

4.7 Pervious Paving



Figure 4-11: Pervious Concrete Parking Lot, Emeryville, California

Best uses

- Parking areas
- Common areas
- Lawn/landscape buffers
- Pathways

Advantages

- Flow attenuation
- Removes fine particulates
- Reduces need for treatment

Limitations

- Needs periodic cleaning
- Weeds
- Use only in lightly trafficked areas
- Higher installation costs

Pervious paving is used for areas with light vehicle loading and lightly trafficked areas, such as automobile parking areas. Table 4-1 shows possible applications for different types of pervious paving. The term pervious paving describes a system comprised of a load-bearing, durable surface together with an underlying layered structure that temporarily stores water prior to infiltration or drainage to a controlled outlet. The surface is porous such that water infiltrates across the entire surface of the material (e.g., crushed aggregate, porous concrete and porous asphalt). Pervious paving is considered a site design measure, and its use can help reduce the size of stormwater treatment measures, but it is not a treatment measure. See Section 4.9 for guidance on how to combine pervious paving with stormwater treatment measures.

Paver Type	Description	Possible Applications
Porous Asphalt	Open-graded asphalt concrete over an open-graded aggregate base, over a draining soil. Contains very little fine aggregate (dust or sand) and is comprised almost entirely of stone aggregate and asphalt binder; surface void content of 12-20%.	Low traffic use, such as parking lots, travel lanes, parking stalls. Surface may be too rough for bicycle path.

Table 4-1: Types of Pervious Paving and Possible Applications		
Paver Type	Description	Possible Applications
Pervious Concrete	A discontinuous mixture of coarse aggregate, hydraulic cement and other cementitious materials, admixtures, and water which has a surface void content of 15-25% allowing water to pass through.	Sidewalks and patios, low traffic volume and low speed (less than 30 mph limit) bikeways, streets, travel lanes, parking stalls, and residential driveways.
Source: Design Guidelines for Permeable Pavements, Redwood City		

Design and Sizing Guidelines

The design of each layer of the pavement must be determined by the likely traffic loadings and the layer's required operational life. To provide satisfactory performance, the following criteria shall be considered:

- The sub-grade shall be able to sustain traffic loading without excessive deformation.
- The granular capping and base layers shall give sufficient load-bearing to provide an adequate construction platform and base for the overlying pavement layers.
- The base aggregate particles shall be selected based on strength and durability when saturated and subjected to wetting and drying. To allow for subsurface water storage, the base must be open graded, crushed stone (not pea gravel), meaning that the particles are of a limited size range, with no fines, so that small particles do not choke the voids between large particles.
- The sub-grade shall be either ungraded in-situ material with a percolation rate of 5-inches per hour, backfilled with coarser fill material, or installed with an underdrain that will remove detained flows within the pervious paving and base.
- The pavement materials shall not crack or suffer excessive rutting under the influence of traffic. This is controlled by the horizontal tensile stress at the base of these layers.
- Pervious pavements require a single size grading to give open voids. The choice of materials is therefore a compromise between stiffness, permeability and storage capacity.
- Runoff coefficients for pervious pavements are listed on the Estimated Runoff Coefficients for Various Surfaces During Small Storms (1.5 to 2-year storm), Table 5-3 in Chapter 5. Pervious pavements by themselves do not treat runoff. However, because of the higher infiltration rates compared to an impervious surface, the size of downstream stormwater treatment measures can be reduced.
- Design calculations for the base shall quantify the following:
 - Type of soil, type of fill if used, permeability of base, k-values (psi/cubic inch)
 - Compressibility (clay and silt contents, organics, muck)
 - Traffic loading (in 18,000 lb. single axle loads)
 - Drainage routing of detained flows within the pervious pavement and base (infiltration through minimum 5-inch per hour base into in-situ soils, or collection in underdrain if percolation rate cannot be met with in-situ soils)
- Design shall be reviewed by manufacturer or National Ready Mixed Concrete Association (NRMCA) (www.nrmca.org).
- Depth to groundwater shall be at least 10 feet from bottom of base.

- Permeable pavements must be laid on a relatively flat slope, generally 5% or flatter. If permeable pavements are laid on steep slopes, the open graded crushed aggregate base may tend to migrate downhill, causing the surface to deform.
- Installation shall be by contractors familiar with pervious paving installation. Only contractors with certification from NRMCA should be considered. More information can be found at www.concreteparking.org.

