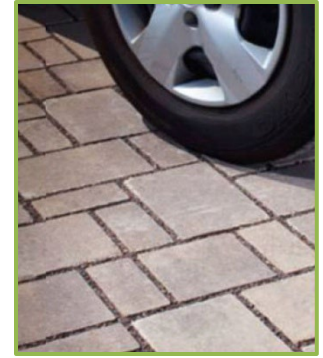




PERMEABLE PAVERS

Permeable pavers are an alternative to traditional paving surfaces which can decrease stormwater runoff around your home. They are well-suited for use when constructing sidewalks, parking areas, patios, and driveways not within public right-of-way. Permeable pavers consist of permeable interlocking or grid concrete pavers underlain by a drainage layer. A permeable paver system allows stormwater runoff to pass between the paver surfaces into an underlying stone reservoir, where it is temporarily stored and allowed to infiltrate into the underlying soil. Permeable pavers can provide significant reductions in stormwater runoff and pollutant loads in your watershed.



LOCATION

- Permeable pavers are only allowed when used as a BMP.
- Maximum contributing drainage area to surface area ratio is 4:1.
- Permeable paver systems should be located at least 5 feet from building foundations and 10 feet from buildings with basements.
- NOTE: Permeable pavers should not be located:
 - (1) above an area with a seasonally high-water table less than three feet below the gravel bottom. or bedrock less than two feet below the gravel bottom;
 - (2) over other utility lines;
 - (3) above a septic field; or
 - (4) within Right-of-Way.
- Permeable pavers should drain only impervious areas. Drainage from other areas onto the pavers will eventually clog them.
- **Slope Limits.** Permeable paver systems should be installed on slopes less than 6% (16.7:1, H:V) to help ensure even distribution of runoff over the infiltration surface; pavers should slope away from structures.



CONSTRUCTION

The table at the right provides Permeable Paver area size requirements for different depths of the ASTM No. 57 stone layer. This stone averages in size from ½” to 1-½”. Example: A roof top measures 1000 square feet. For a stone depth of 8 inches the required area of permeable pavers 310 sq ft.

- Always call Missouri One Call to locate utility lines before you dig.
- Permeable paver systems require multiple layers. Manufacturer’s instructions, if available, should be followed in lieu of these guidelines.
- **Infiltration Limits.** The soil infiltration rate suitable for a paver system is 0.25 inches per hour (in/hr) or greater. Conduct a soil infiltration test per Appendix A. Professional assistance shall be obtained in this case. If the rate is less than 0.25 in/hr, provide an underdrain leading to daylight (with rodent-proof screen) or discharged with a popup emitter as described in Appendix D.
- **Top Course of Aggregate.** The top course consists of the pavers and a crushed aggregate material swept between the paver

Contributing Drainage Area (square feet)	Depth of Lower Stone Storage Layer (inches)				
	4	5	6	8	12
	Area of Pavers (square feet)				
100	60	50	40	40	30
500	260	230	200	160	120
1000	520	450	390	310	230
2000	1040	890	780	620	450
3000	1550	1330	1170	930	670
4000	2070	1770	1550	1240	890
5000	2580	2220	1940	1550	1110



joints, such as ASTM No. 8 stone or 1/8” to 3/8” pea gravel. The thickness of this layer varies depending upon the depth of the paver.

- **Bedding Course of Aggregate.** The bedding course consists of 2 to 3 inches of No. 8 stone, or 1/8” to 3/8” pea gravel. The bedding course provides a level bed for setting the pavers evenly.
- **Aggregate Base Course.** The aggregate base course consists of a minimum of 4 inches of No. 57 stone. The aggregate base course acts as a reservoir to provide stormwater storage capacity.
- **Permeable Drainage Geosynthetic.** A permeable drainage geosynthetic must be used to separate the aggregate base course from the subgrade. This fabric must be a needle-punched nonwoven polypropylene geotextile of Mirafi® brand 140N or equivalent material. Lapping of fabric shall be at least 18 inches.
- **Subgrade.** The subgrade layer is the layer of native soils below the gravel and the permeable drainage fabric. Prepare the subgrade soil layer by scarifying or tilling to a depth of 3-4 inches.
- Care should be taken to avoid compaction of the soil in the location planned for the permeable pavers during home construction.
- Excavation to final subgrade elevation should not take place until the pavers are ready to be installed.
- **Subgrade slope.** Even though the permeable pavement surface is sloped, the sub-grade of the treatment measure should be flat and in some cases, terraced where the driveway has a steep slope, in order to promote infiltration. Additionally, this will prevent the stormwater from running along the bottom of the subgrade and discharging at the bottom of the slope.
- **Underdrain.** Prior to submittal, perform an infiltration test according to Appendix A. If the rate is less than 0.25 in/hr, provide an underdrain leading to daylight (with rodent-proof screen) or discharged with a popup emitter as described in Appendix D.
- **Paver Area Reduction.** If the infiltration rate is more than 0.50 in/hr the paver area may be decreased 10% for every 0.50 in/hr of infiltration rate increase above 0.50 in/hr.



