Outfalls

We can choose to manage storm water as a valuable natural resource. If not, storm water can become a nuisance that is generated by the impermeable surfaces in urban development. The pervious concrete slab is filtration media that also serves as rigid pavement. Treat the slab like any other filtration media and recognize the threat of contamination and design it to reduce the sources of clogging problems.

Identify the intended path of runoff through the system, where it will hold and at what elevation. The percolation rates of the subgrade soil are calculated against the expected precipitation. Design features are designed in these systems to direct the storm water with specific objectives in mind. Usually, the system is designed to hold storm water and percolate it into the subgrade. The typical systems hold storm water within aggregate voids or structures below the pavement in detention basins to slowly percolate into the subgrade soil through a ***permeable system.***

A closed system may also be built by using an impermeable collection liner under the pervious slab. Pavement built on contaminated soils or where nasty liquid spills may occur would require an ***impermeable system.*** Impermeable liner is also used to collect or direct water within a storm water system that can irrigate trees or rain gardens.

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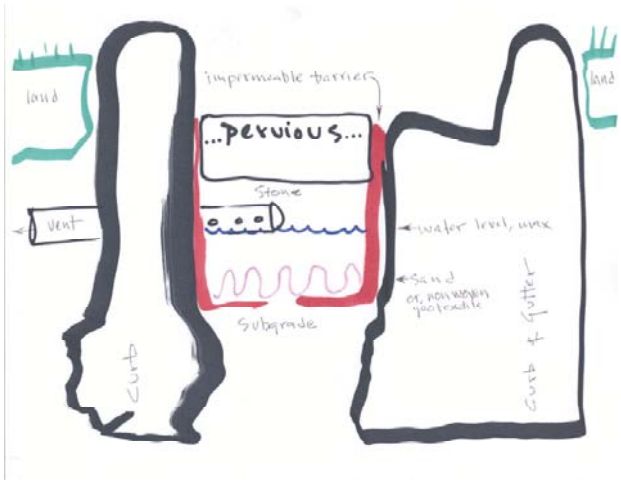
All of the surfaces that surround the pavement are evaluated for their potential runoff and silt. The pervious system is easily protected if the slab surface elevation is slightly higher than the surrounding landscape. If the system is subject to runoff from landscape areas, the flow should be directed through a swale to slow the flow and allow silt to settle and deposit in the swale before storm water enters the pervious system. If the system is subject to runoff from adjacent impervious pavement surfaces, anticipate more frequent cleaning service.

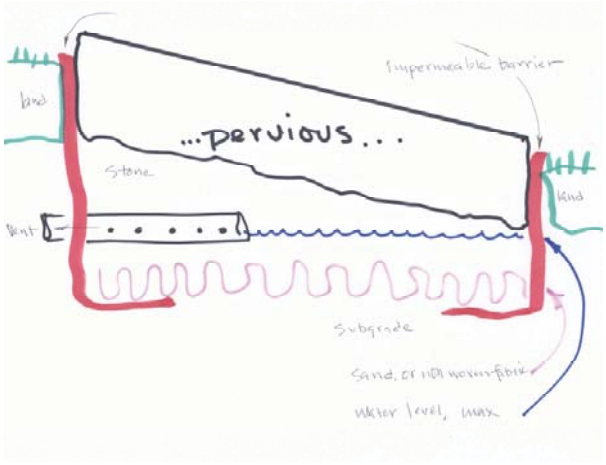
Climate information will class the system as never or rarely freezing, or as being subject to ***freeze-thaw*** conditions during service. Pervious systems designed for freezing climates should allow water to vent from the detention basin at an elevation below the pervious slab. These vents will direct storm water elsewhere when the detention basin is full. Regardless of capacity, systems that discharge from vents have already achieved the main objectives of storm water management.



* trap the contaminants from first flush.
* moderate the storm water temperature.
* delay and slow the flow.

Impermeable Liner

The impermeable system is completely sealed, with welded seams and works best using roofing or pond liner. However, numerous applications will use impermeable barrier that is 15 mil poly sheeting in narrow strips. The illustrations show this impermeable barrier in red, being used to direct water and / or to protect the movement of soils. The storage capacity of the detention basin is within the voids of the aggregate base. These voids become loaded with silt if certain precautions are not observed. Many pervious designers recommend a concrete curb be placed at the slab edge to prevent the inflow of silt. However, economy will prevail in most cases to use the impermeable barrier as a suitable alternative to block the inflow of moist soils that surround the perimeter. The vertical silt barrier should completely encase the edges of the detention basin aggregate.



