



Installation Manual

PaveDrain® Installation Manual

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The Confidential Information to be disclosed can be described as and includes:

Invention description(s), technical and business information relating to proprietary ideas and inventions, ideas, patentable ideas, trade secrets, drawings and/or illustrations, patent searches, existing and/or contemplated products and services, research and development, production, costs, profit and margin information, finances and financial projections, customers, clients, marketing, and current or future business plans and models, regardless of whether such information is designated as "Confidential Information" at the time of its disclosure.

2. The Recipient agrees not to disclose the confidential information obtained from the discloser to anyone unless required to do so by law.

3. This Agreement states the entire agreement between the parties concerning the disclosure of Confidential Information. Any addition or modification to this Agreement must be made in writing and signed by the parties.

4. If any of the provisions of this Agreement are found to be unenforceable, the remainder shall be enforced as fully as possible and the unenforceable provision(s) shall be deemed modified to the limited extent required to permit enforcement of the Agreement as a whole.

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

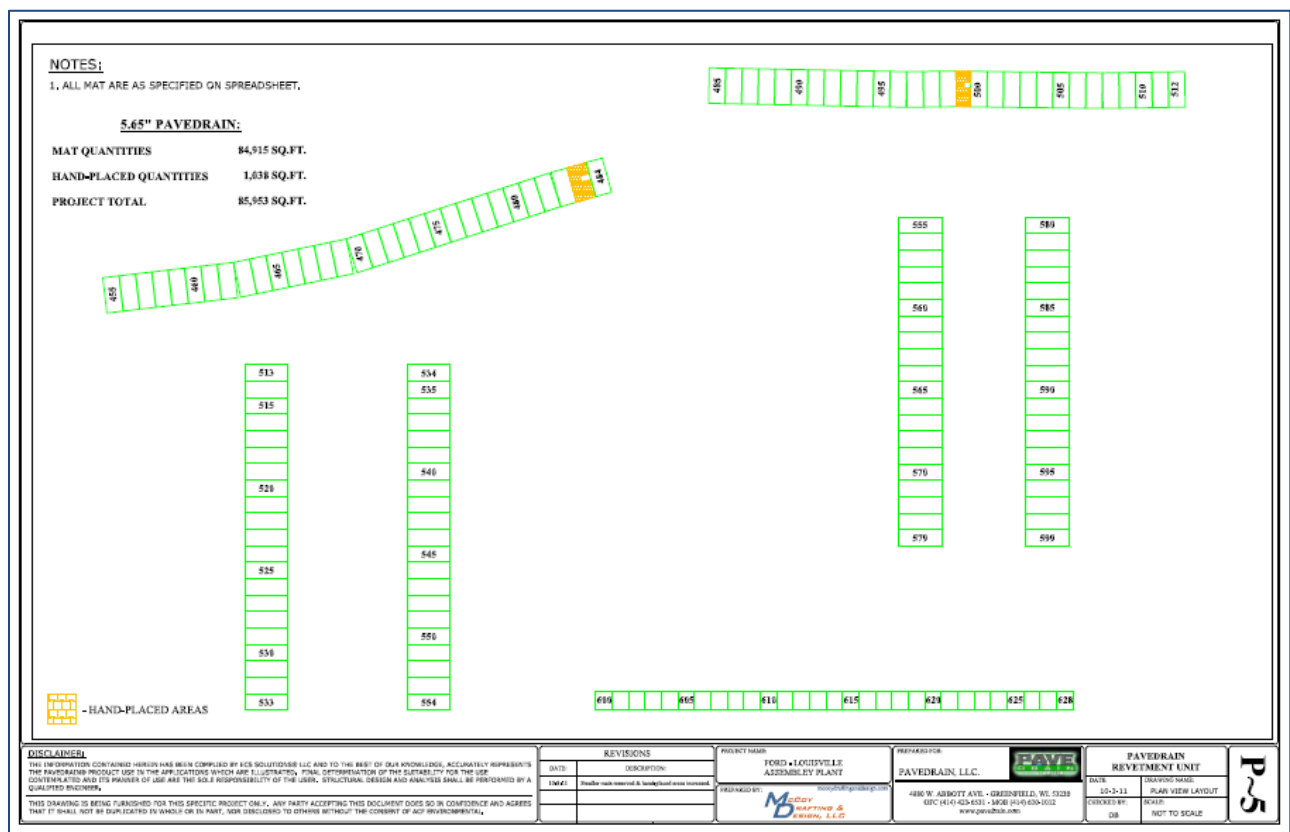


Fig. 2

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



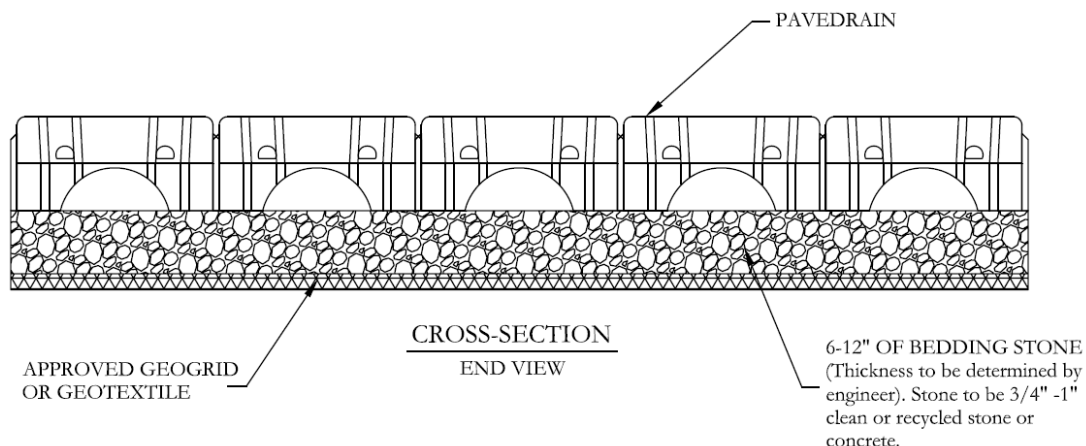
PREPARATION OF OPEN GRADED BASE

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.

