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IFAS Extension

Exfiltration Tanks/Trenches





The modular system shown here was installed at the Madera *subdivision in Gainesville in 2003; together with permeable pavers, this system captures and exfiltrates, on average, one-third of the roof's runoff.*

Definition:

Exfiltration tanks and trenches (or dry wells) are sub-surface engineered detention and infiltration cells with significant volume or pore space to store and control site runoff. They are sometimes referred to as subsurface detention or retention, infiltration or percolation tanks, soakaways or underground infiltration basins. While infiltration trenches are usually rock filled ditches into which stormwater enters from the top, exfiltration trenches often involve a pipe in the middle of the trench through which stormwater enters.

Objectives:

These structures capture and discharge stormwater at a controlled rate. They function in concert with pervious surfaces by enhancing the infiltration and storage capacity of on-site soils and treating runoff before it recharges the groundwater. Exfiltration systems act as small, distributed, underground stormwater retention ponds.

Overview:

Exfiltration tanks and trenches can be used to convey and distribute captured runoff across a lot or subdivision. These exfiltration structures provide a storage area for rapid runoff during a storm, then allow it to infiltrate gradually through the soil into the groundwater. Runoff water enters the underground chamber at the inlet and a physical filtration process removes pollutants as the exfiltrate enters the surrounding soil. However, some pollutants can remain in the exfiltrate water, so additional source control is needed where groundwater contamination is a concern.

Exfiltration tanks and trenches can vary considerably in size. Large underground exfiltration designs generally utilize concrete and large pipe systems. Modular products are available that are usually constructed of lightweight but durable plastic wrapped in a geo-textile. Modular

Applications

- Residential lots
- Commercial development
- Parking lots
- Green spaces
- Golf courses

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Benefits

- Detention
- Infiltration
- Stormwater reuse
- Groundwater recharge
- Runoff attenuation
- Reduction in peak velocity
- Reduction in stormwater runoff volume
- Possible reduction in size of centralized stormwater retention ponds

products are the best option for individual homes, which on a per lot basis, typically have very small stormwater volumes. These products take up little space and can be buried under the lawn areas. The modular design allows for flexibility in applications and integration with existing site features. They are lightweight and easy to install and are engineered to be resistant to very high loads.

Water Protection Benefits:

Water conservation implications – Exfiltration systems do not benefit potable water supplies directly, but do assist in groundwater recharge and reducing some demand by on site vegetation.

Stormwater implications – Sub-surface infiltration systems such as exfiltration tanks reduce peak velocity and volume of stormwater runoff. When significant storage volumes and mitigation of peak runoff velocity are attained, zero stormwater discharge from the lot may be achieved. This in turn can reduce the size of centralized stormwater retention ponds..

Design Considerations:

Underground exfiltration is infiltration dependant and can be incorporated into most site designs having well drained soils. Application of this practice is particularly beneficial where land costs are high or space availability is low. This practice can also be applied in high water table conditions, but the effective vertical storage volume is reduced requiring greater area coverage for similar volume capacity.

Operations and Maintenance:

Exfiltration trenches can become clogged, so it is important to prevent sediments and materials from entering the system as much as possible and periodically remove those that accumulate. Access for maintenance should be considered in the design, potentially including an observation well of PVC pipe leading to the bottom of the trench to allow for monitoring of the drawdown rate. Some systems incorporate an underdrain below the filtering system, which can be used as an overflow should clogging occur.

Credits in Green Building Certification Programs:

- LEED for Homes (SS 4.3 management of runoff from roof)
- LEED for Neighborhood Development Pilot (GCT Credit 9: Stormwater Management)
- NAHB Model Green Home Building Guidelines (1.3.5 Manage storm water using low-impact development when possible)

Relative Costs:

Materials are the highest percentage of the overall exfiltration system costs. The modular system installed at *Madera* for a single-family residential lot cost just over $1000 and is part of an LID treatment train at both the lot and community scales. When evaluating costs, consider that the use of exfiltration tanks or trenches can reduce or eliminate the costs of monitoring effluent because of reductions in runoff/discharge.

Design Keys

- Good where land costs are high or space availability is low
- Well-drained soils
- Low water table

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References and Resources:

Atlantis© Infiltration Tank System (Atlantis Corp – Australia): http://www.atlantiscorp.com.au/applications/infiltration_tank

EPA Stormwater BMP Fact Sheet: Infiltration Trench http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=70

Livingston, Eric H., Robert Baldwin, and Brian Clevenger. "Lessons Learned About Successfully Using Infiltration Practices." National Conference on Tools for Urban Water Resource Management and Protection Proceedings. Chicago, IL, February 7-10, 2000. EPA/625/R-00/001, pp. 141-161. July 2000.

Sub-Surface Infiltration Areas (Pennsylvania Association of Conservation Districts' Best Management Practices Fact Sheet): http://www.pacd.org/resources/pollution_solutions/Dauphin/InfiltrationArea.pdf

Credits

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