3. Permeable Pavement

Definition. Alternative paving surfaces that capture and temporarily store the Stormwater Retention Volume (SWRv) by filtering runoff through voids in the pavement surface into an underlying stone reservoir. Filtered runoff may be collected and returned to the conveyance system, or allowed to partially infiltrate into the soil.

Design variants include:

- P-1 Porous asphalt (PA)
- P-2 Pervious concrete (PC)
- P-3 Permeable interlocking concrete pavers (PICP) or concrete grid pavers (CGP)

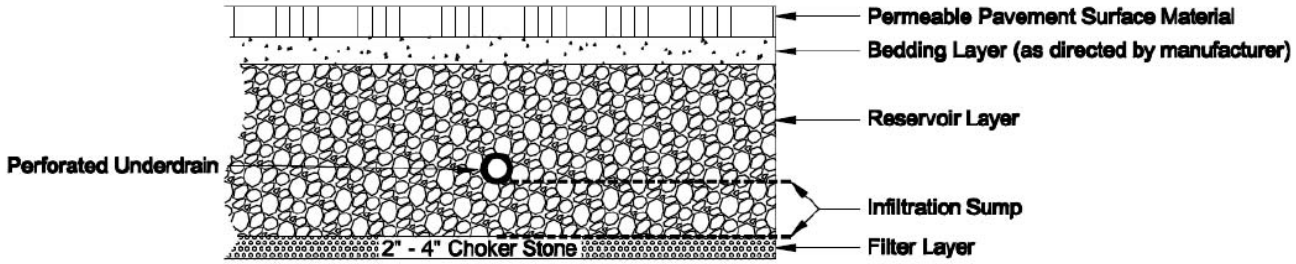

Figure 3.4.2. Cross Section of an Enhanced Permeable Pavement Design with an Underdrain.

Equation 3.4.1. Reservoir Layer or Infiltration Sump Depth

$$d_p = \frac{\{(P \times Rv_i \times DA / Ap) - (\frac{1}{2} i \times t_f)\}}{\eta_r}$$

Where:

d_p = Depth of the reservoir layer (or the depth of the infiltration sump, for enhanced designs with underdrains) (ft.)

DA = Total contributing drainage area, including the permeable pavement surface (sf.)

A_p = Permeable pavement surface area (sf.)

P = The rainfall depth for the SWRv or other design storm (ft.)

Rv_i = 0.95 (runoff coefficient for impervious cover)

i = The field-verified infiltration rate for the subgrade soils (ft./day). If an impermeable liner is used in the design then i = 0.

t_f = The time to fill the reservoir layer (day) – assume 2 hours or 0.083 day

η_r = The effective porosity for the reservoir layer (0.35)

3. Permeable Pavement (continued)

Equation 3.4.2. Drawdown Time

$$t_d = \frac{d_p \times \eta_r}{\frac{1}{2} i}$$

d_p must fully drain within 48 hours

Equation 3.4.3. Permeable Pavement Storage Volume

$$Sv = d_p \times \eta_r \times A_p$$

Where:

A_p = the permeable pavement surface area (ft^2)

Table 3.4.2. Material specifications for underneath the pavement surface.

Material	Specification	Notes
Bedding Layer	PICP: 2 in. depth of No. 8 stone over 3 to 4 inches of No. 57 stone PC: None PA: 2 in. depth of No. 8 stone	ASTM D448 size No. 8 stone (e.g., 3/8 to 3/16 inch in size). Should be double-washed and clean and free of all fines.
Reservoir Layer	PCIP: No. 57 stone PC: No. 57 stone PA: No. 2 stone	ASTM D448 size No. 57 stone (e.g. 1 1/2 to 1/2 inch in size); No. 2 Stone (e.g. 3 inch to 3/4 inch in size). Depth is based on the pavement structural and hydraulic requirements. Should be double-washed and clean and free of all fines.
Underdrain	Use 4- to 6-inch diameter perforated PVC pipe (or equivalent corrugated HDPE may be used for smaller load-bearing applications), with 3/8-inch perforations at 6 inches on center. Perforated pipe installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, is used to connect with the storm drain system. Ts and Ys should be installed as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface with vented caps at the Ts and Ys.	
Infiltration Sump (optional)	An aggregate storage layer below the underdrain invert. The depth of the reservoir layer above the invert of the underdrain must be at least 12 inches. The material specifications are the same as Reservoir Layer.	
Filter Layer (optional)	The underlying native soils should be separated from the stone reservoir by a 2 to 4 inch layer of choker stone (e.g. No. 8).	
Geotextile (optional)	Use a woven monofilament polypropylene geotextile with a flow rate greater than 100 gpm./sq. ft. (ASTM D4491).	
Impermeable Liner (optional)	Use a thirty mil (minimum) PVC Geomembrane liner covered by 8 to 12 oz./sq. yd. non-woven geotextile. Note: This is used only in fill soils as determined by a geotechnical investigation.	
Observation Well	Use a perforated 4- to 6-inch vertical PVC pipe (AASHTO M 252) with a lockable cap, installed flush with the surface or just beneath PICP.	