5.8 Pervious Pavers, Porous Concrete, Geogrid System

Pervious pavers, porous concrete, and geogrid systems are all semi-pervious pavement alternatives to traditional asphalt and concrete. This LID SWMF approach reduces the amount of stormwater runoff by allowing rainwater to infiltrate through it, where traditional pavement allows very little stormwater infiltration. Using this type of material can greatly increase infiltration in areas that would normally contribute to the volume of stormwater that would have to be retained and treated on site. This in turn could potentially bring the impervious surface of your project below the 40% ISR threshold and enable you to qualify for the stormwater management exemption. Pervious pavement, porous concrete, and geogrid systems are a cost effective approach to reducing the IRS associated with your site. They also work well in tandem with additional LID SWMF techniques.

Advantages:

Installing pervious pavers, porous concrete, and geogrid systems in areas on your property that would normally be regular concrete or pavement reduces the ISR and reduces stormwater runoff production. The reduction associated with each option is as follows:

- a) Pervious Pavers ISR Reduction Factor = 0.75
- b) Porous Concrete ISR Reduction Factor = 0.50
- c) Geo Grid ISR Reduction Factor = 0.25

Example of how to determine the ISR reduction:

- 500 ft² pervious paver driveway would count as (500 ft² x 0.75) 375 ft² impervious area.
- 500 ft² porous concrete driveway would count as (500 ft² x 0.50) 250 ft² impervious area.
- 500 ft² geo-grid driveway would count as (500 ft² x 0.25) 125 ft² impervious area.

Additionally, pervious pavement may increase aesthetic value and can be used in a variety of applications, such as driveways, patios, and sidewalks. It can also have a positive effect with reducing the heat island effect.

Limitations:

This LID SWMF approach can be relatively high maintenance. Edge restraints such as ribbon curb must be installed around the pervious pavement to prevent failure. The surface must be maintained to prevent significant clogging which will negatively impact infiltration rates. This application is not suitable for areas with steep slopes greater than 0.5%. Certain pervious pavement surfaces may be difficult to traverse for individuals who have physical disabilities. Void spaces filled with filter material can cause the pavement surface to be uneven and especially
difficult for those using crutches, walkers, or high-heeled shoes. Sites subjected to hazardous materials and gasoline are not appropriate for this LID SWMF.

Design Considerations:

- Pervious pavers, porous concrete, and geogrid materials are a great alternative to traditional paving options in areas that are subject to ponding.
- Pervious pavers are interlocking blocks that have small open areas filled with gravel or natural vegetation.
- Porous concrete and porous asphalt provide a more traditional appearance; both mixes contain small voids that allow water to infiltration through the material and into the ground below.
- Geo-grids are comprised of a continuous plastic grid filled with gravel or natural vegetation.
- All of these applications should be limited to low traffic areas, such as driveways and sidewalks.
- The infiltration rate of the native soil is essential to the function of the pervious pavement system. Compacting the area will reduce the infiltration rate and should be avoided. If the parent soil has been compacted then the soil must be scarified to a minimum depth of 24 inches and re-graded.
- Runoff from adjacent landscaped areas should not be directed onto the pervious pavement system to prevent the system from getting over loaded with pollution and sediment.
- A pretreatment bioswale or grassy filter strip should be established around the pervious pavement, this will allow suspended sediments to settle out of the stormwater prior to entering the area essentially reducing the frequency of maintenance.
- Porous pavement should be placed over a 2 inch minimum layer of pea gravel followed by a geotextile fabric overlain a minimum 8 inch subbase of well-graded No. 57 gravel (this layer is intended for stabilization and to allow water to infiltrate in to the voids between the gravel).
- Each layer of material should be separated by geotextile fabric designed for stormwater applications.
- The geotextile fabric strips should overlap a minimum of 16 inches and should be secured a minimum of 4 feet beyond the area of the proposed LID SWMF.
- It is always a good idea to install a small 4-inch diameter observation well. The well should be placed within the footprint of the pervious pavement in a location away from vehicle traffic or where it will not become a tripping hazard. The observation well should extend to the bottom of the gravel layer without puncturing the geotextile fabric that is separating the filter media from the native soil. The water will rise in the observation well during a storm event and the property owner will be able to monitor the amount of time it takes water to infiltrate into the soils below. This will allow the owner to gage when maintenance might be necessary.

Design Steps:

1. First determine the required storage volume, soil conditions, depth to the SHGW, and the natural slope of the property at your location using the methods described in Section 2 and Section 3, this will assist you in choosing the optimal location for the LID SWMF.

2. The underlying soil may not be compacted. If compaction is unavoidable, the infiltration rates presented in this manual cannot be used for the recovery calculations. In this case, a professional infiltration test will be required to determine the infiltration of the compacted material.

3. You will want to keep a minimum of two to four feet separation between the bottom of the pervious pavers and the SHGW. For this example, we will use a depth to SHGW of eight feet.
4. Determine the area (dimensions) of the proposed pervious pavement. The design depth of the LID SWMF will be dependent on the proposed area associated with the pervious pavement and the required storage capacity.