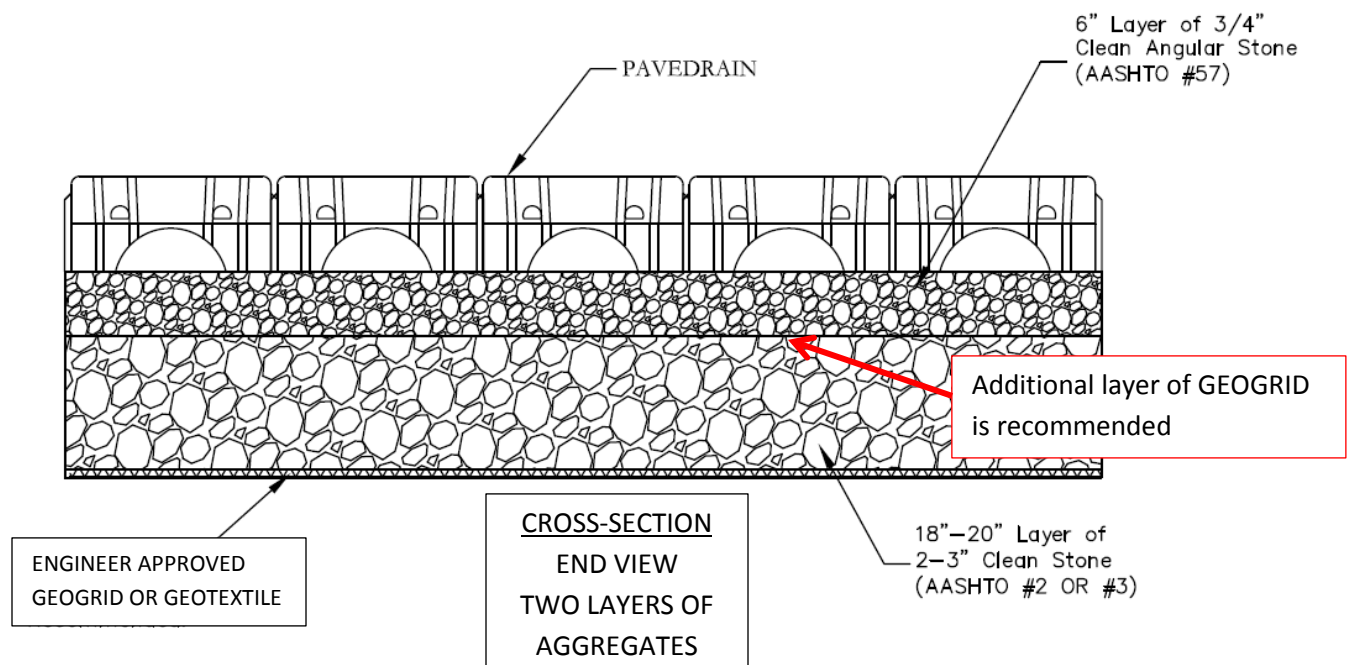


REMEMBER: Subgrade preparation is **CRITICAL!** The PaveDrain® System will mirror any discrepancies made with the subgrade.

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 marking paint, tape measure, chalk line, block markers/crayons, string line, survey stakes, rubber mallets, 4' 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" roller and plate compactor.

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: $D_{15} \text{ open graded base} / D_{50} \text{ bedding material} < 5$ and $D_{50} \text{ open graded base} / D_{50} \text{ bedding material} > 2$

Where: open graded base = AASHTO #57 bedding material = sieve size for which 15 percent of material is smaller
D50 = sieve size for which 50 percent of material is smaller.

Section 2

Hand-Placement of PaveDrain® Units

Hand placing of individual PaveDrain® units is an option when your project poses certain problems, such as low over-head power/telephone lines, tight areas between buildings and any other area you cannot operate a crane or excavator to install mats. This method of installation typically requires (1) foreman (with minimal experience and/or minimal training of the PaveDrain® System) and (3) general laborers. The (4) man crew will be able to install roughly 1,500 SF per day. The amount of SF they install will increase as their experience grows. The foreman will be able to operate any of the necessary equipment (i.e. forklift, bobcat or mini-excavator) while directing the laborers. It's also recommended to choose this option of installation when your project is 5,000 SF or smaller.

Step #1: If existing hardscapes are to remain (i.e. asphalt or concrete) the prepared area needs to be 3" (three) inches larger than the area to receive the individual units. In some applications a concrete collar can be poured before the units are installed (SEE FIG.6 & 7).

Fig. 6



Fig. 7



Step #2: ***Base preparation is CRITICAL!!!***

Undulations and grade changes in the rock base will be reflected in the PaveDrain® System. A plate compactor may be the best way to level and flatten the base rock before and during installation (See Fig. 5). A well prepared rock base is shown in (Fig. 9).

Fig. 8



Fig. 9



Step #3: **STARTING POINT....**It is beneficial to take the entire area into consideration and lay your first unit in one of two places; the middle or in one corner. String lines will help facilitate your placement. If you decide to place your first unit in the middle you must mark that unit in the middle with a "+". Then use your string lines to find the exact middle of your open area. Place the unit with the "+" under the intersection of your string lines and you are ready to begin (SEE Fig. 11). If you start in one corner, you want to use your string line to make an exact 90° corner where you will lay your first unit (SEE Fig. 10).