Filter Fabric

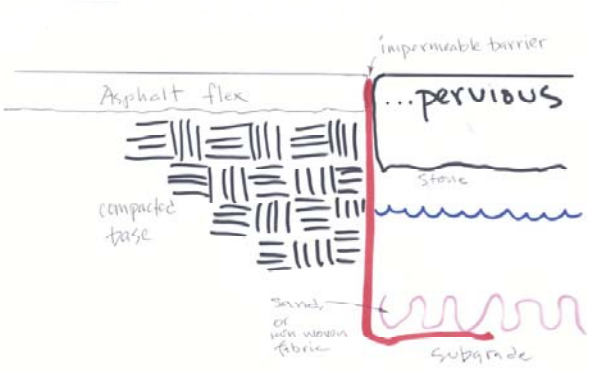
A widely used practice has historically prevailed in the use of filter fabric (4oz,non-woven geotextile) to protect the perimeter edges and the bottom of the detention basin. Recent findings indicate that this fabric may plug or otherwise be compromised in its function. A popular alternative has been adopted with good results. Subgrade soils can be isolated from the bottom of the basin with a 4 inch layer of fine aggregate, instead of filter fabric. Also, filter fabric does not perform as well as heavy, impermeable barrier at the perimeter edges. Filter fabric or the alternative sand layer are shown in a pink, wavy line at the top of the subgrade.

Freezing pervious

Freezing conditions will not allow detention of storm water within the slab. All freezing designs must include the provision to vent the detention basin in the event the capacity reaches maximum water elevation (somewhere below the bottom of the slab). Every pervious pavement design includes the critical water elevations as well as the elevation and slope of the subgrade soil, below the detention basin. Our illustrations show water in blue.

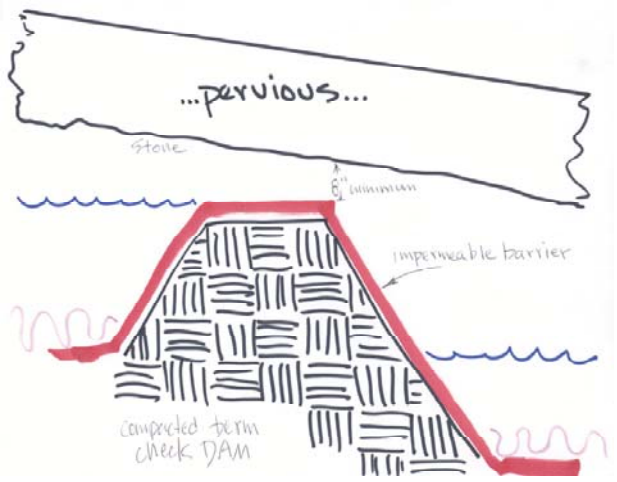
Asphalt Edges

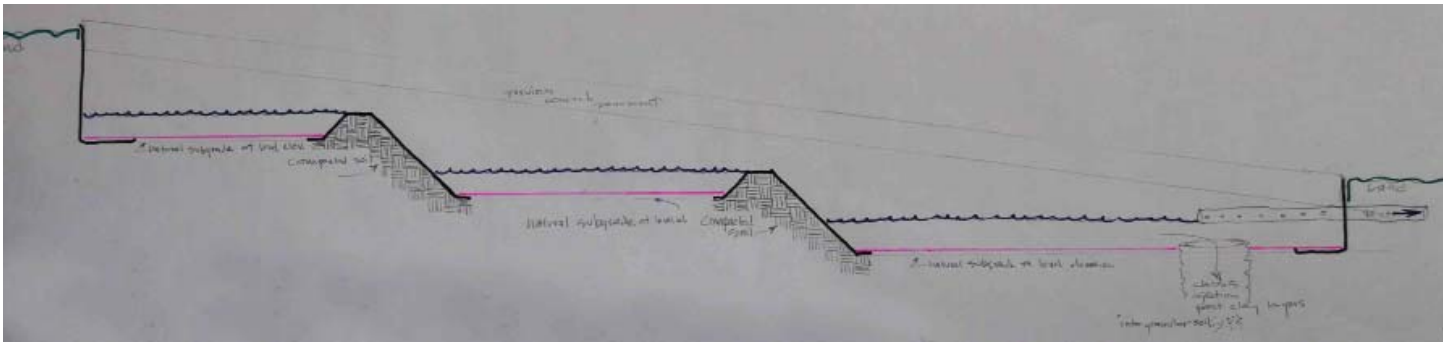
The design of base materials and their compaction are very different for pervious concrete systems as compared to those for asphalt pavement. Flexible asphalt pavement depends greatly on compacted soils which tend to erode into the voids of a pervious system. When asphalt pavement is adjoining a pervious detention basin, an impermeable silt barrier must be used to block the movement and destabilization of the asphalt pavement. Many designers will specify a solid curb of conventional concrete to provide this essential barrier. Impermeable, 15 mil poly also shown good success.