5. The pervious paver treatment system will have gravel as a subbase, therefore in order to get a representative volume for the capacity of the system, you will need to take into account the average porosity of the gravel media, for this we will use 0.3. Porosity is the ratio of void volume of total volume, in other words it allows us to determine how much volume the gravel will take up in the LID SWMF.

<table>
<thead>
<tr>
<th>Required Volume of Stormwater to Be Retained (ft³)</th>
<th>Average Porosity of Filter Media</th>
<th>Additional Infiltration Trench Volume to Account for Filter Media</th>
<th>Total Required Volume To Account for Filter Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>440 ft³</td>
<td>0.3</td>
<td>440 ft³ x 0.3 = 132 ft³</td>
<td>440 ft³ + 132 ft³ = 572 ft³</td>
</tr>
</tbody>
</table>

From this, we can see that the volume of the system will need to be increased slightly to accommodate the space that the gravel will occupy.

6. Next, determine the available capacity of the proposed area. We will use a standard two-car driveway with a length of 30 feet and a width of 20 feet.

   **Total Area of Driveway (ft²)**
   
   \[30 \times 20 \text{ ft} = 600 \text{ ft}^2\]

7. We will determine the depth of the LID SWMF needed to meet the stormwater storage requirements with in the proposed foot print of the driveway.

   \[
   \frac{\text{Total Required Volume To Account for Filter Media (ft³)}}{\text{Proposed Area of Pervious Pavement (ft²)}} = \frac{\text{Depth of Pervious Pavement Filter Media (gravel) (ft)}}{
   \]

   \[
   \frac{572 \text{ ft³}}{600 \text{ ft²}} = 0.95 \text{ ft}
   \]

8. The depth of the gravel filtration system associated with the pervious pavers will need to be at least 1 foot (12 inches).

   Refer to Calculation Sheet 5.8 included at the end of this section for assistance in designing a pervious pavement system.

Operation and Maintenance:
Visual inspection should be completed at least quarterly and maintenance should be completed on an as needed basis. The voids between pavers should be inspected for missing aggregate. If any filter material has settle or is missing it should be replenished. The surface of the pervious pavements can become clogged with fine particles and material that must be removed to maintain design infiltration rates. This can be achieved by using a vacuum or regenerative sir sweeper. The surface must not be pressure washed to remove sediment since pressure washing
can force material deeper into the system where it is more difficult to extract, thus permanently reducing infiltration rates. If the system consist of cells filled with vegetation than it must be mowed during the growing season. The mower should be fitted with a bag to collect the clippings.

**Important**

No pesticide or fertilizer to be applied to this area and within a 10’ perimeter.

**Pervious Pavement Examples:**


Maintenance Form 5.8 – Pervious Pavement:

Pervious Pavement LID SWMF

Owner: __________________________________________

Address: __________________________________________

Phone: __________________________________________

E-mail: __________________________________________

Parcel Number: __________________________________

Date of Last Inspection: ______________________________

- Please attach pictures

List any additional LID SWMF on site:

List any previous concerns:

Inspection List

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does water drain freely through the system?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are there any areas with prolonged standing water on or around the pavement?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is there a buildup of sediment on or around the pavement?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Is the system over flowing?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Are sediment basins clean and clear from buildup (if applicable)?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Has soil settled or eroded around the pavement?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Has there been any soil compaction within the area?</td>
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<td>☐</td>
</tr>
<tr>
<td>Last time sediment was removed from the system.</td>
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</table>

Maintenance Items To be Completed:

By signing this form, I certify that I have inspected this system.

[Signature]

Owners Signature: ____________________________ Date: ____________
**Pervious Pavement Design Calculations**

<table>
<thead>
<tr>
<th>Site Characteristics</th>
<th></th>
<th>Line 1</th>
<th></th>
<th>Line 2</th>
<th></th>
<th>Line 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area of Parcel</td>
<td>ft²</td>
<td></td>
<td>Depth To SHGW</td>
<td>ft</td>
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<tr>
<td>Infiltration Rate (See Table 3)</td>
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<td>Is Your Property In The Following Locations:</td>
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<td>Is Your Property In The Following Locations:</td>
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<td>ICPAL</td>
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<tr>
<td>Dune Lake</td>
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<td></td>
<td>Near a Mosquito Control Ditch</td>
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<td>Treatment Volumes</td>
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<td>Attenuation Volume</td>
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<td>Design Volume</td>
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<td>Additional Volume Requirement</td>
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<td>Total Required Volume of Infiltration Trench</td>
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<td>Length Allotted for Pervious Pavement</td>
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<td>Width Allotted for Pervious Pavement</td>
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<td>Area Allotted for Pervious Pavement</td>
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<td>Required Filter Media Depth</td>
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<td></td>
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<td></td>
<td>in</td>
<td>Line 11</td>
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<td>Recovery Time</td>
<td>hr</td>
<td>Line 12</td>
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</tbody>
</table>

LID SWMS TM Section 5.8


Figure 3. Typical Cross-Section and Materials