ACF WEST INC.
GEOSYNTHETICS
Products | Service | Solutions

ACF West is the local distributer of PaveDrain
With Locations at:

15540 Woodinville-Redmond Rd
Bldg A #400, Woodinville, WA 98072
(425)415-6115

2505 Frank Albert Rd
Bldg B #111, Fife, WA 98424
(253)922-6641

8951 SE 76th Dr, Portland, OR 97206
(503)771-5115

Northwest Pavement Management Association
"Government and Private Agencies
Working Together for Better Pavements"

NORTHWEST PAVEMENT MANAGEMENT ASSOCIATION

ACF WEST INC. GEOSYNTHETIC PRODUCTS

www.acfwest.com

ACF West Inc. was established in 1986 as a full line stocking distributor of geosynthetic products. We continue to represent manufacturers committed to providing quality materials for the varied demands of the Northwest. ACF welcomes inquiries regarding the selection of correct materials for your project site.

Geotextiles
Woven
Non Woven
Polypropylene
Polyester
High Strength



Geogrids
Polyester
Uniaxial
Biaxial
Retaining Walls & Slopes
Base Reinforcement




Cellular Confinement
Base Stabilization
Earth Retention
Channel Protection
Vertical Walls



Drainage Solutions
Sheet Drain, Strip Drain
Stormwater Detention / Retention / Modules
Small Footprint
95% Efficient
Adaptable, High Strength




Asphalt Interlayer
Paving Fabrics
Waterproofing Membranes
Reinforcement Grid
Repair Systems
Engineered Paving Mats



Barricades Gabion Systems Plastic Sheeting Sediment Bags Grass Pavers

Coir Erosion Control
100% Biodegradable Coir
Available in 400,700, and 900 grams / square meter
Service life 3-5 years
Coir Logs



Erosion Blankets
Straw, Coconut, Excelsior, Jute
Synthetic & Natural Netting
Turf Reinforcement Mats (TRM)
Channel Lining



Hydro Mulch
Hydraulic Mulch
Stabilized Mulch Matrix
Bonded Fiber Matrix
Flexible Growth Medium
Agronomic Solutions



Sediment Control
Sediment Fences
Straw Wattles
Drain Guards
GeoRidge Ditch Berm
Triangular Silt Dike




Wheel Wash Systems
Automated Wheel Wash and Disinfecting Systems
Portable & Permanent
One, Two & Three Wheel Revolution Systems


Geomembranes
ACF West Reinforced HDPE
Geosynthetic Clay Liners
LLDPE
EPDM



Portland
8951 SE 76th Drive
Portland, OR 97206
503-771-5115
503-771-1161 Fax
800-878-5115

Medford
3040 Nellis Way
Medford, OR 97504
541-608-1648
541-608-6333 Fax
541-261-3167 Cell

Salt Lake City
2120 N. Redwood Road
Salt Lake City, UT 84116
801-521-5141
801-521-5144 Fax
800-804-1393

Seattle (North)
15540 Woodinville-Redmond Road
Woodinville, WA 98072
425-415-6115
425-415-6126 Fax
800-423-4567

Seattle (South)
2505 Frank Albert Road
Fife, WA 98424
253-922-8641
253-922-8642 Fax
800-991-8641

Low Impact Development

- Is a term used to describe a land planning and engineering design approach to managing stormwater runoff

What is PaveDrain?

PAVE DRAIN
STORMWATER'S ARCH ENEMY

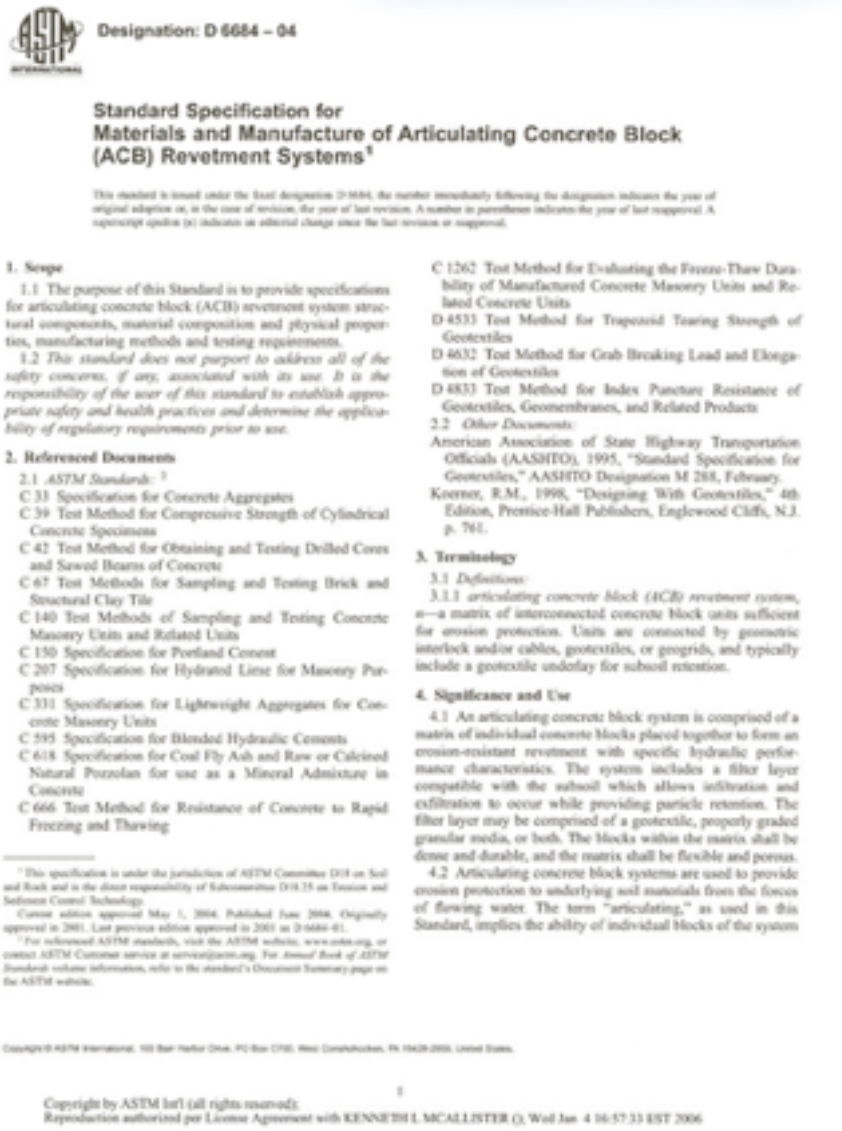
What its NOT?

- It's NOT a paver
  - It has some of the same characteristics of a paver…

ICPI
INTERLOCKING CONCRETE PAVEMENT INSTITUTE ®

What is PaveDrain?

- ❑ It's a *PERMEABLE* Articulating Concrete Block/Mat (P-ACB/M)
- ❑ It follows the ACB ASTM
  - ASTM D 6684 - 04



Designation: D 6684 – 04

Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems[1]

This standard is issued under the fixed designation D 6684; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The purpose of this Standard is to provide specifications for articulating concrete block (ACB) revetment system structural components, material composition and physical properties, manufacturing methods and testing requirements.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 33 Specification for Concrete Aggregates
C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
C 42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile
C 140 Test Methods of Sampling and Testing Concrete Masonry Units and Related Units
C 150 Specification for Portland Cement
C 207 Specification for Hydrated Lime for Masonry Purposes
C 331 Specification for Lightweight Aggregates for Concrete Masonry Units
C 595 Specification for Blended Hydraulic Cements
C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete
C 666 Test Method for Resistance of Concrete to Rapid Freezing and Thawing
C 1262 Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
D 4533 Test Method for Trapezoid Tearing Strength of Geotextiles
D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

2.2 *Other Documents:*

American Association of State Highway Transportation Officials (AASHTO), 1995, "Standard Specification for Geotextiles," AASHTO Designation M 288, February.
Koerner, R.M., 1998, "Designing With Geotextiles," 4th Edition, Prentice-Hall Publishers, Englewood Cliffs, N.J. p. 761.

3. Terminology

3.1 *Definitions:*

3.1.1 *articulating concrete block (ACB) revetment system, n*—a matrix of interconnected concrete block units sufficient for erosion protection. Units are connected by geometric interlock and/or cables, geotextiles, or geogrids, and typically include a geotextile underlay for subsoil retention.

4. Significance and Use

4.1 An articulating concrete block system is comprised of a matrix of individual concrete blocks placed together to form an erosion-resistant revetment with specific hydraulic performance characteristics. The system includes a filter layer compatible with the subsoil which allows infiltration and exfiltration to occur while providing particle retention. The filter layer may be comprised of a geotextile, properly graded granular media, or both. The blocks within the matrix shall be dense and durable, and the matrix shall be flexible and porous.

4.2 Articulating concrete block systems are used to provide erosion protection to underlying soil materials from the forces of flowing water. The term "articulating," as used in this Standard, implies the ability of individual blocks of the system

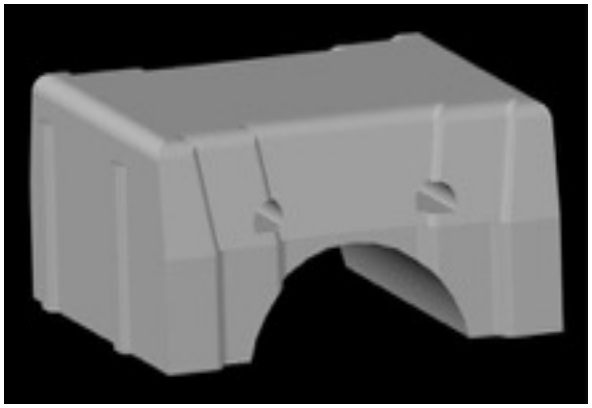
[1] This specification is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.35 on Erosion and Sediment Control Technology.

Current edition approved May 1, 2004. Published June 2004. Originally approved in 2001. Last previous edition approved in 2001 as D 6684-01.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Sustainable Stormwater Solution
Solve Multiple Problems…With One Product

THE PAVEDRAIN® SYSTEM SERVES THREE PURPOSES:
It Paves, It Drains AND It Stores!

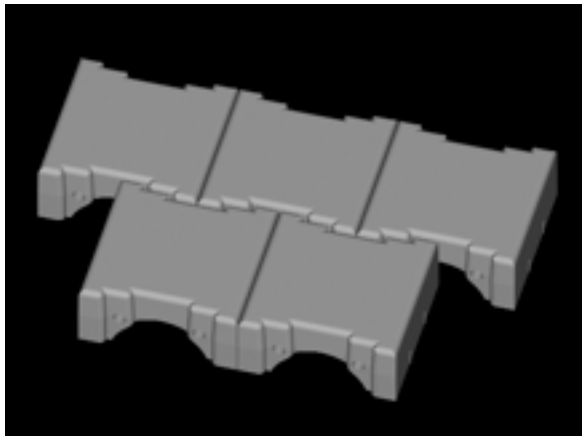


Individual Block

- 12” x 12” x 5.65”
- 45 – 48 Lbs. Ea.

Polyester Cable

Aluminum Crimps



Assembled Mattress

- 7’ x 17.5’ (Typical)
- 7’ x 36’ (Largest)

U.S. Patent Nos:
8,251,607B, 8,366,343
D609,369S Other
Patents Pending

It’s a new and improved paving system

Bladensburg, Maryland Parking Lot AFTER…

The PaveDrain Difference

THE OFFICIAL BLOG OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Greenversations

Paving the Way in American Manufacturing

By Nancy Stoner

Posted on February 23rd, 2012

About the author: Nancy Stoner is the Acting Assistant Administrator for the EPA's Office of Water

On a cold February day, I stood in a driveway in an industrial complex in Bladensburg, MD, just outside the nation's capital. Water from a 500-gallon container was gushing onto the ground in front of me. But rather than forming large puddles and flowing across the parking lot, the water was simply disappearing – not into thin air, but into a special system of permeable pavers called PaveDrain.

Instead of letting rain flow off hard surfaces and carry pollution into local waterways and stormdrains, this innovative product captures it and allows it to slowly filter into the ground. Ernest Maier, a Bladensburg, MD company, manufactures the PaveDrain system and had hosted me for a demo. They are exactly the type of company that President Obama spoke about in his State of the Union address when he laid out a blueprint for an economy that is built to last – one built on American manufacturing, American energy and the skills of American workers.

Loading Capacity & Massive Infiltration Rates

PAVE DRAIN
STORMWATER'S ARCH ENEMY

Pennoni
PENNONI ASSOCIATES INC.
CONSULTING ENGINEERS

November 21, 2011

PVDR 1101.00

Mr. Doug Buch
PaveDrain, LCC
4880 W. Abbott Avenue
Greenfield, WI 53220

RE: PAVEDRAIN CONCRETE BLOCK
STRUCTURAL ANALYSIS FOR AASHTO TRUCK LOADING

Dear Mr. Buch:

We have completed our structural analysis of the PaveDrain concrete blocks and find them capable of supporting AASHTO HS-20 and H-20 truck loading.

We analyzed the the blocks as unreinforced concrete arches supporting a uniform truck tire load with impact per AASHTO standards. The arches were reviewed considering both a fixed end condition and a pinned end condition. We used the ASTM D 6684-04 specified minimum compressive strength of 4000 psi for the concrete. The actual tested strength of the PaveDrain units averages 8900 psi which is more than double the strength used in our structural calculations.

As with all vehicular traffic paving systems, the subgrade soil and base preparation for the PaveDrain blocks must be properly prepared and is critical to the performance of the system.

Sincerely,

PENNONI ASSOCIATES INC.

HS20 & H20 Loading

Germaine E. Lenz, PE, SECB
Structural Project Engineer

GEL/gel

Attachment: Calculations (4 pages)

cc: Khaled Hassan, Pennoni
Charlie Snyder, Pennoni

L:\Projects\PVDR\PVDR1101-Pave Drain H-20 Review\PaveDrain letter 2011-11-21.docx

2041 Avenue C • Suite 100 • Bethlehem, PA 18017 • Tel: 610-231-0600 • Fax: 610-231-2033
www.pennoni.com

CNA
engineers, surveyors & landscape architects

March 23, 2012

Ernest Maier Inc.
4700 Annapolis Road
Bladensburg, Maryland 20710

Attn: Mr. Dan Bishop

Re: Infiltration Testing of PaveDrain

Gentlemen:

In response to your request, CNA has determined the field water infiltration rated of PaveDrain material in accordance with ASTM C1701/C1701M-09. The testing was performed March 9, 2012. at the Ernest Maier Block Company Store located at 4700 Annapolis Road in Bladensburg, Maryland.