MAINTENANCE

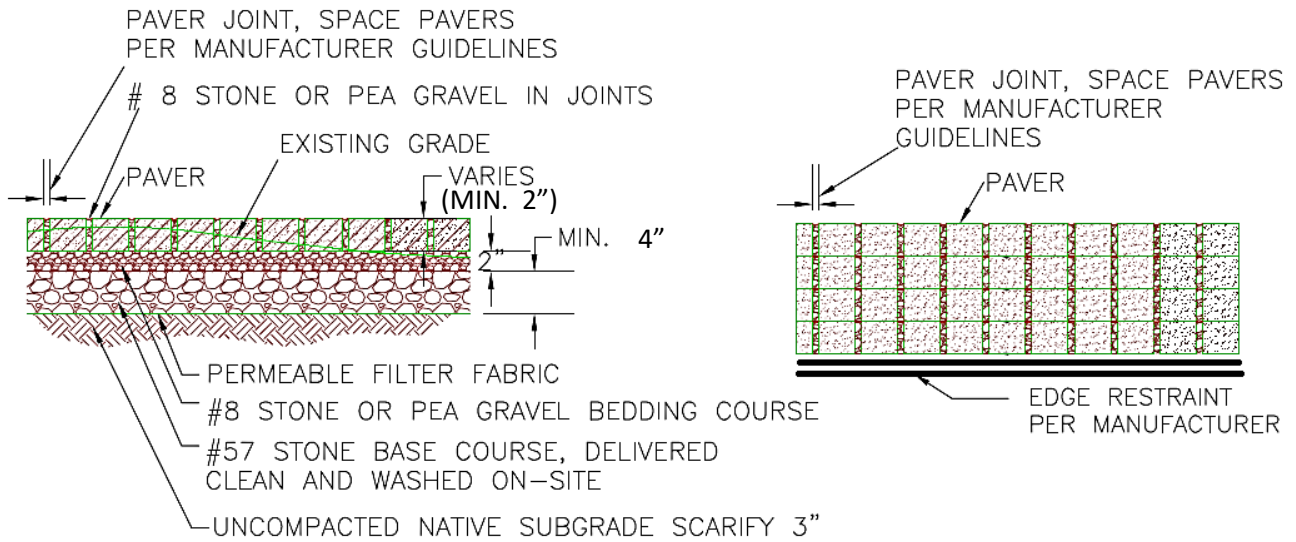
Maintenance is very important for permeable pavers systems, particularly in terms of ensuring that they continue to provide measurable stormwater management benefits over time.

- Remove accumulated sediment and debris from joint spaces monthly.
- Monitor the permeable paver system for excessive ponding during storm events and repair as needed.
- Vacuum, sweep, or blow permeable paver surfaces quarterly to keep the surface free of sediment.
- Sweep new No. 8 stone into the spaces between stones as needed. Inspect permeable paver surface for deterioration annually. Repair or replace any damaged areas as needed.





PERMEABLE PAVERS – LAYOUT SKETCH



TYPICAL COMPONENTS (ATTACH MANUFACTURER’S INSTALLATION GUIDELINES)

CONSTRUCTION STEPS:

1. Prior to submittal, perform an infiltration test according to Appendix A. If the rate is less than 0.25 in/hr this method can only be used with an underdrain as described in Appendix D. If the rate is more than 0.50 in/hr the paver area may be decreased 10% for every 0.50 in/hr of infiltration rate increase above 0.50 in/hr.
2. Review potential paver areas and layout. Pavers should slope less than 6% away from the structure and should not be located: (1) above an area with a water table or bedrock less than two feet below the trench bottom; (2) over other utility lines; or, (3) above a septic field.
3. Measure the area draining to the pavers and determine required paver area from the table on the next page based on the depth of the lower stone storage layer.
4. Excavate area to appropriate depth and scarify soil to 3-4 inches.
5. If underdrain required, excavate area, install geosynthetic, install bedding aggregate, and install perforated HDPE (if below frost line: HDPE or PVC), or equivalent pipe wrapped with polyester filter sock.
6. Place permeable drainage geosynthetic in the excavated area in order to separate the aggregate base course from the subgrade. This geosynthetic must be a needle-punched nonwoven polypropylene geotextile of Mirafi® brand 140N or equivalent material.

