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Demystifying Porous Pavement Truths

Porous Pavement: Winter Durability Fact Check

Properly designed porous pavement systems do not get damaged by the dynamics of freeze thaw cycles.

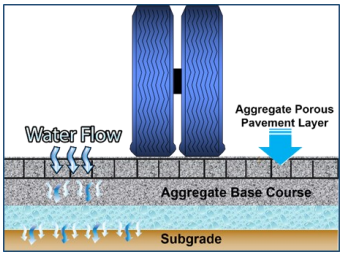
Winter Durability for Porous & Pervious Pavements

For decades, civil engineering roadway designers have been trained to use positive drainage, crack sealing, and sealcoating to keep the area under pavement dry. The prevailing mentality was to use well-graded, tightly compacted base under impervious concrete or asphalt wearing surfaces. When water gets between the well graded base and the impervious surface – frost conditions would lift pavements, weaken base structure, create potholes and in general, wreak havoc with the life of the pavement. So, it is not surprising that age-old tenets related to moisture, seepage and freeze-thaw cycles get mistakenly applied to porous pavement systems.

Myth: The Dynamics of Freeze-Thaw Cycles Damage Porous Pavements.

NOT TRUE! Properly designed porous pavement systems do not get damaged by the dynamics of freeze-thaw cycles. What makes well-designed porous pavement cross-sections so resistant to the power of freezing and expanding water? The answer is space. Poorly-graded crushed aggregate offers up to 40% void ratio which gives water a place to move, a place to expand into upon freezing, and a network of pathways to drain.

High void ratio systems allow the Earth's natural warmth to move up from below the frost line into and through the open-air system just as water and ice-melt moves down and through the system. If the water can't permeate into the ground and is trapped in the open graded base system, the voids allow expansion of the water as it forms to ice to harmlessly expand into the void areas.



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How Freeze-Thaw Affects Porous Pavement

There are more than one freeze types. There is the **dry freeze** and the **hard dry freeze** condition that describes regions with low precipitation and multiple freeze thaw cycles or only one or 2 freeze cycles, respectively. Neither of these freeze types challenge porous pavement systems, because they lack moisture.

There are **wet freeze** regions having 15+ freeze thaw cycles that require 6 to 12 inches of open graded base course to safely allow expansion of the water that percolates and drains through the pavement and base throughout the cycles.

Then there is the more challenging **hard wet freeze**. This is the condition described by areas that have moderate to high precipitation combined with a frost depth that develops over the course of several months. The National Ready Mixed Concrete Association offers a solid set of recommendations defining open graded base course depth and the porous pavement depth, based on 65% of the maximum frost depth for the area. So, an area that gets 24 inches of frost depth should design for a 16-inch total pervious cross-section. The 16 inches includes the porous pavement, the open graded base course and any pervious subbase.

Concerns with freeze-thaw having negative effects on the performance of porous pavements is understandable, but simply a myth. Because of their high void spaces and ability to allow expansion of water and ice, freeze-thaw cycles have very little effect on porous pavements.

So, you can have all of the benefits of porous pavements--reduce detention pond system expenses, reduce land utilization for stormwater purposes, return water to the aquifer below and cut stormwater conveyance and structure costs--with the comfort of knowing that freeze thaw cycles will not damage your porous pavement