Infiltration testing was performed on the PaveDrain material both prior to installation as well as material which had been in place for several months. The material tested prior to installation was fabricated as a "mock up", and the installed material had been in place since May 20, 2011. Test results are attached to this letter. It should be noted that variances between the test results were caused by turbulence of the water used in the test as well as potential variances in pouring rates due to human error. It is our opinion that these discrepancies likely produce a reported infiltration rate which is less than the true rate of the PaveDrain material.

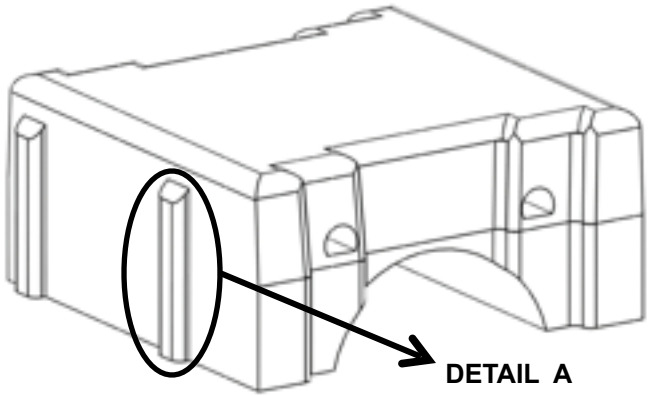
Based on the test results, it is our opinion that the infiltration rate of PaveDrain material is a minimum of 4,000 inches per hour. CNA is available to discuss our results at your convenience. If you have any questions, please contact our office.

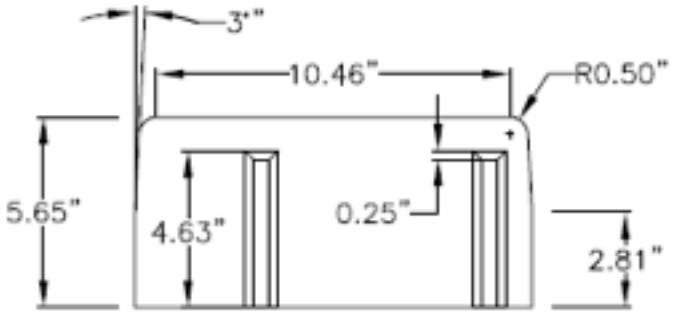
Sincerely,
CNA, Inc.

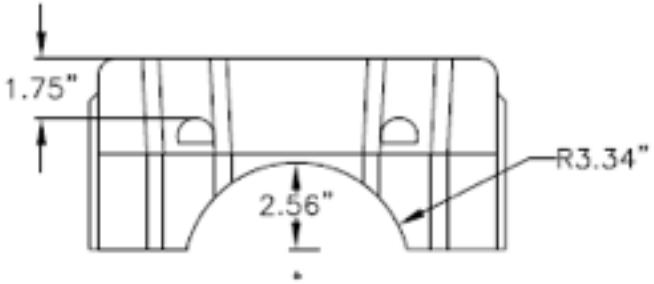
Stephen K. Nolan, P.E.
President

4,000 Inches per hour. (Under Slight Head).

PaveDrain DIMENSIONS

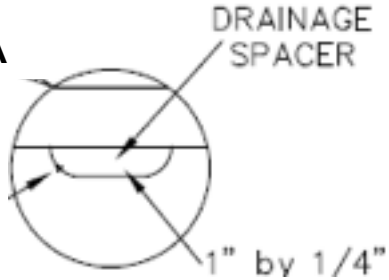




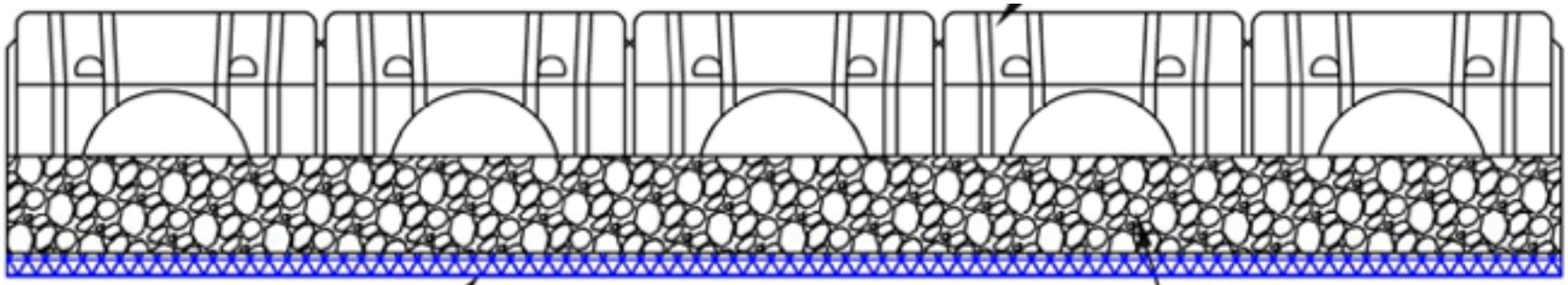


END VIEW

DETAIL A



Typical PaveDrain Cross-Section



CROSS-SECTION

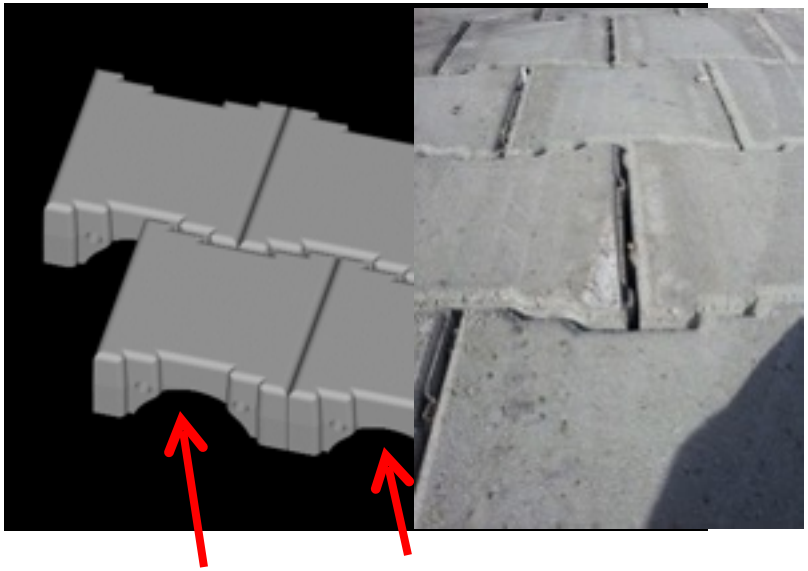
END VIEW

APPROVED GEOGRID OR GEOTEXTILE

6-12" OF BEDDING STONE (Thickness to be determined by engineer). Stone to be 3/4" -1" clean or recycled stone or concrete.

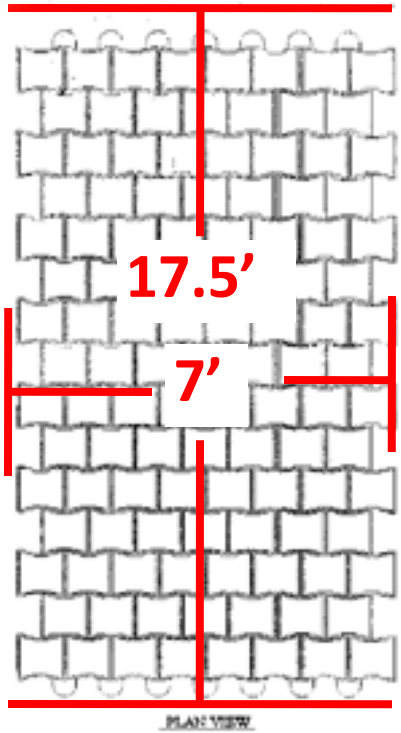
PAVE DRAIN®
STORMWATER'S ARCH ENEMY

All corners are rounded so that no “edge” is created to catch on a snow plow.



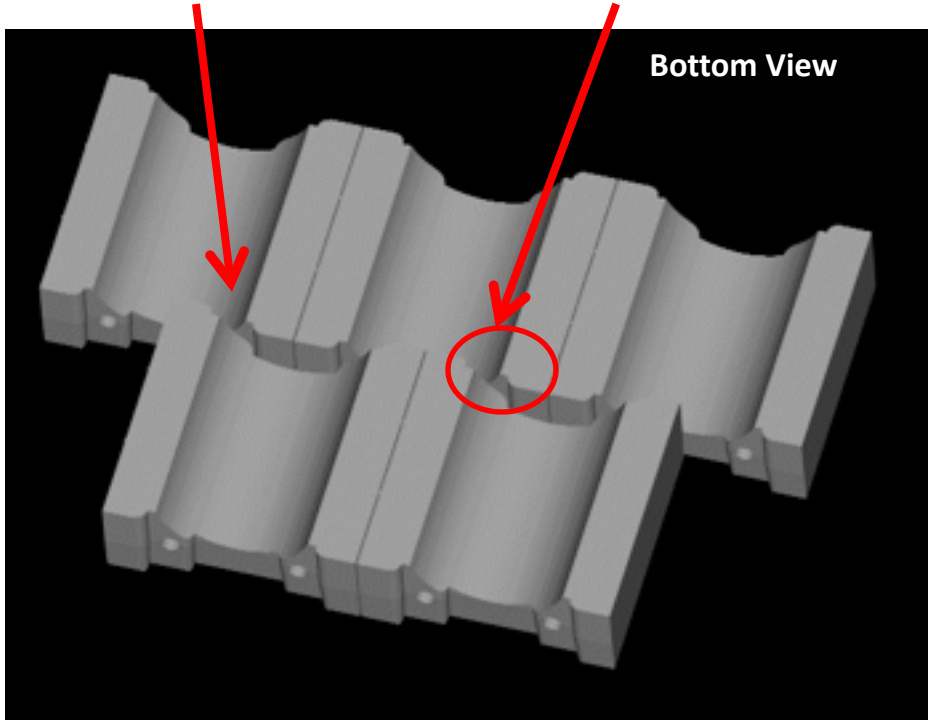
Prefabricated cable ducts will allow large mats to be assembled and lifted into place with equipment.

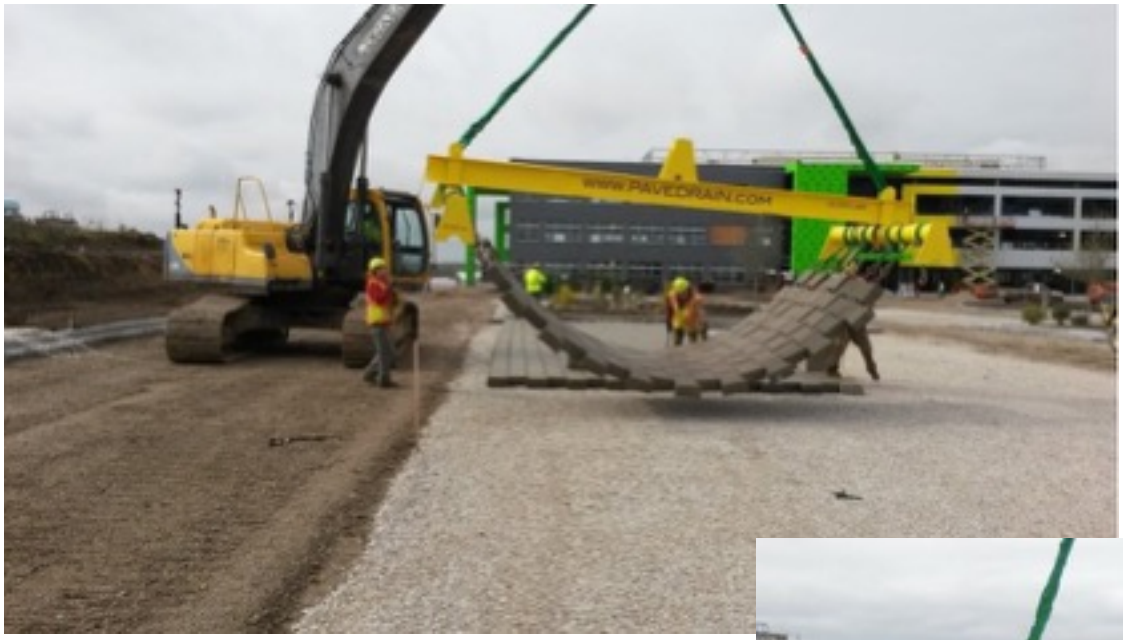
Mat sizes will vary.



PAVE DRAIN®
STORMWATER'S ARCH ENEMY

Continuous flow is allowed among ALL blocks for added capacity.
This will also allow for lateral water movement for grade changes.





Conventional construction equipment can be utilized for installation

6 - 7 laborers is typical to start. Usually ends up at 4-5.

Spreader Bar will be rented to contractors

TESTING – Rain Simulator

8” per hour rain simulation test

Less than 15 minutes following simulated rainfall…dry block

Infiltration Rates

CNA
engineers, surveyors & landscape architects

March 23, 2012

Ernest Maier Inc.
4700 Annapolis Road
Bladensburg, Maryland 20710

Attn: Mr. Dan Bishop

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Based on the test results, it is our opinion that the infiltration rate of PaveDrain material is a minimum of 4,000 inches per hour. CNA is available to discuss our results at your convenience. If you have any questions, please contact our office.

Sincerely,
CNA, Inc.

Stephen K. Nolan, P.E.
President

4,000 Inches per hour!!