INITIAL INSPECTION POINT

7. Place and tamp No. 57 stone base course to specified depth in no more than six-inch lifts. Four-inch minimum depth.
8. Place and tamp No. 8 stone or pea gravel bedding layer to depth specified. Two-inch minimum depth.
9. Lay paving stone one at a time or using mechanical placement as applicable. Cut stone at edges to fit.
10. Install edge restraints per manufacturer’s specifications.
11. Sweep more No. 8 stone or pea gravel into stone joints until filled and even.
12. Cut and route downspouts or other rainwater delivery components, leaf screen option(s) chosen (circle selected options in Pretreatment Options Detail figure in Appendix E). Strap and support as needed.
13. Backfill perimeter of pavers where required and establish vegetation

FINAL INSPECTION POINT

CITY OF KIRKWOOD PROPERTY ADDRESS: DATE:	ATTACH THIS TWO-PAGE SPECIFICATION TO SITE PLAN SUBMITTAL	PERMEABLE PAVER SPECIFICATIONS PAGE 1 OF 2
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PERMEABLE PAVERS – LAYOUT SKETCH
 PROVIDE PLAN AND ELEVATION VIEWS OF PERMEABLE PAVER SYSTEM AND STRUCTURES/HOUSE SHOWING ROOF AREA DIRECTED TO PAVERS AND KEY DIMENSIONS, CONNECTIONS AND ANY APPLICABLE OVERFLOW RELATIVE TO PROPERTY LINE. ATTACH MANUFACTURER’S SPECIFICATIONS IF APPLICABLE. ATTACH INFILTRATION TEST RESULTS WHEN PERFORMED.

SIZING CALCULATION:

SITE INFILTRATION RATE= _____ IN/HR

- IS UNDERDRAIN REQUIRED? YES NO N/A
- CAN BMP AREA BE REDUCED? YES NO N/A

IF YES, BY WHAT %: 10 20

Contributing Drainage Area (square feet)	Depth of Lower Stone Storage Layer (inches)				
	4	5	6	8	12
	Area of Pavers (square feet)				
100	60	50	40	40	30
500	260	230	200	160	120
1000	520	450	390	310	230
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4000	2070	1770	1550	1240	890
5000	2580	2220	1940	1550	1110

MEASURE CONTRIBUTING DRAINAGE AREA AND READ AREA FOR GIVEN MEDIA DEPTH.

CONTRIBUTING DRAINAGE AREA= _____ SQ FT
 DEPTH OF BEDDING COURSE LAYER= _____ INCHES (2 IN, MIN)
 DEPTH OF LOWER STORAGE LAYER (INCHES): 4 5 6 8 12
 PAVER AREA (SF)= _____ ADJUSTED PAVER AREA (SF): _____

- MAINTENANCE:**
1. REMOVE ACCUMULATED SEDIMENT AND DEBRIS FROM JOINT SPACE MONTHLY.
 2. MONITOR THE PERMEABLE PAVER SYSTEM FOR EXCESSIVE PONDING DURING STORM EVENTS AND REPAIR AS NEEDED.
 3. VACUUM, SWEEP, OR BLOW PERMEABLE PAVER SURFACE QUARTERLY TO KEEP THE SURFACE FREE OF SEDIMENT. SWEEP NEW STONE INTO THE JOINTS AS NEEDED.
 4. INSPECT PERMEABLE PAVER SURFACE FOR DETERIORATION ANNUALLY. REPAIR OR REPLACE ANY DAMAGED AREAS AS NEEDED.

CITY OF KIRKWOOD PROPERTY ADDRESS:	ATTACH THIS TWO-PAGE SPECIFICATION TO SITE PLAN SUBMITTAL	PERMEABLE PAVER SPECIFICATIONS PAGE 2 OF 2
DATE:		