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Principles of Permeable Paving

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Paved surfaces are synonymous with modifying natural water flow patterns, preventing infiltration and percolation of rain and runoff water into soils. The impermeable surfaces commonly found in walkways, parking lots, patios and other hardscape features can create undue pressure on drainage systems, undesirable ponding on-site and uncomfortable conditions for people, property and plants. Permeable paving, however, can alleviate some of these issues by facilitating drainage below the paved surface. In this fact sheet, we will identify some principles, practices and concepts to install and maintain a permeably paved surface.

Permeable Paver Basics — Surface Level

Designing and building a permeable paved surface entails many of the same principles as the more common, impermeable paver installations. For background information on installing a typical paver patio, refer to LSU AgCenter Fact Sheet P3867. As always, any construction, particularly below ground, should be done in accordance with state and local regulations, and utilities must be marked before excavation.

Permeable paved patios can be divided into several categories. Some installations will use standard pavers and installation practices as mentioned in the referenced article above, with the difference being the polymer sand used as a joint compound between pavers is replaced with a porous material such as pea gravel or a coarse material that provides structural benefits while allowing water to readily infiltrate below the surface. Installations may also take on a more naturalized look, using a combination of larger pavers with greater spacing with groundcovers or turf between the pavers. The material used and the arrangement of pavers depends on personal preference and aesthetics and should account for the volume of water that needs to be managed. Another option for permeable paved surfaces is to use porous concrete. Concrete is produced through mixing cement, coarse aggregates, water and sand. If the amount of sand is reduced or removed from the recipe, ample interconnected pore space within the concrete is created, allowing water infiltration to occur directly within the paver.

Aggregate between individual pavers at the Georgia Botanical Gardens. Photo by Damon Abdi

Large steppingstones over coarse aggregate may allow rapid water infiltration. Photo by Dan Johnson, www.greenmandan.com

Permeable Paver Basics — Digging Deeper

Now that it has been identified how in fact water will move from the paver surface to the subsurface, it is necessary to consider the eventual fate of the water once it infiltrates below the pavers. A subbase comprised of coarse aggregates sized to provide both structural stability and ample pore space is needed to store water and to facilitate the continued percolation of runoff further into the soil. The subbase must support the downward movement of water, a consideration as critical as offering physical support to the pavers that rest on the surface. Tying the subsurface aggregate foundation into features such as French drains can provide further water removal capabilities. More intricate permeable pavement systems may have several segments of different sized aggregates, geotextiles and subdrains, depending on site conditions and water mitigation demands. More information about installing and maintaining French drains can be found in LSU AgCenter Fact Sheet P3879.

Environmental and Maintenance Considerations

Permeable pavers can provide an advantage over typical paver installations in several ways besides mitigating flooding concerns. In urban areas, permeable paving can allow more water infiltration to nearby tree roots and enhance subsurface air exchange, a crucial consideration in maintaining healthy tree roots. Permeable paving can also offer an initial pretreatment of runoff water by trapping sediments, certain contaminants and debris in the permeable pores. Certain styles of permeable paving can also be easier to maintain than a rigid, typical paved surface. For example, pavers with ample space between them reserved for gravel, groundcovers or soil can be uplifted and renovated in the event that nearby tree roots push pavers up, or if natural wear and tear or soil settling occurs. While sediments clogging pores can eventually pose an issue, vacuum sweeping can help rejuvenate the permeability of the pavers.

While a valuable tool in numerous landscape applications, permeable paving may not be appropriate for high traffic areas, especially ones where heavy loads are consistently traversing or resting on the surface. Restricting heavy commercial vehicles from driving upon permeable paving surfaces is a good practice. The coarse texture of certain permeable paving surfaces may present mobility challenges, so be sure to consider accessibility in the purpose, design and installation of these systems.

Installation of permeable pavement. Irregular spacings between pavers offer an aesthetic intrigue and large pore spaces to hold aggregate/water. Photo by Dan Johnson, www.greenmandan.com

Permeable pavement can help drainage in close spaces. Photo by Dan Johnson, www.greenmandan.com

Environmental and Infrastructure Benefits

Permeable paving offers a range of environmental benefits outside of reduced pressures on local drainage systems. By allowing more water to soak into the soil than traditional paved areas, light rain events may have more limited impacts on drainage systems and standing water can be reduced. Permeable paving can be intricate or simple, ranging from a basic home walkway to a multi-layered series of coarse aggregates and drains in a critical location.

Selected References

https://www.epa.gov/system/files/documents/2021-11/bmp-permeable-pavements.pdf

D.E. Abdi, J.S. Fields. AgCenter Publications P3867, P3879

Using plants between widely spaced pavers offers a uniquely natural look. Photo by Dan Johnson, www.greenmandan.com

For more information on permeable pavement, please contact your local LSU AgCenter extension office or visit **www.lsuagcenter.com**.

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