The PaveDrain Advantages

- **Storage ABOVE the Base AND Below**
- Massive Infiltration
- Lateral Permeability
- Stable Surface
- Installation Friendly
- Integrates with system design for stormwater management:
  - Peak discharge control
  - Water quality control
  - Runoff volume reduction
- ***Maintenance – DOCUMENTED, LOW COST RESULTS***

UNIVERSITY OF LOUISVILLE

Center for Infrastructure Research

PAVE DRAIN
STORMWATER'S ARCH ENEMY

ASSESSMENT OF INFILTRATION PERFORMANCE AND MAINTEANCE OF PAVEDRAIN PAVEMENTS
FOR TWO APPLICATIONS IN LOUISVILLE, KY

Hamidreza Kazemi, PhD Candidate
Thomas Rockaway, Ph.D., P.E.
Josh Rivard, MUP
Center for Infrastructure Research
Civil and Environmental Engineering Department
University of Louisville

❖ Monitoring Project

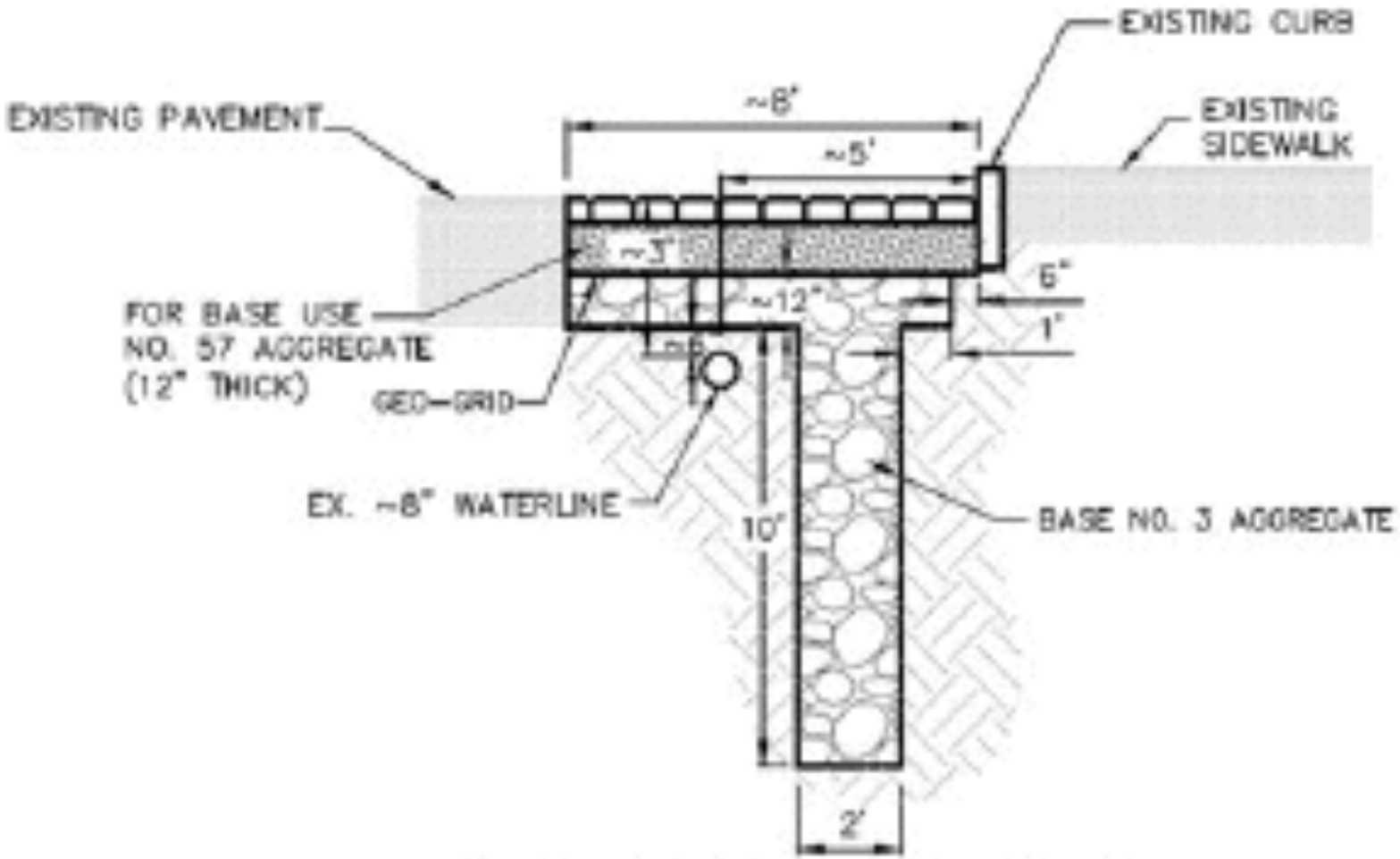
- ❑ Multi-year effort to evaluate and establish long-term trends
- ❑ Standardize design and maintenance criteria
- ❑ Partnership
- ❑ USEPA Monitoring of Infrastructure

MSD
Metropolitan Sewer District

Green

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

❖Project Description – Controls 19G & 19H



19G STANDARD CROSS-SECTION

UNIVERSITY OF LOUISVILLE

Center for Infrastructure Research

PAVE DRAIN

STORMWATER'S ARCH ENEMY

❖ Clogging & Maintenance

- ❑ Electronic Measurements AND…
- ❑ Visual Inspections
  - Clogging advanced from the up-gradient edge towards the down-gradient edge and along the curb
- ❑ Once clogging reached the down-gradient edge the ratio volume decreased to <1:1…TIME FOR MAINTENANCE

UNIVERSITY OF LOUISVILLE

Center for Infrastructure Research

PAVE DRAIN
STORMWATER'S ARCH ENEMY

❖ Project Description – Control 19H & 19G

Characteristic	Control 19H	Control 19G
Drainage Area (acre)	0.27	0.72
Impervious %	59%	61%
Impervious Area: Control's Area	**16:1**	**20:1**
Control's Length (ft)	55	120
Control's Width (ft)	8	8

TREMENDOUS AMOUNT OF DEBRIS WORST CASE SCENARIO

The PaveDrain Difference – Maintenance

PaveDrain VAC Head

- ❑ 30” diameter
- ❑ Weight is under 50 lbs.
- ❑ Handle for ease of moving
- ❑ Adjustable polyethylene caster wheels

- ❑ Continuous suction up to 3,400 CFM, only 1,500 CFM is used.
- ❑ Spinning water nozzles displace 1,000 psi. Can be adjusted up to 2,500 psi

UNIVERSITY OF LOUISVILLE

Center for Infrastructure Research

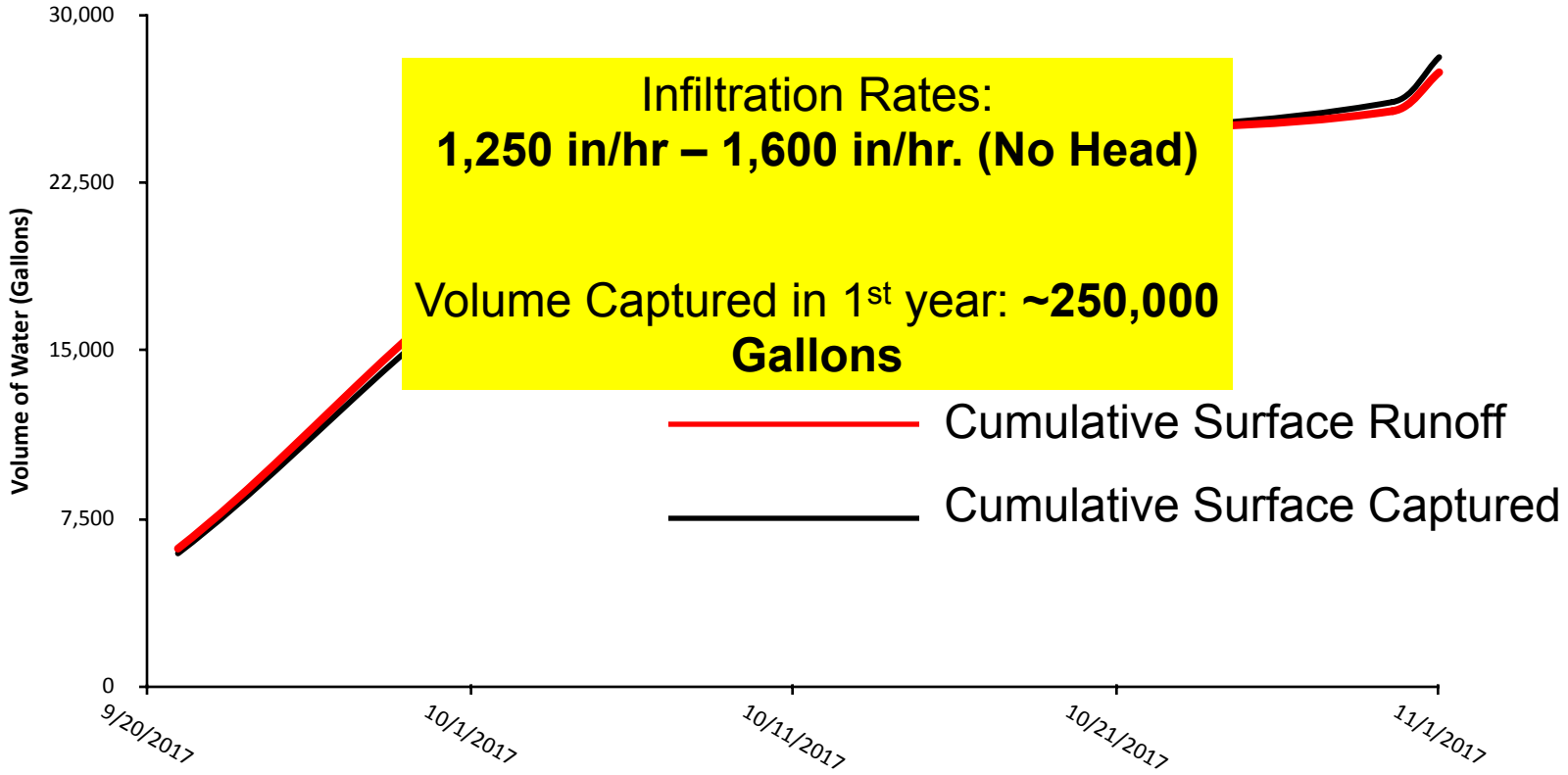
PAVE DRAIN
STORMWATER'S ARCH ENEMY

❖ Maintenance Effectiveness

- ❑ PaveDrain Vac Head

❖ Maintenance Effectiveness: Conclusions

- ❑ Results indicate that unclogged and properly maintained PaveDrain® blocks, were able to capture ALL stormwater runoff flowing into controls 19G & 19H



❖ Maintenance Effectiveness: Conclusions

- ❑ Performance can be restored
- ❑ Type of maintenance is important

If all else fails…

Maintenance Advantage

No other system can be mechanically lifted out allowing for the aggregate base to be cleaned and then re-installed!!!!

MANUFACTURING

MANUFACTURING - COLORS

About Color

- The color illustrations on this page are as accurate as photography and printing processes allow. Final selection of colors should be made from several physical samples.
- Shade variations are inherent in colored concrete products using natural materials. Delivered product can vary slightly from physical samples. When installing colored concrete products, units should be selected randomly from several packages simultaneously.
- PaveDrain® is produced with a process utilizing the highest quality color pigments and raw materials available. This process ensures that each PaveDrain® unit is thoroughly saturated with formulated aggregates and color pigment throughout the full thickness of the unit, not just a surface coating.
- All products are produced in accordance with industry accepted standards and applicable specification requirements.

About Efflorescence

Efflorescence is a whitish, powder like deposit that may sometimes appear on the surface of the paving stones. It may appear immediately or within a short time after installation.

Left alone, normal wear and exposure to the elements will dissipate the efflorescence.

Efflorescence is a normal occurrence in all cement based products, as well as many color paving products. Because it is a natural reaction to the proper hydration of concrete, we accept no responsibility or liability for replacement.

If there is a need to remove the efflorescence before it naturally wears away, best results are obtained by using a proprietary efflorescence remover which is available from most mason supply dealers. Do not use muriatic acid.

If a sealer is to be applied to the paving stones, it is recommended that any presence of efflorescence be removed prior to sealer being applied.

The PaveDrain Infiltration Calculator

Project Name:	City of Milwaukee	Do you want to use the arch and gap spacing in PaveDrain for storage?	Enter 1 = Yes, 0 = No: 1
Address:			
	State: WI		
Project Size:	30,000 SF		

Water Storage Factors		
Void space of #57 Clean Stone[1]		35.00%
Void space of #2 Clean Stone[1]		40.00%
Depth of #57 Clean Stone (inches)		6.00
Depth of # 2 Clean Stone (inches)		12.00
Rainwater per Year in State (inches)[2]		32.60
Gallons per Square Foot Factor ("GF")		0.62001
Gallons per Square Foot based on Above		20.21
Storage Space per Pavedrain Block[3]		0.095

Storage Calculation		
Storage (CF) [Clean Stone + Pavedrain]		20,373.40
Gallons per Cubic Feet		7.48
Total Storage in Gallons [Clean Stone + Pavedrain]		152,393.04
Total Storage: Infiltration [Rate x SF x GF]		9,300.15
Total Storage in Gallons		161,693.19
Maximum Rain Event Storage [Storage + Infiltration]		8.69

[1] We have used accepted void percentages from local jurisdictions

[2] Based on NOAA Website figures

[3] See sheet "pavedrainvoid"

[4] Statistics on major cities from NOAA website

Rain Event Calculation & Annual Stormwater Infiltration		
State Capital Largest Daily Rainfall - 2011[4]	Madison 1.09	Inches
Infiltration Rate per Hour Based on Soil		0.50
Target Rainfall Event (Inches/Hour)		6.00
Indicated Gallons of Water on Pavedrain		111,601.80
Excess (Deficit) of Water Storage (Gallons)		50,091.39
Hours to Infiltrate Event in Soil (Rain Event)		12.00
Annual Gallons Infiltrated of Runoff from Direct Rainfall		606,369.78
Hours to Infiltrate Direct Rainfall (Rainfall-Year/Infiltration Rate)		65.20

Supplemental Surface		
Roof (SF)		5,000
Impervious Surface (SF)		10,000
Total Supplemental Surface		15,000
Total Gallons for Year		303,184.89
Capacity Required during Targeted Rain Event		55,800.90
Capacity Required during 2" Inch/Hr Event		18,600.30

Overall Excess (Deficit) of Water Storage (Gallons)	(5,709.51)

Notes & Warnings
-Hours to Infiltrate Event in Soil (Rain Event) Are Acceptable. (Cell H29) -Warning: Water Storage Deficit. Increase Project Size (Cell C16), Stone Depth (Cell D25).

Des Moines, IA - MLK & Ingersoll Ave.

