJECT ANALYSIS IS REQUIRED BEFORE SPECIFICATION

Recognizing the importance of individual project analysis, Hanover® will need the following information as a minimum to determine suitability of the application:

- Roof sector height
- Parapet height (s)
- Job location
- City Design Wind Speed
- Copy of any available wind engineering studies (showing roof plan wind uplift predicted negative uplift pressures)
- Roof sector(s) identification (i.e. A, B, C)
- Roof plan

Hanover® commissions several wind consultants and engineers who have many years of experience dealing with roof wind design. Complete the **Building Wind Design Criteria form** and submit to Hanover. Forms can be downloaded from www.hanoverpavers.com. Each form will be reviewed by our consultants and will be returned to the sender to aid in the bidding process.

VENTLOC® | TECHNICAL DATA & COLORS

RELATIVE STRENGTHS & PACKAGING		
STANDARD WEIGHT, NATURAL	STANDARD WEIGHT, WHITE	HEAVY WEIGHT, NATURAL
Compressive: 7,080 psi	Compressive: 6,720 psi	Compressive: 7,770 psi
Absorption: 2.16%	Absorption: 1.87%	Absorption: 1.78%
Density: 117.4 lb/ft3	Density: 120.7 lb/ft3	Density: 138.8 lb/ft3
SF/Pc: 1.5	SF/Pc: 1.5	SF/Pc: 1.5
Lbs/Pc: 24	Lbs/Pc: 24	Lbs/Pc: 30
Lbs/SF: 15 - 17	Lbs/SF: 15 - 17	Lbs/SF: 18 - 20
Pcs/Cube: 80	Pcs/Cube: 80	Pcs/Cube: 80
Lbs/Cube: 1929.60	Lbs/Cube: 1929.60	Lbs/Cube: 2488



Ventloc® is stocked in a Natural color with a Natural finish. Ventloc® is available in all of Hanover’s standard colors as well as a Tudor® finish. Additional colors are available when quantities permit. When reflective properties are important, White is available.

SRI VALUES	
Natural Reflect. Avg: 0.202 Emitt. Avg: 0.92 SRI: 20.0	White Reflect. Avg: 0.627 Emitt. Avg: 0.91 SRI: 76.0
<p>PLEASE NOTE: Hanover’s White can vary slightly by product type because of raw material variation. It is suggested that actual samples be requested before making the final color selection.</p>	

The test specimens were evaluated in accordance with the following methods.

- ASTM C936/C936M-15, Standard Specification for Solid Concrete Interlocking Paving Units
- ASTM C140/140M-15, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

WIND PRESSURE

When wind flows around a building, it can produce some very high suction pressures. These occur mainly at the leading edges. The flatter the roof, the higher the suction forces are on the roof.

Moving air affects the building or structure by exerting pressure on it. Pressure varies with the velocity of the air (speed and direction) and also with the shape and orientation of the structure. When the wind is forced over the top of a building roof's edge, a phenomena called "flow separation" occurs. This separation creates a negative uplifting pressure. The higher the wind speed, the higher the negative uplifting force which is measured in pounds per square foot, or PSF. (i.e. Up to 30 feet in elevation, a wind speed of 130 mph equates to a negative 43 PSF uplifting force).

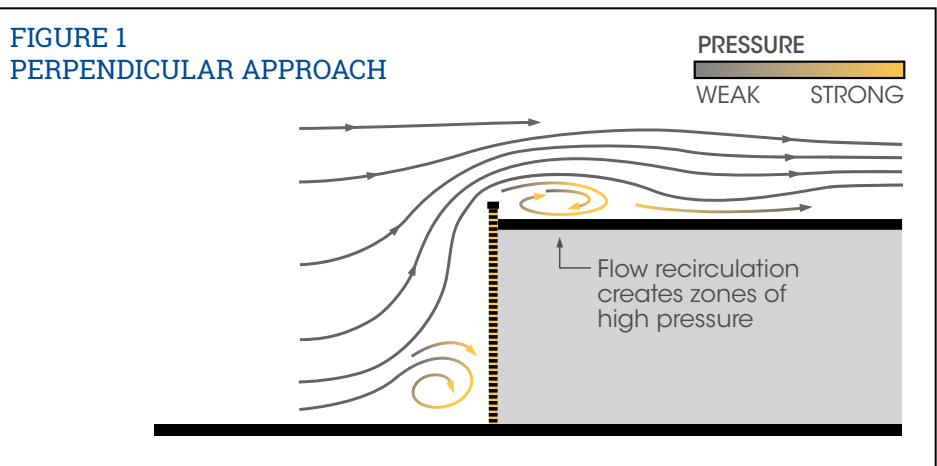
FIGURE 1 and **FIGURE 2** show two different scenarios in which flow separation occurs.