Fig. 10

Fig. 11



Step #4: Keep the units tight during installation and follow the string lines. Rubber Mallets may help you “seat” the units after they are placed (SEE Fig. 12 & 13).

Fig. 12



Fig. 13



NOTE: *Foot traffic should be kept to a minimum on the rock. If the rock is compacted correctly, little movement should be apparent once stepped on.*

Step #5: The individual PaveDrain® Units can be cut or tailored to accommodate a variety of different shaped working areas or obstacles within the working area. Using a concrete block masonry saw with a diamond tipped blade will allow you to custom fit your site (SEE Fig. 14 & 15)!

Fig. 14



Fig. 15



Section 3

Mattress Installation

Step #1: If existing hardscapes are to remain (I.E. asphalt or concrete) the prepared area needs to be 1' (one) foot larger than the mats. Mats to be installed are 16'. Prepared area is 17' (SEE Fig. 16).

Fig. 16



Step #2: ***Base preparation is CRITICAL!!!***
Undulations and grade changes in the rock base will be reflected in the PavDrain® System. A plate compactor may be the best way to level and flatten the base rock before and during installation (SEE Fig. 17, 18 & 11) "Base Preparation" Section.

Fig. 17



Fig. 18



Step #3: ***DO NOT UNDERESTIMATE*** the sag in the mat. The longer the mat the more the mat will sag and the higher you will need to pick the mat in order to get it off of the truck (SEE Fig. 19).

Fig. 19



PaveDrain® Mats were 7.5' x 32.2' and weighed 11,500 lbs.

The Spreader bar weighed an additional 3,500 lbs.

NOTE: *PaveDrain's Mat Installation Spreader Bar* is available for rent. It will arrive (ready to use) on the first truckload of mats. *PaveDrain, LLC® can also supply drawings to anyone who would like to fabricate their own spreader bar.*

Step #4: “Zippering” the mats into place can be facilitated with pry bars (SEE Fig. 20).

Fig. 20



Step #5: If Submittal pack requires the use of PaveDrain® Lock Block™ and/or Lock Block rows you will need a 4 ½" dia. angle grinder with a concrete cutting blade (SEE Fig. 20 & 21).

Fig. 20



Fig. 21



Step #6: Once the mats have been zippered together; if there is any differential heights between the mats, they can be vibrated into place by putting a non-woven geotextile on top of the blocks and then running a plate compactor over the zippered seam (SEE Fig. 22).

Fig. 22



Step #7: The PaveDrain® Mats can be tailored to accommodate a variety of different obstacles within the working area. Each site is different but some examples of obstacles can be: water meter openings, man-holes, existing curb drains, light posts, sign posts and/or existing concrete

structures. The specified PaveDrain® mats can be tailored by removing individual units within the mat (before the mat is installed *OR* after the mat is installed) (SEE Fig. 23 & 24).