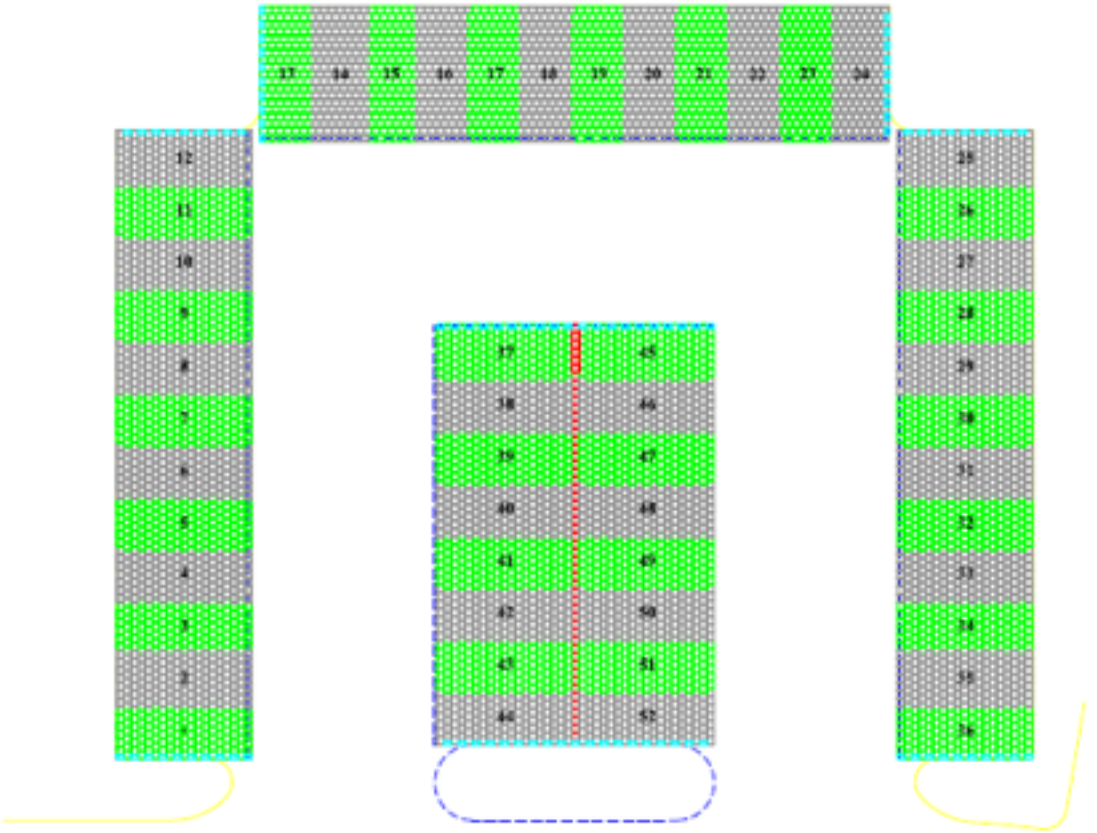
MAT COVERAGE

5,422 UNITS (6,035 SF.)

HAND-PLACED COVERAGE

LOCK BLOCKS — 52 +/- UNITS (69 SF.)

HALF BLOCKS — 96 +/- UNITS (65 SF.)



MAT TOTAL:	6,035 SF.
HAND-PLACED TOTAL:	94 SF.
PROJECT TOTAL:	6,129 SF.

NOTES:

1. ALL VOIDS GREATER THAN 2" SHALL BE FILLED WITH 4,000PSI CONCRETE.
2. - - - INDICATES AREA OF COVERAGE, AS TAKEN FROM DWG FILE PROVIDED BY:COOPER CRAWFORD & ASSOCIATES, LLC.

DISCLAIMER:

THE INFORMATION CONTAINED HEREIN HAS BEEN COMPILED BY PAVEDRAIN® LLC AND TO THE BEST OF OUR KNOWLEDGE, ACCURATELY REPRESENTS THE PAVEDRAIN® PRODUCT USE IN THE APPLICATIONS WHICH ARE ILLUSTRATED. FINAL DETERMINATION OF THE SUITABILITY FOR THE USE CONTEMPLATED AND ITS MANNER OF USE ARE THE SOLE RESPONSIBILITY OF THE USER. STRUCTURAL DESIGN AND ANALYSIS SHALL BE PERFORMED BY A QUALIFIED ENGINEER.

THIS DRAWING IS BEING FURNISHED FOR THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED IN WHOLE OR IN PART, NOR DISCLOSED TO OTHERS WITHOUT THE CONSENT OF PAVEDRAIN® LLC.

REVISIONS

DATE	DESCRIPTION
3/4/13	Initial Plan w/ Overlap Info Digitized

PROJECT NAME: INGERSOLL SQUARE III, LP — DES MOINES, IA

PREPARED BY: MD Cooper Drafting & Design, LLC

PREPARED FOR: PAVEDRAIN, LLC

4880 W. ABBOTT AVE. • GREENFIELD, WI. 53220
OFC (414) 475-6697 • MOB (414) 651-1017
www.pavedrain.com

PAVEDRAIN 5.65" REVETMENT UNIT

DATE: 3/14/13 — DRAWING NAME: PLAN VIEW LAYOUT

CHECKED BY: DB — SCALE: NOT TO SCALE

P-1

Section 1

Base Preparation

Open Graded Base & Bedding Course Aggregate: Should be a clean 3/4" stone (i.e. AASHTO #57), which weighs approximately 120 pounds per cubic foot. Calculate the depth of stone using the average depth of the stone from the highest point to the lowest point (based on engineered depth calculations). Calculate the project area, including an additional 2 feet around the perimeter and an additional 5% for losses.

Edge Restraint: *Rarely utilized for the PaveDrain® System.* To Be Determined by the engineer of record.

Separation Fabric: A high strength Geosynthetic such as Mirafi *RS280i, RS380i or RS580i®,* Tensar® TriAx® or equivalent is recommended to be installed as a base reinforcement layer between the AASHTO #57 open graded base and the natural subgrade soil. **The "vertical walls" of your prepared area should be lined with a Geosynthetic as well.** The Geosynthetic must lay flat against the subgrade/sides, be free of wrinkles and over-lap the corresponding piece by NO LESS than 12". ***The Geosynthetic is a key component of the PaveDrain® System. Negating its use could be significantly detrimental to the function, performance, safety and design of any project using PaveDrain®.*** PaveDrain, LLC, its licensees, manufacturers and distributors cannot be held responsible for the any project that does not use an appropriate Geosynthetic between the subgrade and the open graded base material.

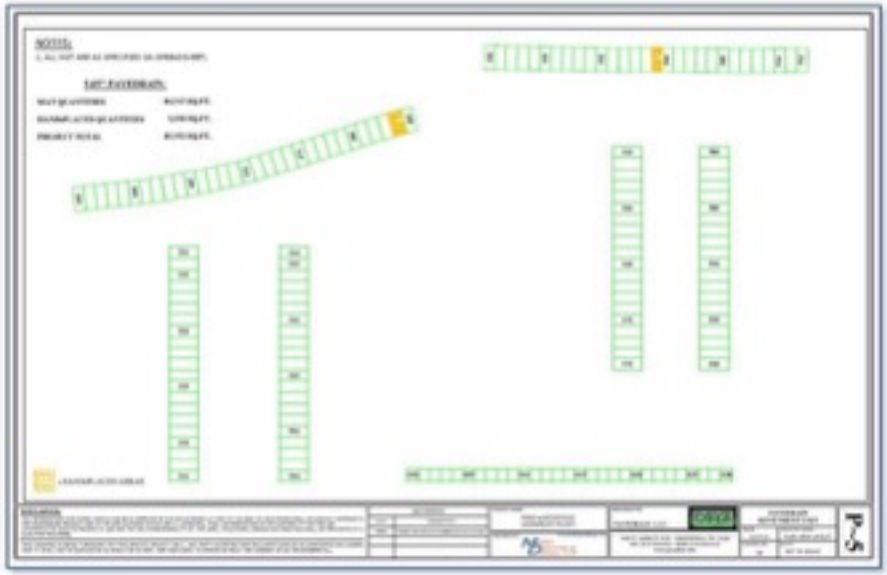
Fig. 1

Fig. 2

LAYOUT & PREPARATION

If individual units are to be installed they will arrive wrapped on pallets. Pallets will weigh approximately 3,600 lbs or less. If the PaveDrain® System is installed in mattress form, a mat layout will be provided by PaveDrain, LLC or its representatives. Mat weights and sizes will be determined in advance of shipment. Each mat will be pre-fabricated at the manufacturing facility and delivered to the site ready to be installed.

NOTE: Before digging, always call your local utility companies to locate any underground utilities.



PREPARE SUBGRADE SOILS

For best results, the finished subgrade must be flat and smooth. The subsurface should be firm and not easily rutted. A California Bearing Ratio (CBR) should be established well in advance of the installation. The appropriate Geosynthetic is critical and should prevent rutting. If the subgrade appears weak or damp following the installation of the appropriate Geosynthetic contact a professional geotechnical engineer or local PaveDrain representative for further assistance.

Fig. 3

Fig. 4

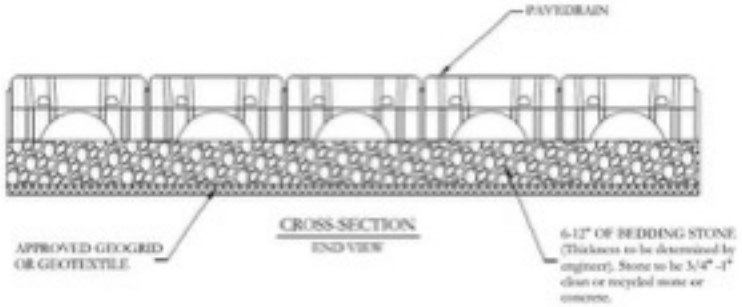
PREPARATION OF OPEN GRADED BASE

The depth of stone should be determined well in advance of the installation of the PaveDrain® System by the engineer of record based on the CBR and stormwater storage requirements.

Open graded base materials **must** be free of fines. Take care not to track soil onto the Geosynthetic or allow sediment to wash into the excavation during construction.

If it is determined that a rock depth of 6-12" is appropriate for the PaveDrain® System (SEE CROSS-SECTION BELOW) then the following directions should be followed.

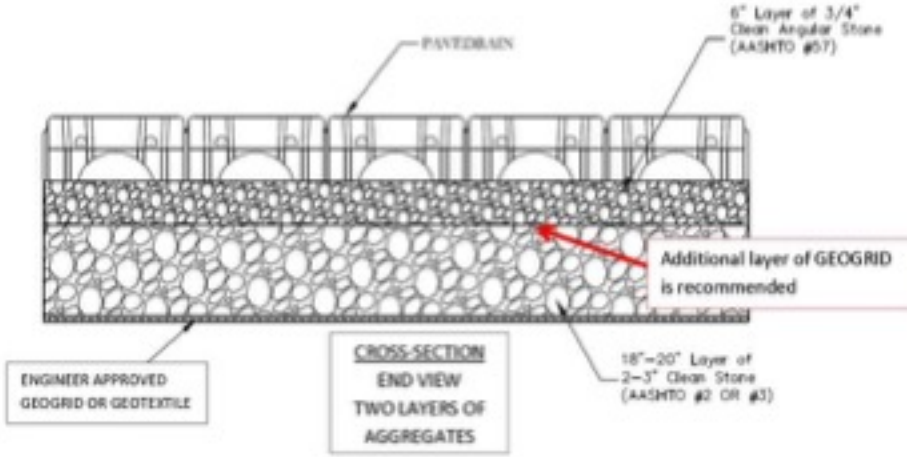
AASHTO #57 stone is recommended as the finish layer of stone for most installations. Place the stone on the appropriate Geosynthetic in 6-inch layer(s) and compact accordingly. A vibratory plate compactor in both directions is best for compaction of the final layer of AASHTO #57 stone that will be in direct contact with the bottom of the PaveDrain® units (Fig. 5). There should be no visible movement of the material once compacted and the base should be smooth when completed.



REMEMBER: Subgrade preparation is **CRITICAL!** The PaveDrain® System will mirror any discrepancies made with the subgrade.

Fig. 5

If it is determined by the engineer of record that a rock depth in excess of 12" is appropriate for the PaveDrain® System (SEE CROSS-SECTION BELOW) then the following directions should be followed.



CRUCIAL TOOLS

Professional survey equipment is always recommended; other suggested materials are Pipe lasers (if available), marking paint, tape measure, chalk line, block markers/crayons, string line, survey stakes, rubber mallets, 4'-5' pry bars, 4 ½" angle grinder with concrete cutting blade, masonry saw (wet/dry) with diamond cutting blade, spade and flat shovel, hard-tooth garden rake, Geosynthetic, "peanut" or double roller and plate compactor.

****BUMP BAR** – For Mattress Installation**

See Step #5 in the Mattress Installation section below for further details and FIG. 21 for a photo of the bar. Made from 5" x 5" angle iron that is roughly 8' in length.

NOTES FOR ENGINEERING

1. For best results subgrade soil infiltration rates should be confirmed.
2. The bottom of the stone should be a minimum of two feet above the seasonally high water table.
3. Avoid over compacting or contaminating the natural subgrade soils.
4. Under drain piping and storage systems may be used if designed by a qualified professional engineer.
5. For moist or clayey subgrade soils consult a geotechnical engineer.
6. A sieve analysis of the open-graded stone material should be reviewed to confirm it meets the following filter criteria:

Filter Criteria: D_{15} open graded base / D_{50} bedding material < 5 and D_{50} open graded base / D_{50} bedding material > 2

Where: open graded base = AASHTO #57 bedding material = sieve size for which 15 percent of material is smaller D_{50} = sieve size for which 50 percent of material is smaller.