WIND UPLIFT LOADS

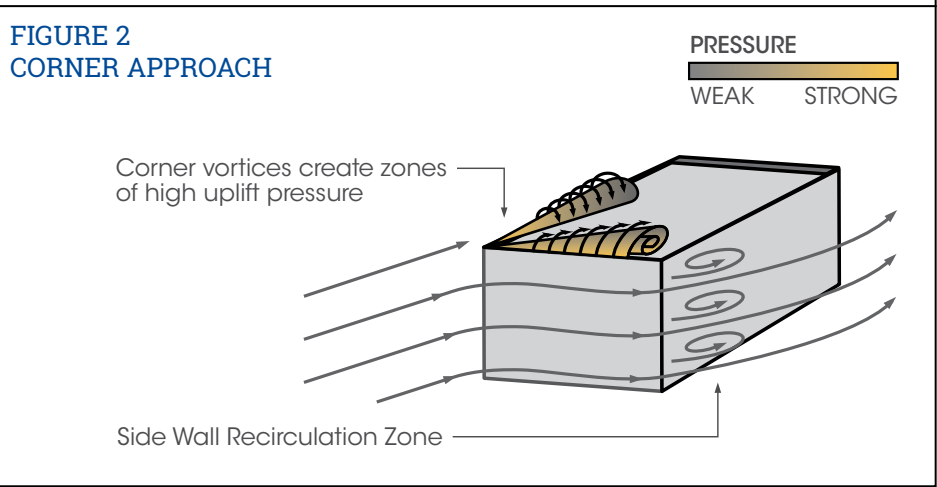
Wind Uplift occurs when wind flow pressures create a strong lifting effect, much like the effect on airplane wings. Wind flow over a roof creates vortices known as

**VENTLOC® AIR VENTS
ENABLE RAPID
TRANSFER OF OVER
PAVER TO UNDER
PAVER PRESSURES.**

**FIGURE 1
PERPENDICULAR APPROACH**



**FIGURE 2
CORNER APPROACH**



whirlwinds that create an uplifting force on roof components. Additionally, positive pressure buildings (HVAC creates positive air flow out of a building) can create an upward push on the roof system at openings. The unique Ventloc® air transfer passageways help negate these positive and negative pressures, providing stability to the paver ballast system.

Wind that is deflected at roof edges, roof peaks or obstructions will cause a large drop in air pressure immediately above the paver's surface in certain zones of the roof (i.e. near corners and walls). Typical roof ballast pavers without vents, which are not specifically designed for wind

PROPER EDGE TERMINATION

Note that edge termination is the most critical aspect of proper roof wind design. Contact Hanover® regarding options for the proper edge termination for your application.

resistance, allow under paver air volume to collect. If the air pressure underneath the paver is not transferred, the resultant pressure difference creates an uplifting force. With no way for the pressure to equalize and no true interlock from one paver to the next, the uplifting force can only be countered by the weight of the individual paver itself. Therefore, ballast dislodgement will occur, resulting in roof ballast failure.

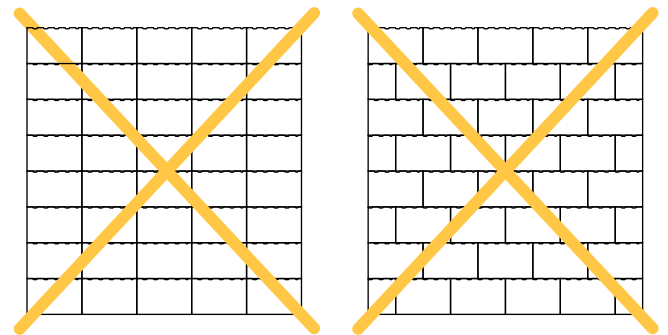
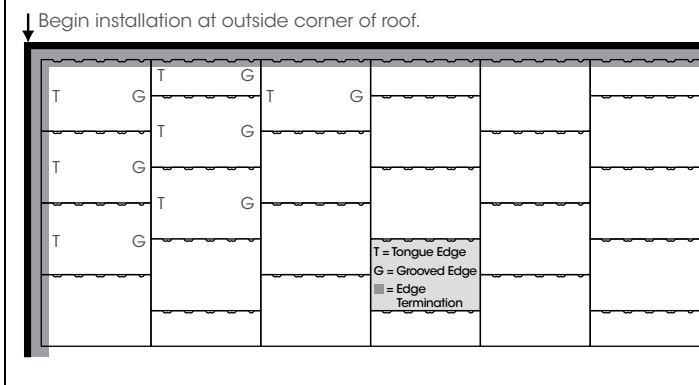
VENTLOC® | INSTALLATION GUIDELINES

Installation specifications have been reduced to brief guidelines. When reviewing these guidelines, take the conditions and situations unique to the location and individual project into consideration. Recognizing the importance of individual project analysis, Hanover® will need specific information before suggesting installation procedures. Project analysis is required before specifying Ventloc® Pavers.

- Ventloc® should be installed in a staggered bond, staggering the tongue and groove edge as shown below in **FIGURE 3**, on a protected membrane and will accommodate limited pedestrian traffic. Adhesive may be required under some circumstances.
- Begin the installation at each corner and work toward the center of that row. All closures should be done in the center with no cut piece less than 6" wide. All cut pieces for this closure should retain the venting edge.
- Ventloc® Pavers must fit snugly together with no spaces between pavers. Full engagement of the tongue and groove must occur. Continue staggered installation of pavers out from each corner of the building, closing paver application in the center areas of the roof with paver cut to fit.
- Cut pavers to fit around drains, curbs and other penetrations. Any unrestrained edges must be adhered. Adhere the first two rows of pavers adjacent to the roof top feature. Cutting details are available.
- Do not use cut pavers less than 6 inches wide. Cut adjacent pavers to allow the installation of a 6" wide paver. Adhere all cut pavers to adjacent units with paver adhesive.
- Edge termination is the most critical aspect of proper roof wind design. Contact Hanover® regarding options for the proper edge termination for your application.

FIGURE 3 | CORRECT VENTLOC® LAYING PATTERN
STAGGERED TONGUE AND GROOVE

FIGURE 4 | INCORRECT VENTLOC® LAYING PATTERN
NON-STAGGERED TONGUE AND GROOVE



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.

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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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