Fig. 23



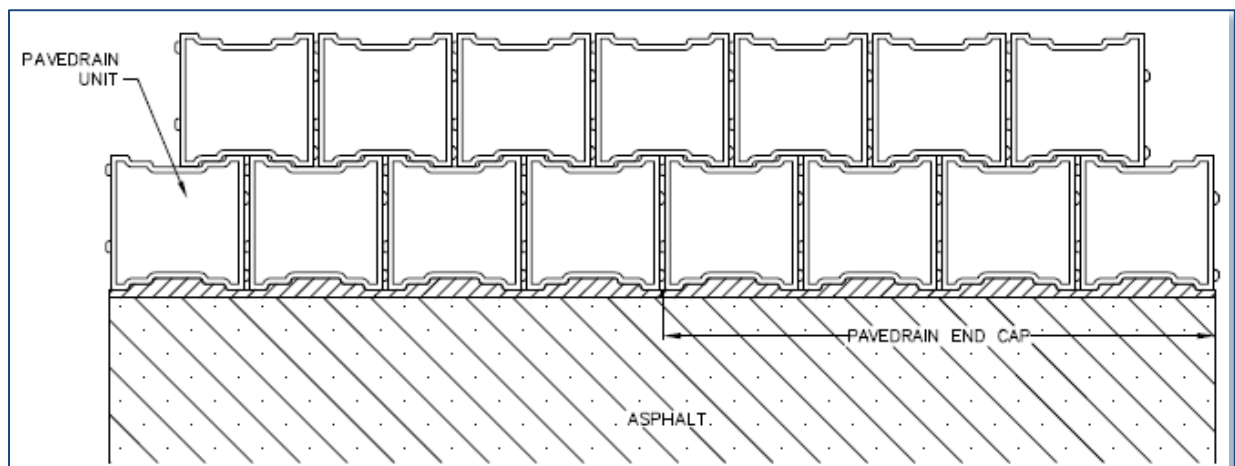
Fig. 24



Section 4

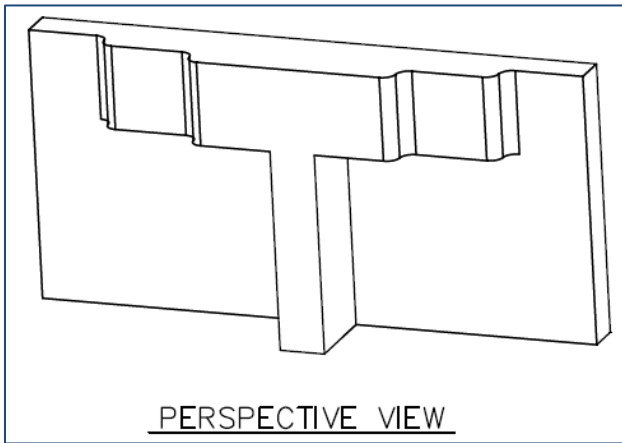
PaveDrain® End Caps

The PaveDrain® End Cap is a patent pending expansion joint made from 100% recycled rubber tires and keeps material and debris from entering the arched storage chamber of the blocks. It is manufactured in 4' sections and is made to fit the shape of the PaveDrain® Units. Installation of the End Caps can be done in conjunction with Mattress Installation or Hand-Placement of PaveDrain®.

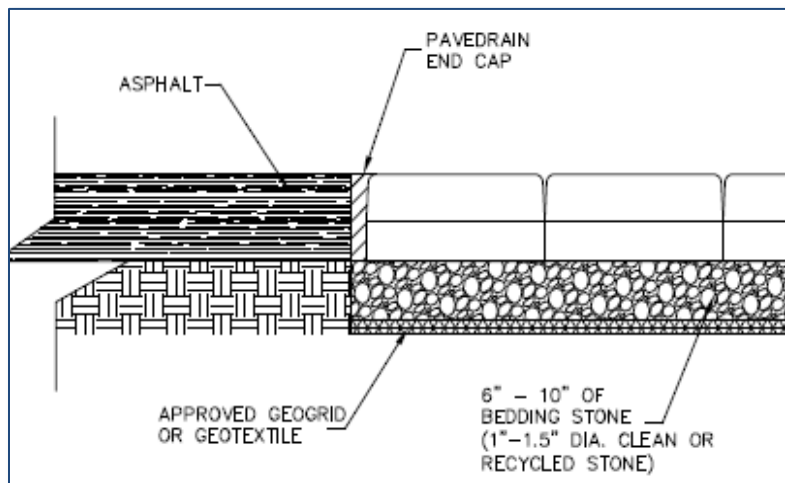




PaveDrain® Units were Hand-Placed within an existing concrete parking lot. The End Caps act as an expansion joint in this application.



The End Cap is made so that a gap is provided for the cables in a PaveDrain® Mat. This space allows you to tuck the mat loops into the arch rather than scoring the end of the block (Fig. 20 & 21).



Conventional materials, such as asphalt, are easily placed directly against the PaveDrain® End Cap.