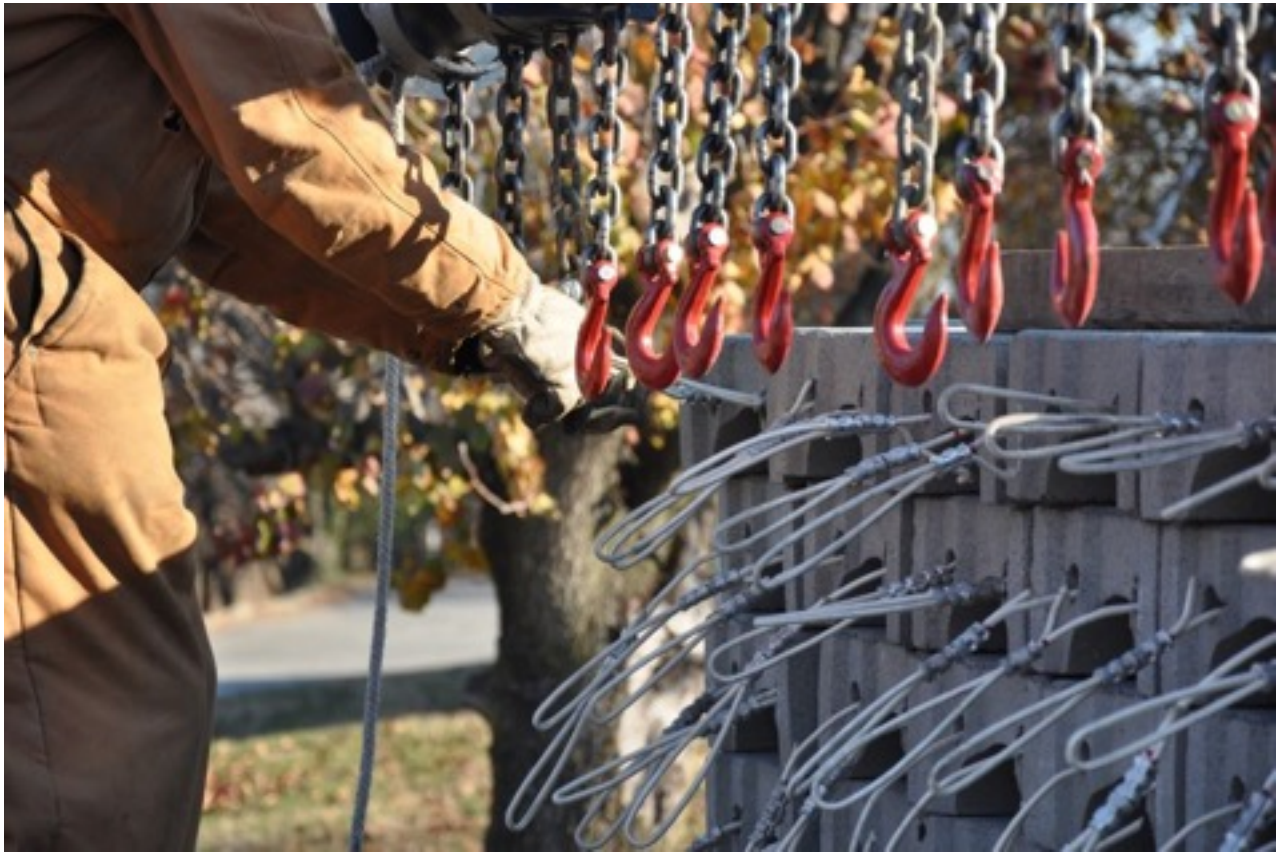
Base Preparation

Base Preparation

The PaveDrain Installation

The PaveDrain Installation

The PaveDrain Installation

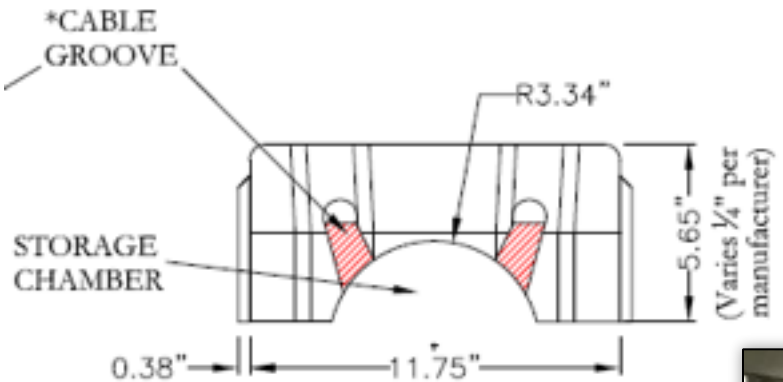


The PaveDrain Installation

The PaveDrain Installation

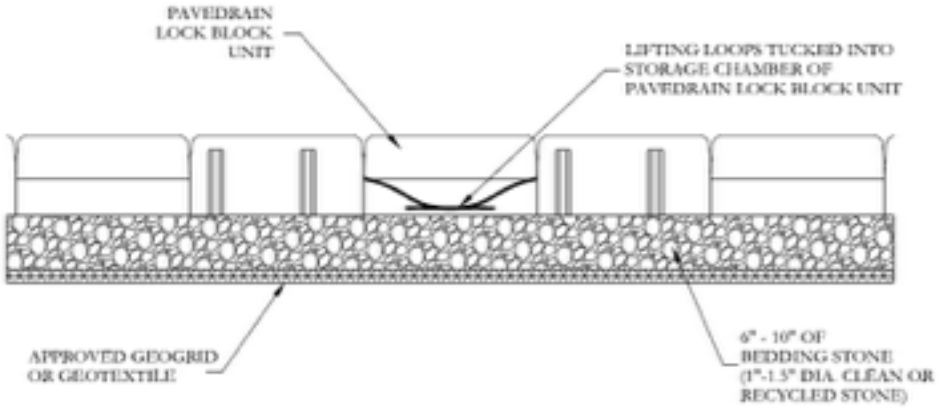
The PaveDrain Installation

The PaveDrain Installation

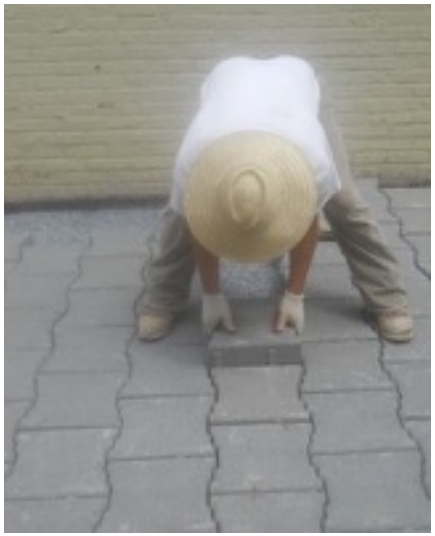


END VIEW

End-to-End Connection



PaveDrain “Lock Blocks” being placed by hand.




PAVE
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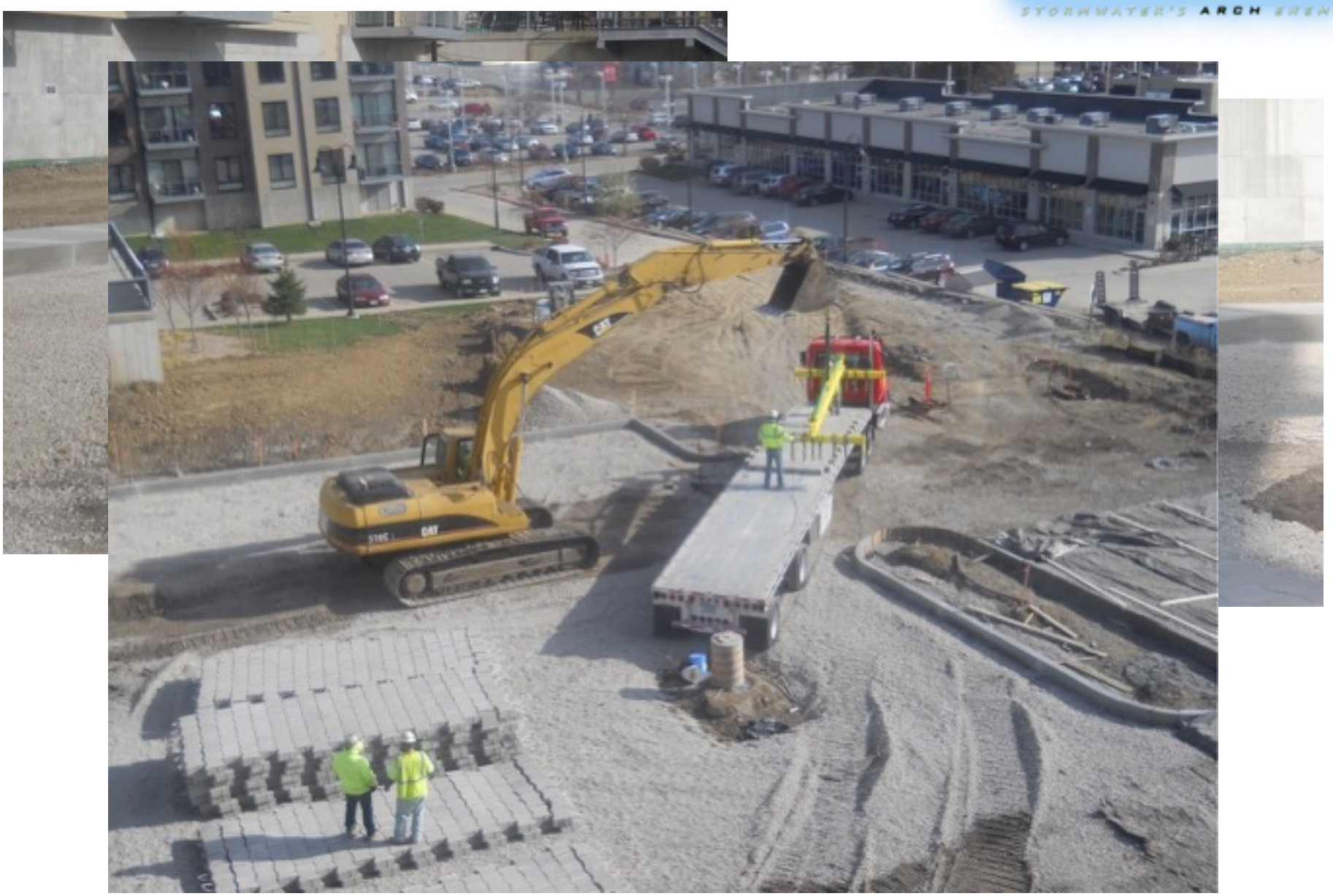
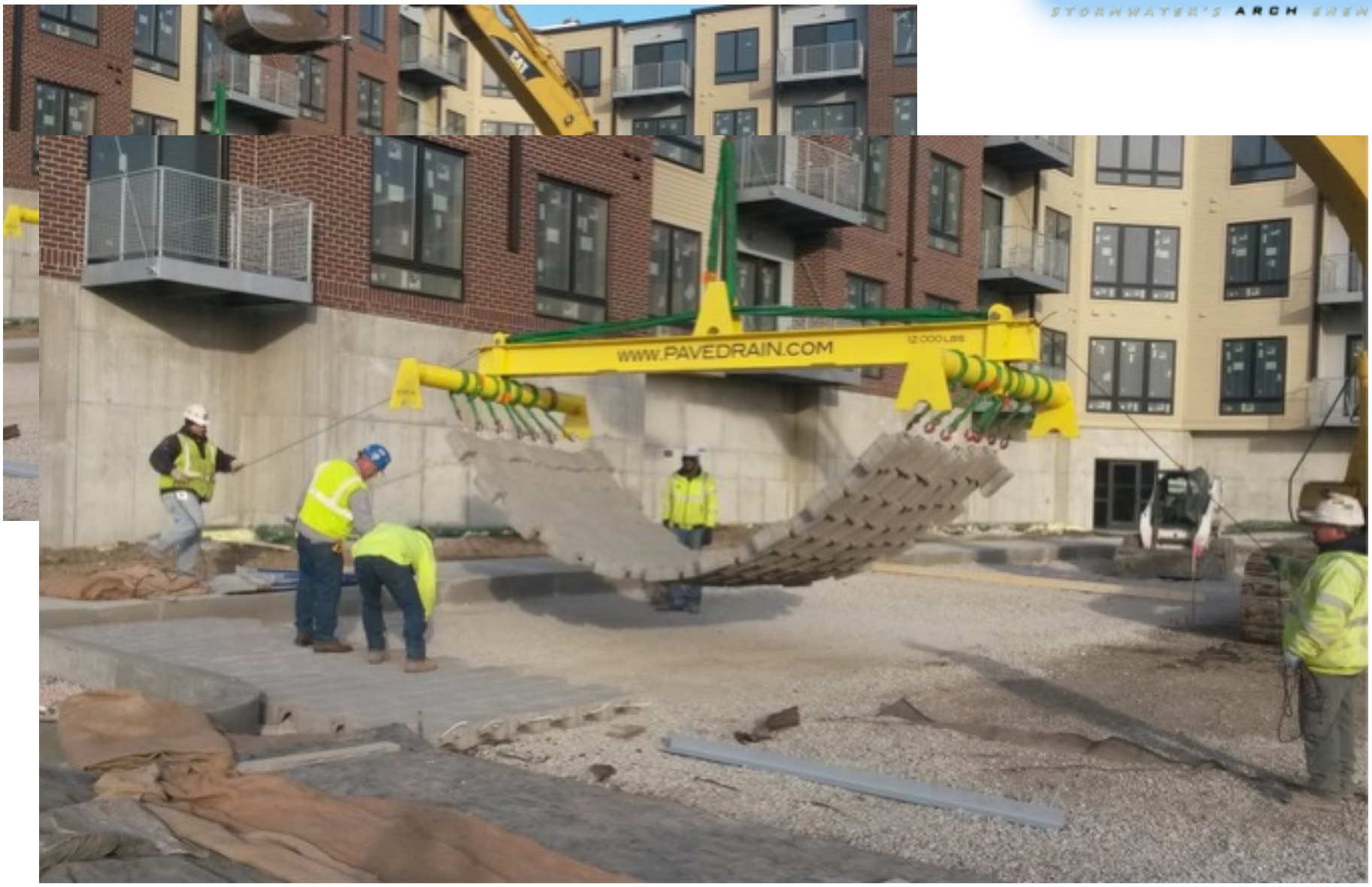
STORMWATER'S ARCH ENEMY
ADA Compliant

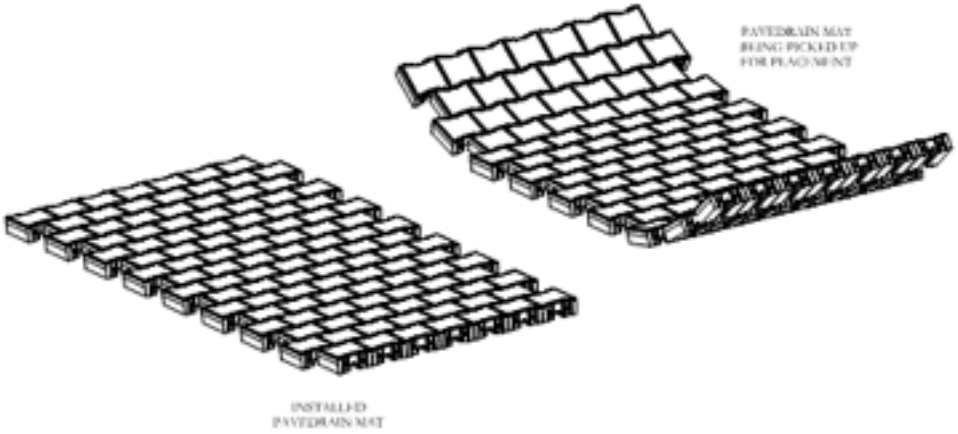
Des Moines, IA - MLK & Ingersoll Ave.