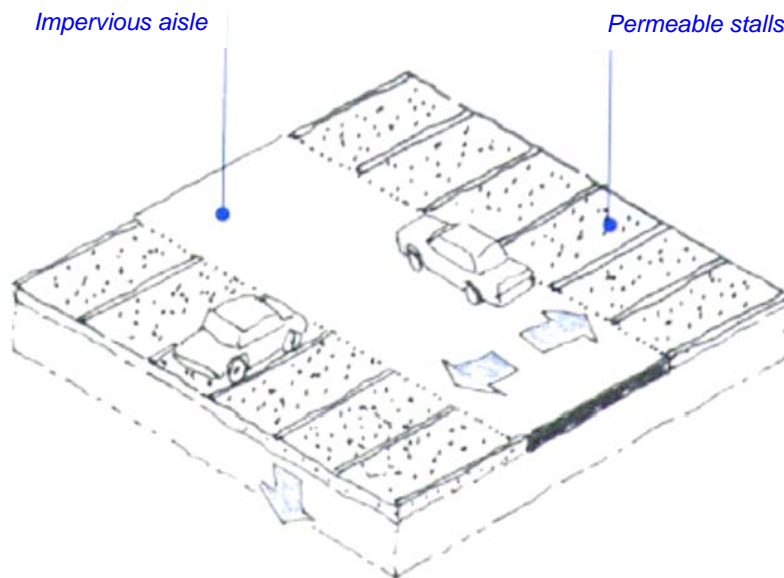


Figure 4-12: Surface view of parking lot with pervious paving in lightly-trafficked areas. (Source: Bay Area Stormwater Management Agencies Association [BASMAA], Start at the Source, 1999)

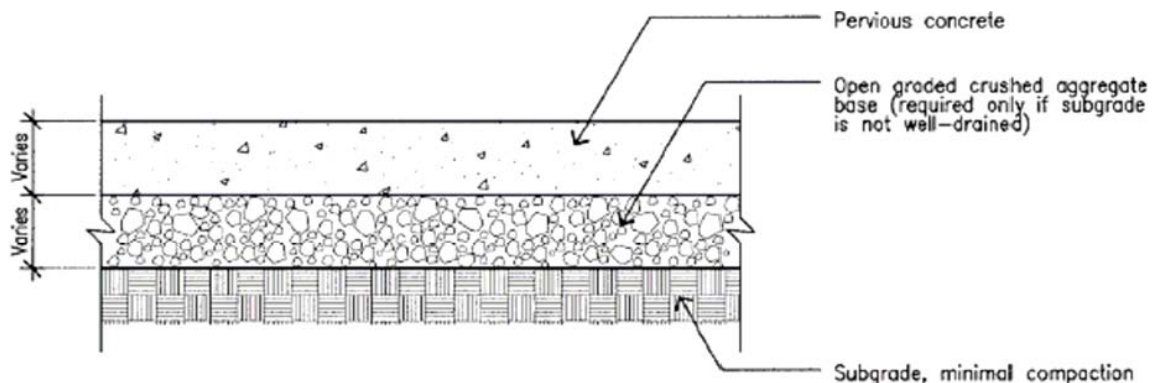


Figure 4-13: Pervious Concrete Installation. (Source: BASMAA, 1999). Depth of pervious concrete will vary with type of usage.

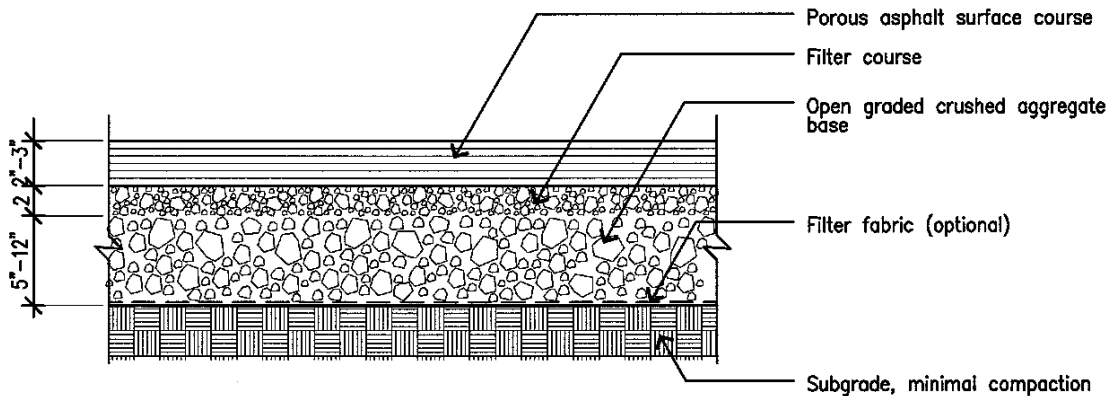


Figure 4-14: Porous Asphalt Installation (Source: BASMAA, 1999)

- Keep landscaped areas well maintained.
- Prevent soil from washing onto the pavement. The surface of the pervious pavement shall be vacuum cleaned using commercially available sweeping machines at the following times:
 - End of winter (April)
 - Mid-summer (July / August)
 - After autumn leaf-fall (November)
- Inspect outlets yearly, preferably before the wet season. Remove accumulated trash and debris.
- When vacuum cleaning is conducted, inspect pervious paving for any signs of hydraulic failure.

As needed maintenance:

- If routine cleaning does not restore infiltration rates, then reconstruction of part of the pervious surface may be required.
- The surface area affected by hydraulic failure should be lifted, if possible, for inspection of the internal materials to identify the location and extent of the blockage.
- Surface materials should be lifted and replaced after brush cleaning. Geotextiles may need complete replacement.
- Sub-surface layers may need cleaning and replacing.
- Removed silts may need to be disposed of as controlled waste.