Check Dams

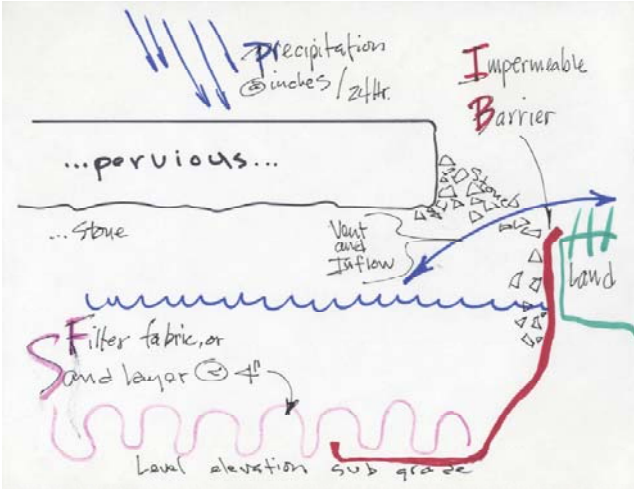
Our favorite design is dead level, with the pavement section and subgrade performing to maximize the detention and percolation of storm water. When the terrain includes slope, you must still keep the detention basin level or back-sloped to maintain effective percolation. Terrace the area, divided by check dams which can hold a share of the storm water volume. Elevation breaks or berms should be protected with impermeable barrier and should be designed with no less than 8 inches of detention aggregate over the berm. Water may be directed to flow toward trees or away from building foundations with impermeable barrier that is properly installed. Keep the top edges up to proper height and the bottom edges should have a horizontal flap to extend under the edges of the detention aggregate.





In/Out Edges

A great design comes from Bruce Ferguson, one that I call IO edges. The edges of the detention basin are left open and extend slightly, outside the edge. The landscape is left low enough to vent the system as well as having a handy filtration area to slow and catch contaminants from inflow, depending on the terrain.

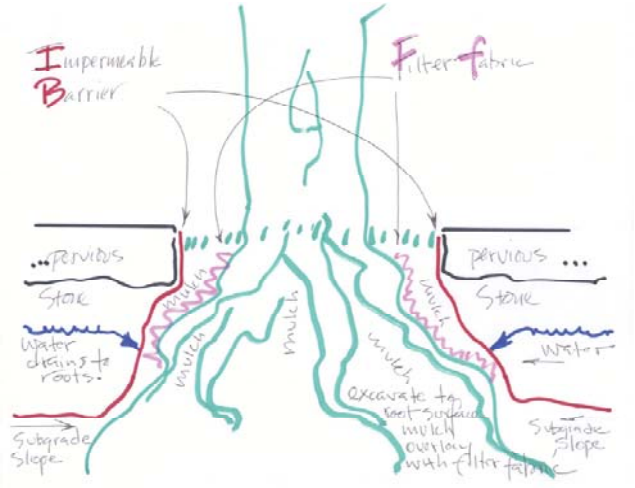


Underground Storage

Storm water storage capacity can be enhanced with structures within the detention basin or may be built outside the system in external storage.

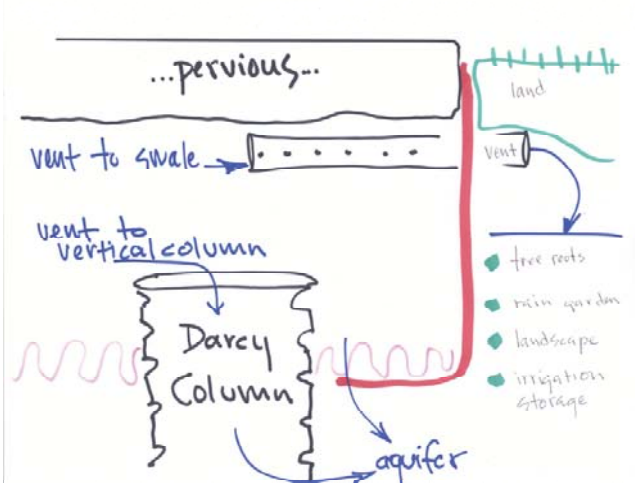
Tree Roots

New construction around existing tree roots requires some careful excavation to rake away the soil above the roots. It's okay to place detention aggregate on the slope of the raked surface of the roots. But, first cover the roots with mulch and filter fabric and a secure layer of impermeable barrier. Rain gardens should also be arranged with similar edges.



Darcy Column

If the subgrade soil is found to be too low in permeability, a column may be installed. Andrew Youngs calls this a Darcy Column but the formal name is Class 5 Injection Well. These require a permit (see downloads) which is easy to process but essential to stay legal. This column can penetrate a layer of clay soil to vent into granular soil just below, allowing significant enhancement of the system.



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