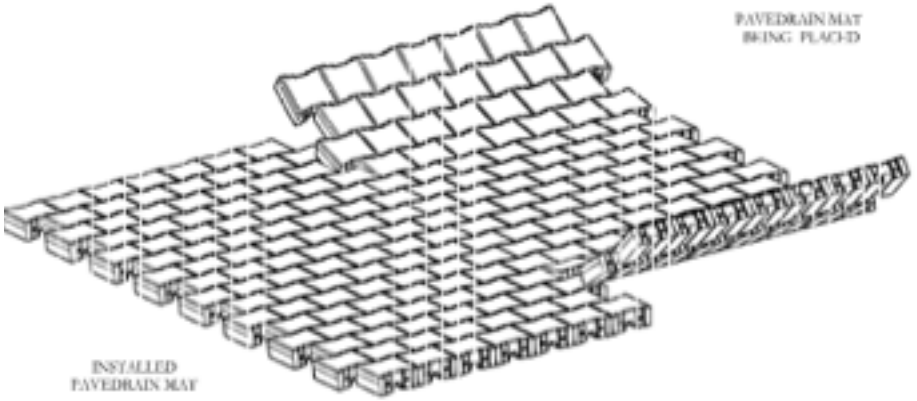


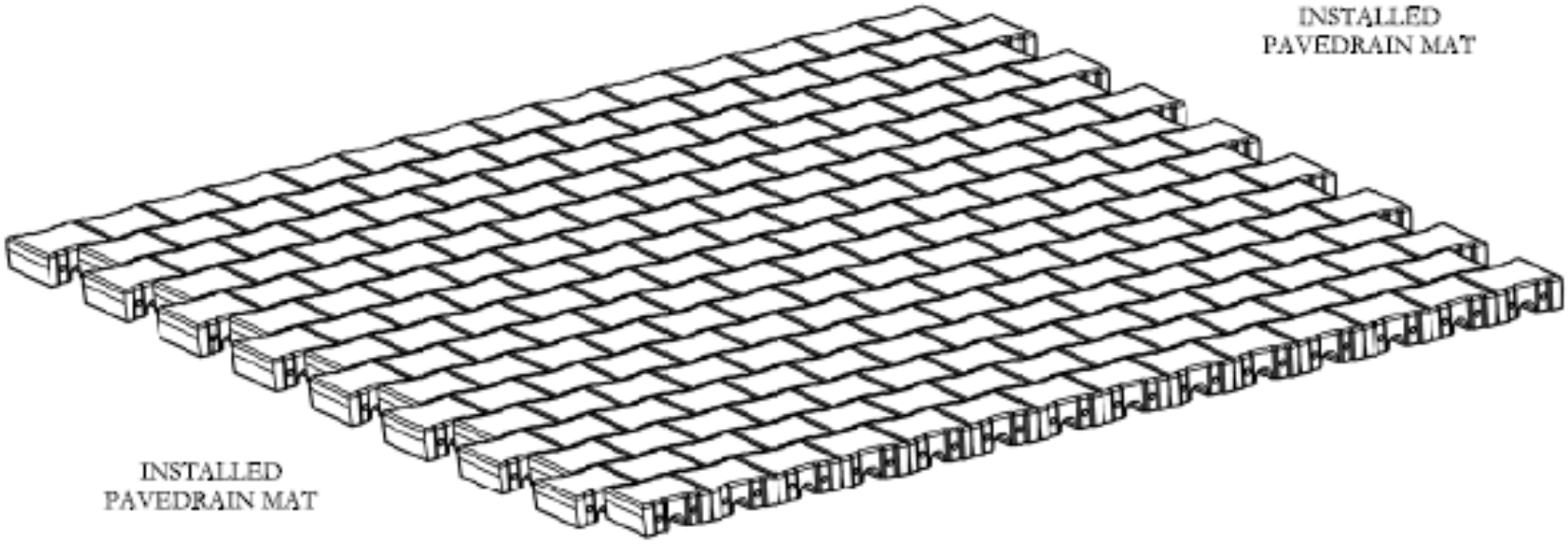
Des Moines, IA - MLK & Ingersoll Ave.



“Zippering” the mats together forms a seamless side-to-side connection.







Des Moines, IA - MLK & Ingersoll Ave.

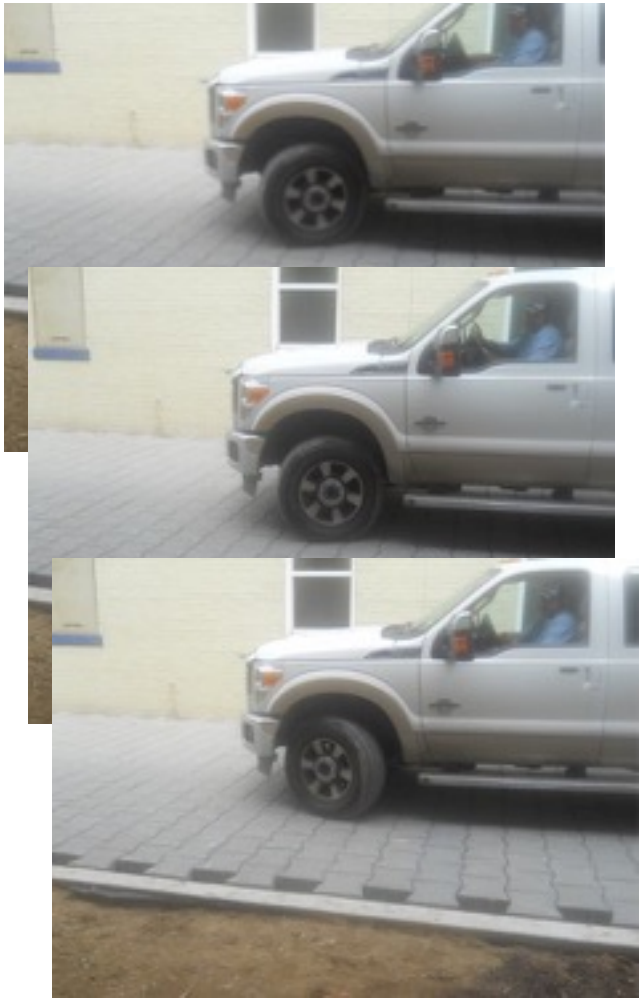
Des Moines, IA - MLK & Ingersoll Ave.

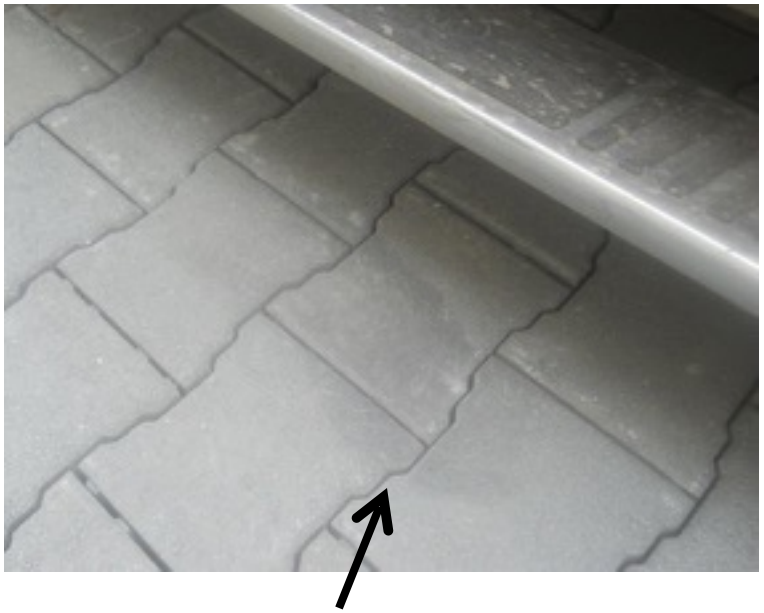
Des Moines, IA - MLK & Ingersoll Ave.

Des Moines, IA - MLK & Ingersoll Ave.

