

Permeable Interlocking Concrete Pavement Frequently Asked Questions

Q: Should a dense-graded or open-graded aggregate base be used under PICPs?

A: An open-graded base is most commonly used because it has water storage capacity (void space between the aggregates) of typically 30% to 40%. The stone sizes in open-graded bases can be as large as 3 in. (75 mm) and as small as 1D4 in. (6 mm). There is typically a thinner layer of small stone sizes (6 mm to 1 mm) used for bedding directly under the concrete pavers. The bedding and base bedding material maximizes storage, filtering, and treatment of pollutants in storm water runoff entering the pavement surface. Open-graded bases are preferred because of the storage and treatment benefits.



Dense-graded bases are occasionally used under PICPs as in the Glen Brook Cove subdivision and the Harbourfront Fire Station. They may be used in areas of concentrated wheel loads from truck traffic. While there is additional structural support, most of the runoff from common rainstorms is stored in the bedding material and within the openings in the pavement surface. Maximum storm water storage and infiltration benefits, however, come from PICP with an open-graded base.

Q: What intensity and duration of storms can be managed?

A: It depends on the amount of water that drains onto the PICP, the depth (and storage capacity), the base, the infiltration rate of the soil under an open-graded base and the presence of drain pipes within an open-graded base. PICPs are intended to manage water quantities and pollutants from smaller, more frequent storms such as those with a return period of 10 years or less. These storms tend to be shorter in duration and often have the highest concentrations of pollutants. PICPs are not intended to control flooding from larger, infrequent rainstorms.

Q: How well does the pavement perform in freeze and thaw conditions?



A: PICPs have been in service for years in freezing climates and have performed adequately. Many projects throughout Canada, the northern U.S., the United Kingdom and Germany speak to the durability of these pavement systems in cold climates, and their ability to accept snowplows without paver damage. In order to ensure high durability in freezing climates, the paving units should conform to the requirements of ASTM C 936 in the U.S. or CSA A231.2 in Canada. Both of these product standards include tests for freeze-thaw durability.

When the sun and temperature are right, ice and snow on PICPs can melt and immediately soak into the pavement surface. Water does not collect on the surface and re-freeze. This reduces slipping hazards. Sand should not be used for foot or tire traction on PICP. Deicing salts can be used. After plowing, melting of any remaining snow can occur if the temperature rises above freezing. This will help eliminate ice from forming and reduce salt contamination in groundwater. Water in the base typically should drain within 24 hours. It's unlikely that ice will form in the base within this time period should temperatures drop below freezing. If the water does freeze before draining, there is adequate space for the ice to expand within the open-graded base, thereby minimizing the risk of heaving. Should soil heaving occur, the pavement surface is flexible and should not be damaged from minor upward movement or from resettlement during a thaw.

Q: Is there any benefit to using PICPs on low-infiltration soils such as some types of clays?

A: Yes. If soil infiltration is slow (generally under 0.5 in./hour or 1.3×10^{-2} m/sec), perforated plastic pipe drains at the bottom of the base can remove excess water while still allowing some of the water to infiltrate into the soil. The drainage rate for the water contained in the base is typically no greater than 24 hours. Over practically impervious soils or high bedrock, an impervious pond liner can be used to detain, filter and release the water through drain pipes. Regardless of the rate of soil infiltration, the filtering action of the open-graded base can reduce water pollutants. All permeable pavements require periodic surface cleaning.

Q: Does the surface conform to the Americans with Disabilities Act (ADA) requirements?



A: Yes. ADA Design Guidelines require that surfaces be firm, stable and slip resistant. PICP designs can provide a firm and stable surface for visually impaired persons and those using wheeled mobility devices. If the openings in the surface are not desirable, solid units can be used in areas subject to disabled persons. Such areas might include designated spaces in parking lots.

ADA recommends that the static coefficient of friction for flat surfaces along accessible routes be 0.6 and 0.8 for ramps. ADA advisory material recommends various test methods to assess surface slip resistance. PICPs can meet slip ADA resistance requirements using test methods recommended in ADA advisory literature. For additional information on these requirements, see ICPI Tech Spec 13 - Slip and Skid Resistance of Interlocking Concrete Pavements.

Q: How is a PICP surface cleaned and how often?

A: The openings in the surface of PICPs will require periodic removal of detritus and sediment trapped by the small sized crushed stone. Dirt is typically removed by a vacuum-sweeping street cleaning machine. Cleaning is done when the pavement surface and detritus are dry and can be loosened by sweeping and vacuuming. The frequency of cleaning will vary with the use of the pavement and position of sediment, leaves, etc. from adjacent areas. Cleaning should be done at least once a year, and the surface monitored during the early life of the pavement so that a regular cleaning schedule can be established.

A North Carolina State University study has shown that the initial surface infiltration rate of PICPs can be as high as 2,000 in./hour (5,080 cm/hour). Other research has shown that near initial surface infiltration rates can be restored through cleaning and replacement of the initial 3/4 to 1 in. (20 to 25 mm) depth of small stones in the openings of PICPs. For highly clogged pavement openings, the stones can be removed with vacuuming and replaced with clean material. This is a distinct maintenance advantage over pervious concrete and porous asphalt pavements.

Q: What about high heel shoes?



A: Solid pavers can be introduced into PICP paving patterns in pedestrian areas to accommodate a variety of shoes including high heels.

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