The PaveDrain Difference – Hand Placed

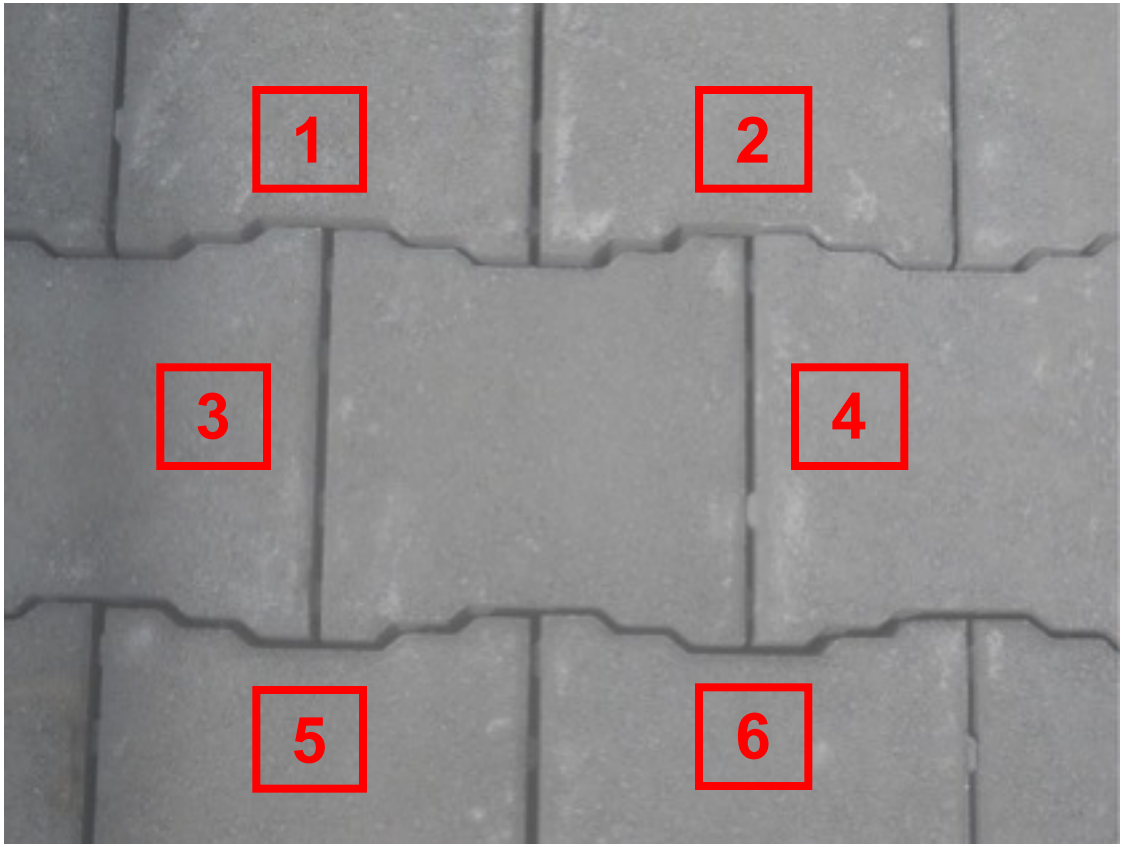
The PaveDrain Difference





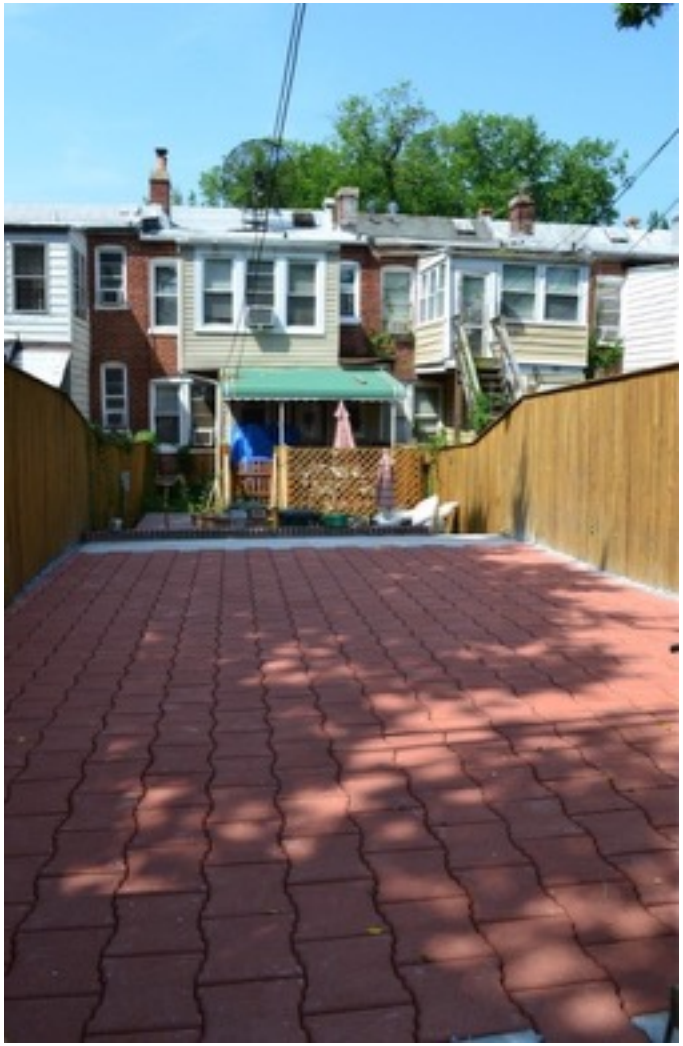
Tread marks left by turning wheel

The PaveDrain Difference



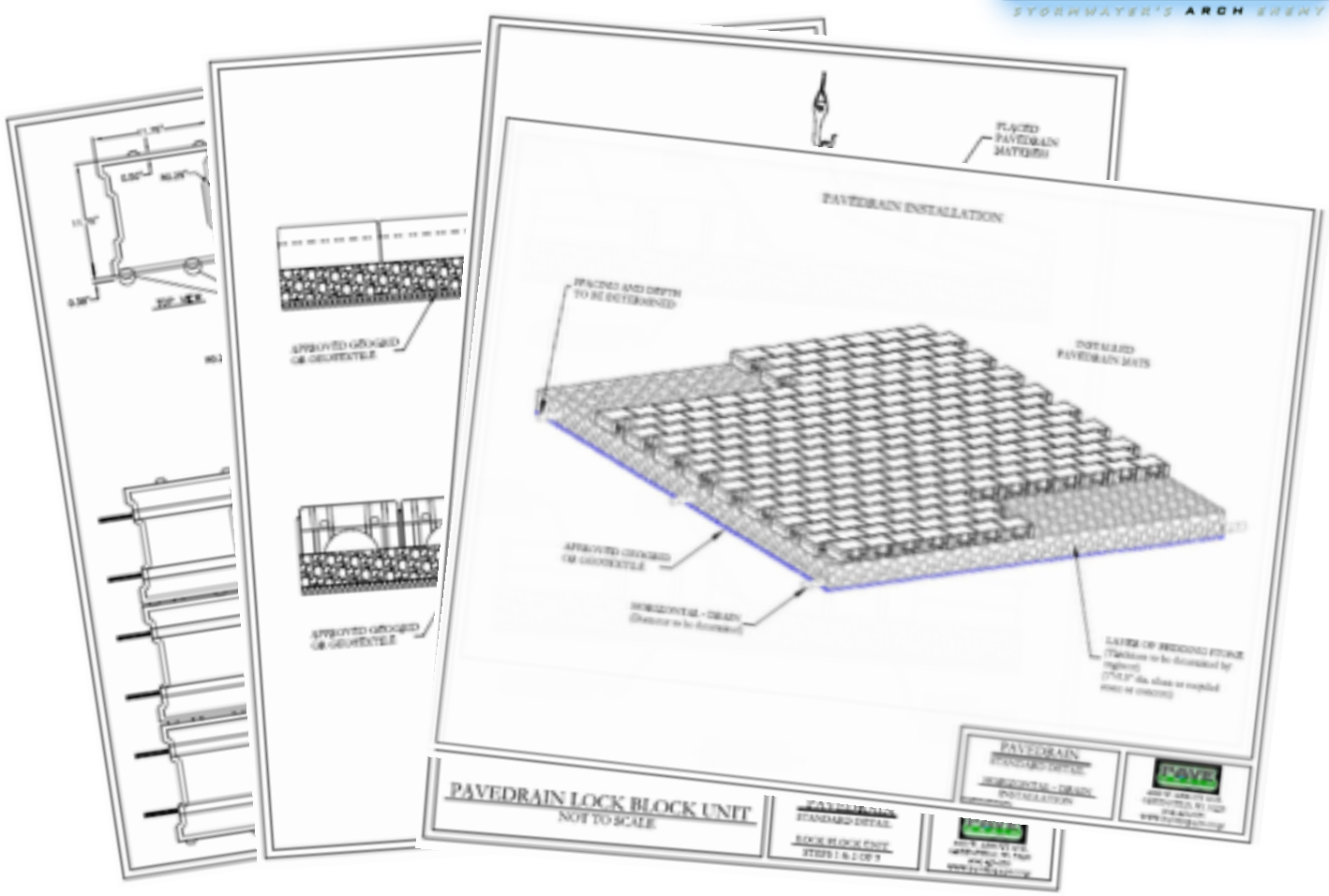
City Streets – Installed Projects

The PaveDrain Difference – Unique Projects

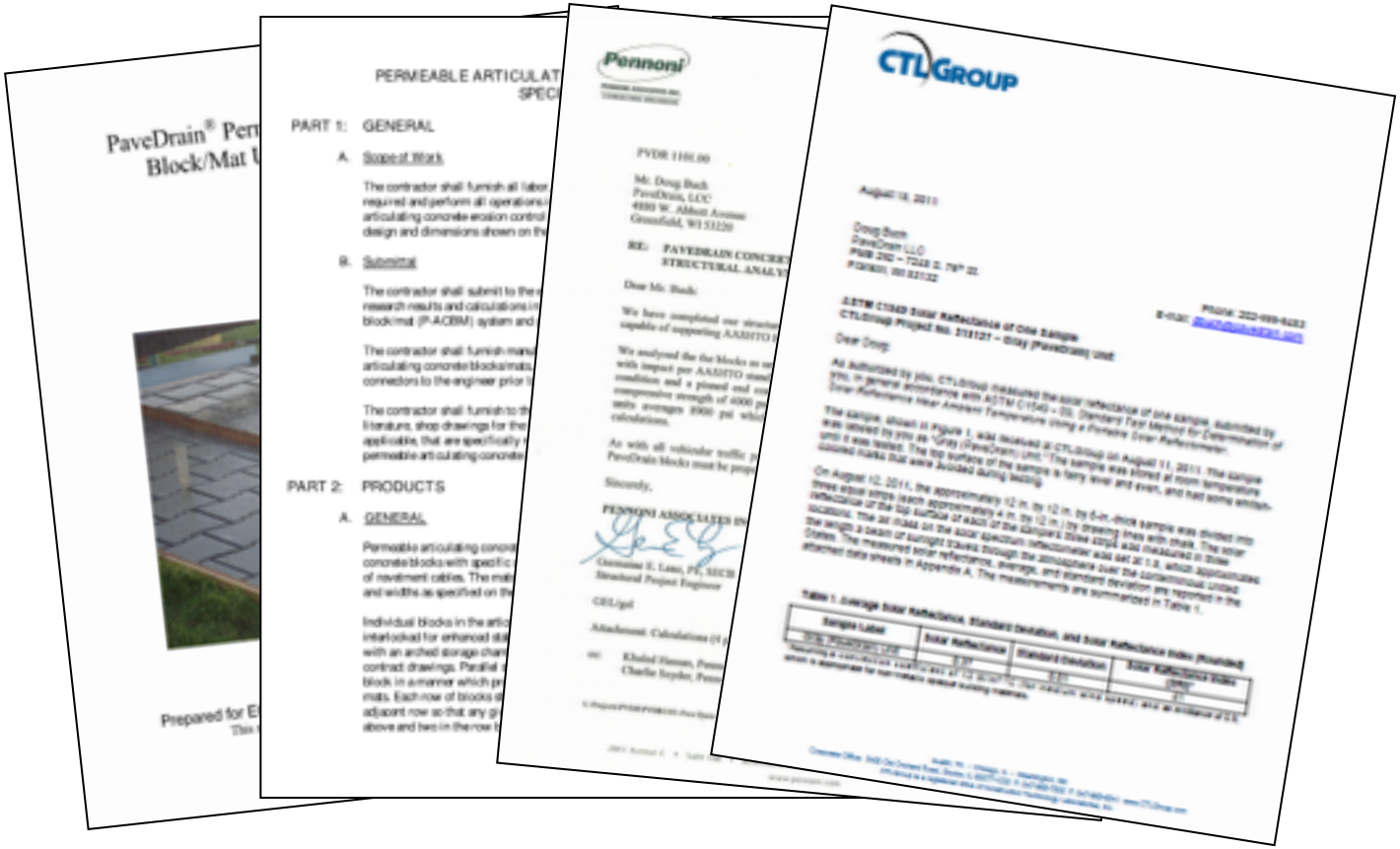


The PaveDrain Difference – Recent Projects

What we can provide for you…



What we can provide for you…



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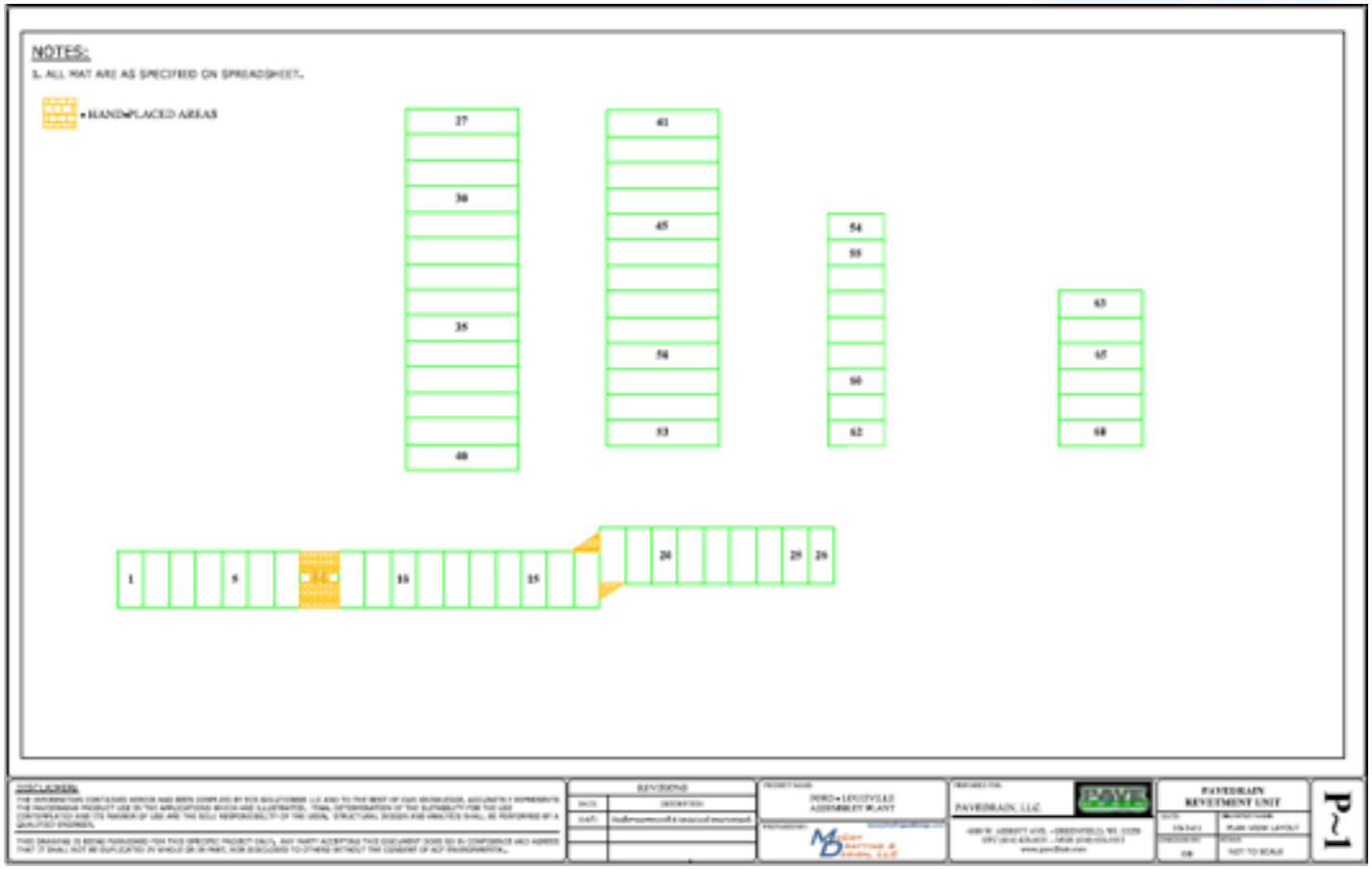
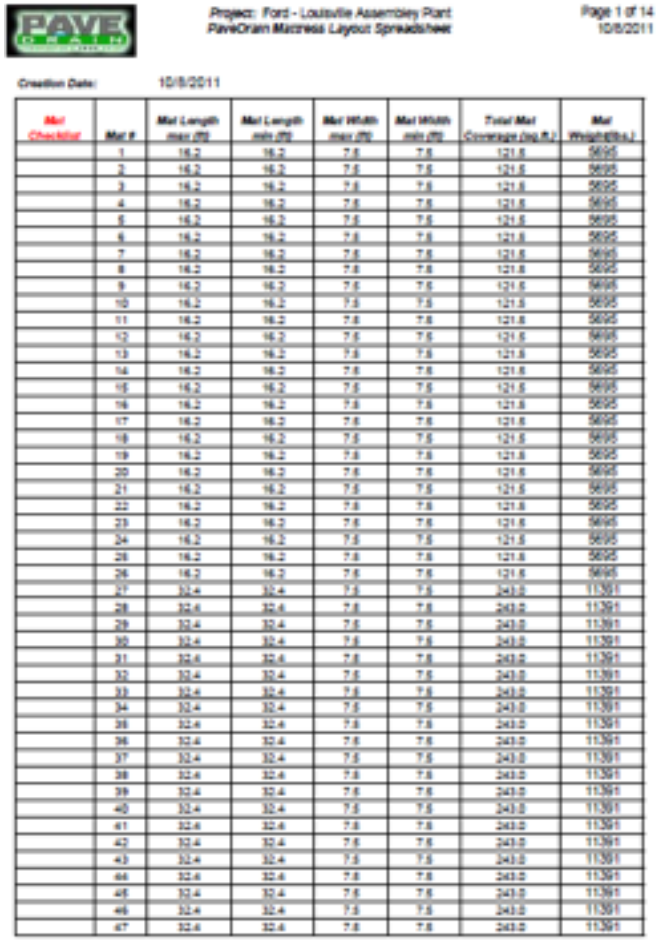


What we can provide for you…



Project: Ford - Louisville Assembley Plant
PaveDrain Mattress Layout Spreadsheet

Page 1 of 14
10/8/2011

Creation Date: 10/8/2011

Mat Checklist	Mat #	Mat Length max (ft)	Mat Length min (ft)	Mat Width max (ft)	Mat Width min (ft)	Total Mat Coverage (sq.ft.)	Mat Weight (lbs.)
	1	16.2	16.2	7.5	7.5	121.5	5695
	2	16.2	16.2	7.5	7.5	121.5	5695
	3	16.2	16.2	7.5	7.5	121.5	5695
	4	16.2	16.2	7.5	7.5	121.5	5695
	5	16.2	16.2	7.5	7.5	121.5	5695
	6	16.2	16.2	7.5	7.5	121.5	5695
	7	16.2	16.2	7.5	7.5	121.5	5695
	8	16.2	16.2	7.5	7.5	121.5	5695
	9	16.2	16.2	7.5	7.5	121.5	5695
	10	16.2	16.2	7.5	7.5	121.5	5695
	11	16.2	16.2	7.5	7.5	121.5	5695
	12	16.2	16.2	7.5	7.5	121.5	5695
	13	16.2	16.2	7.5	7.5	121.5	5695
	14	16.2	16.2	7.5	7.5	121.5	5695
	15	16.2	16.2	7.5	7.5	121.5	5695
	16	16.2	16.2	7.5	7.5	121.5	5695
	17	16.2	16.2	7.5	7.5	121.5	5695
	18	16.2	16.2	7.5	7.5	121.5	5695
	19	16.2	16.2	7.5	7.5	121.5	5695
	20	16.2	16.2	7.5	7.5	121.5	5695
	21	16.2	16.2	7.5	7.5	121.5	5695
	22	16.2	16.2	7.5	7.5	121.5	5695
	23	16.2	16.2	7.5	7.5	121.5	5695
	24	16.2	16.2	7.5	7.5	121.5	5695
	25	16.2	16.2	7.5	7.5	121.5	5695
	26	16.2	16.2	7.5	7.5	121.5	5695
	27	32.4	32.4	7.5	7.5	243.0	11391
	28	32.4	32.4	7.5	7.5	243.0	11391
	29	32.4	32.4	7.5	7.5	243.0	11391
	30	32.4	32.4	7.5	7.5	243.0	11391
	31	32.4	32.4	7.5	7.5	243.0	11391
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	33	32.4	32.4	7.5	7.5	243.0	11391
	34	32.4	32.4	7.5	7.5	243.0	11391
	35	32.4	32.4	7.5	7.5	243.0	11391
	36	32.4	32.4	7.5	7.5	243.0	11391
	37	32.4	32.4	7.5	7.5	243.0	11391
	38	32.4	32.4	7.5	7.5	243.0	11391
	39	32.4	32.4	7.5	7.5	243.0	11391
	40	32.4	32.4	7.5	7.5	243.0	11391
	41	32.4	32.4	7.5	7.5	243.0	11391
	42	32.4	32.4	7.5	7.5	243.0	11391
	43	32.4	32.4	7.5	7.5	243.0	11391
	44	32.4	32.4	7.5	7.5	243.0	11391
	45	32.4	32.4	7.5	7.5	243.0	11391
	46	32.4	32.4	7.5	7.5	243.0	11391
	47	32.4	32.4	7.5	7.5	243.0	11391

Spreadsheet to communicate with owner, engineer, contractor and supplier!

Arch
Pre-formed patented arch located at the bottom of the unit. Gives 20% storage capacity as well as lightening the unit weight without affecting its strength.

ADA Compliant Gaps
The unit interlock and spacers allow for a gap between each unit no greater than ½". This falls under 4.5.4 gratings within the guidelines set by the ADA.

Beveled Edge
R0.500 Edge located around the top of each unit. Provides a smooth transition between the vertical and horizontal portion of the unit. Allows for snow plowing to transition from block to block.

Interlocking Shape
Patented shape that allows each unit to positively interlock with one another **without** the use of aggregate between the joints. One unit has immediate contact with six other units.

Infiltration
4,000 inches per hour within a one (1) square foot area. Conducted under the guidelines of ASTM C1701 by a Third Party Testing Firm.

Freeze-Thaw Testing
Tests the durability of the unit for cold weather climates by 100-150 cycles of freezing then thawing each unit in a plain water or water/saline solution. Conducted under the guidelines of ASTM C1262 by a Third Party Testing Firm.

Compressive Strength
4,000 psi minimum. The capacity of the unit to withstand axially directed pushing forces measured in Pounds per Square Inch. Conducted under the guidelines of ASTM D6684-04 by a Third Party Testing Firm.

HS-20/H-20 Loading
Product passes test to handle heavy truck loads. Conducted under the guidelines of ASTM C140 by a Third Party Testing Firm.

Worldwide & Local Production
PaveDrain is manufactured using the dry cast method on a typical block machine. This allows us to send our molds to the closest facility to the job. This reduces transportation costs and will benefit local economies.

Installation (ease & speed)
The units can be installed two different ways: (1) Hand placing individual units (2) Mattress Form. Hand placing is common for overhead constraints that do not allow for the use of larger equipment. Customer can tailor the installation to suit each different site with only one product. If the area is small the units could be hand-placed. If an area is larger they can utilize mats.

Permeability Maintenance
Due to its open joint design, the maintenance associated with the System has been drastically reduced for most applications.

LEED Credits
Five different credits can be associated with the use of this system: Credits 5.1, 5.2, 6.1, 6.2 and 7.1.

I COME IN COLORS TOO!

PaveDrain System

PAVE DRAIN
STORMWATER'S ARCH ENEMY

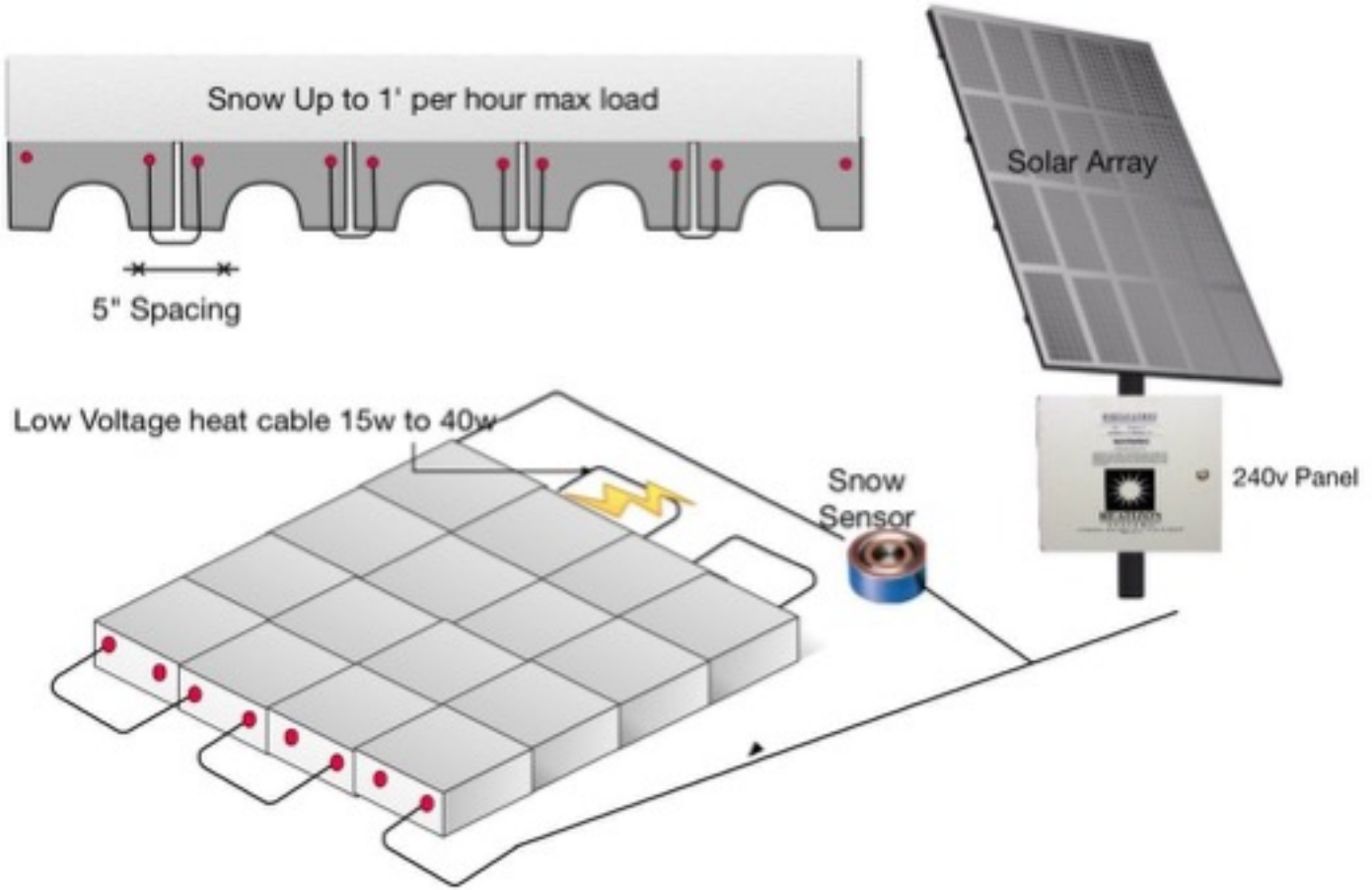
Headquarters
PMB 292 – 7245 S. 76th St.
Franklin, WI 53132-9041

Distribution & Manufacturing
Across all of North America
Visit www.pavedrain.com to view

Contact
phone: 888-575-5339
email: info@pavedrain.com

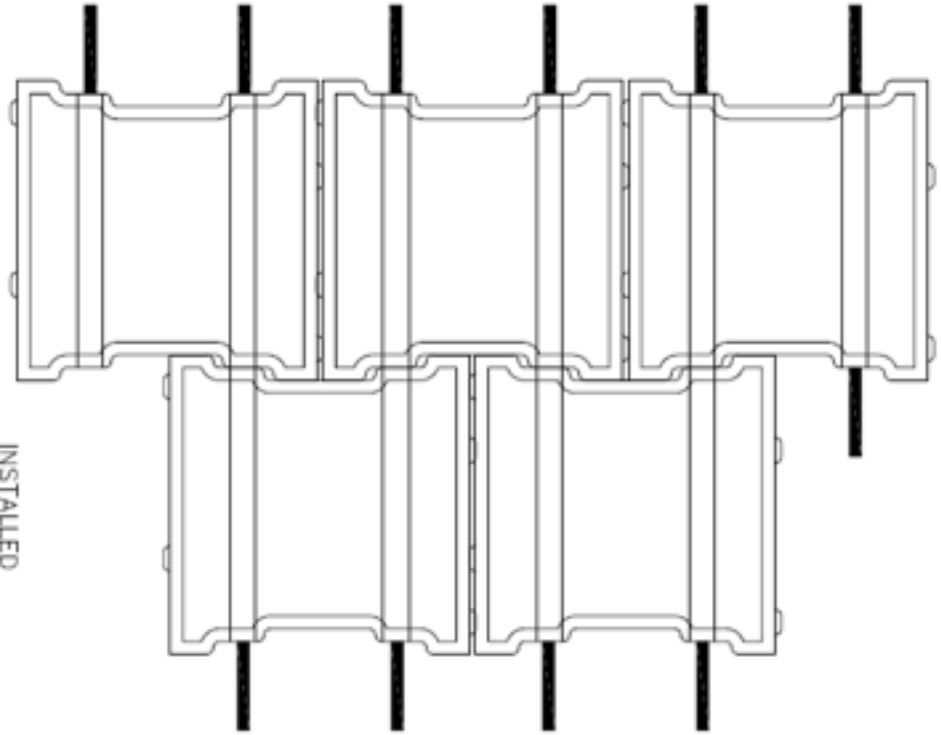
The PaveDrain Difference – Heated

Radiant Heat

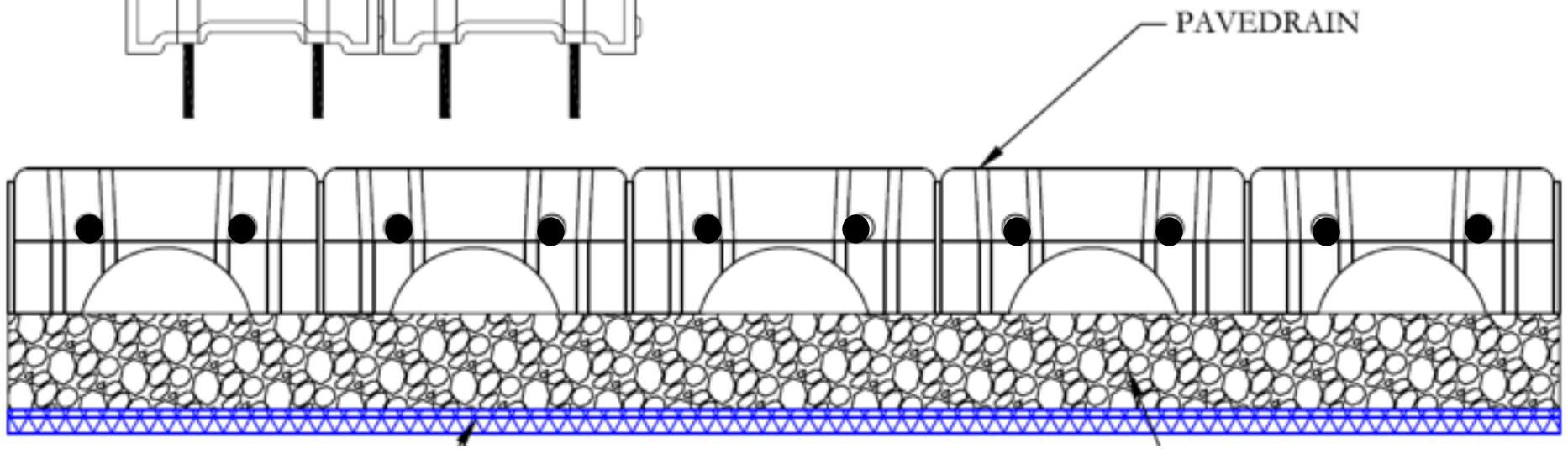


Radiant Heat

PAVE DRAIN HEATED



Six Inch Spacing Of Wiring Is The Key!!




PAVE
DRAIN®
STORMWATER'S ARCH ENEMY
ADA Compliant too!!
PaveDrain…a paving revolution!

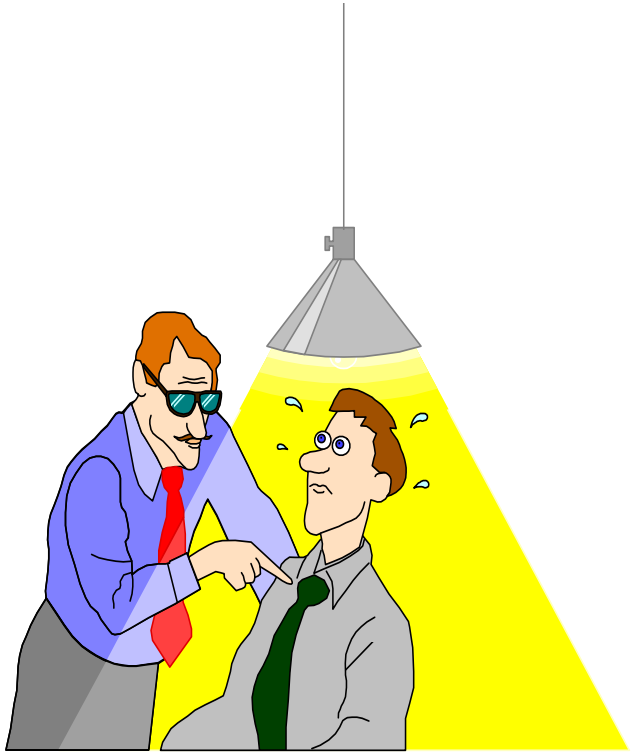
PAVE DRAIN

STORMWATER'S ARCH ENEMY

"This really is an innovative approach, but I'm afraid we can't consider it. It's never been done before."

THANK YOU!!!

Questions



Comments