

Porous Pavements Working in Northern Climates

By Chuck MacDonald



The crew of Pine Bend Paving begins to lay the mat for a porous asphalt parking lot for the Ramsey-Washington Metro Water District in suburban Minneapolis-St. Paul. (Photos courtesy of Barr Engineering and Pavement Management Services.)

Porous asphalt pavements are being used increasingly as a means to manage stormwater in an environmentally friendly way. Porous parking lots are showing their mettle in northern climates, as well as in the Sunbelt, including one that is nearly 30 years old.

In 2005, the Ramsey-Washington Metro Water District specified a porous asphalt parking lot for their location in suburban Minneapolis-St. Paul. The organization is responsible for protecting the water resources of the watershed.

The District had ordered “green roofs” for its headquarters building, and installed a series of rain gardens. So a porous parking lot was a natural for helping to manage the water runoff on the property.

The unusual concept of a porous parking lot is that it allows water to filter through the pavement structure and to collect in a stone recharge bed underneath the pavement. The water is retained there and slowly infiltrates the soil and from there to the water table. The porous asphalt mix has a lower concentration of fines than traditional asphalt. With fewer fines, the mix allows water to drain through the material. The underlying stone recharge bed must be uniformly graded to maximize the void space. The void space between the stones provides the critical storage volume for the stormwater.

Barr Engineering designed the porous lot for the watershed district. The lot was about 900 square yards, sufficient for 23 parking places. “Our biggest challenge on the project was the large areas of silt and clay,” said Kurt Leuthold, the chief engineer on the project. “For the porous lot to



The porous asphalt mix has a lower concentration of fines than traditional asphalt and is laid over a stone recharge bed.

The aggregate is being compacted before the parking lot is laid at Grand Valley State. The underlying stone recharge bed must be uniformly graded to maximize the void space in porous asphalt lots.

work right there must be some soil with infiltration capacity.”

Leuthold and his team solved the problem by designing the recharge bed with a slope. Water could percolate from the recharge bed through the sandy soil. In areas where the soil was impermeable, the slope of the stone bed directed the water toward the sandy subgrade where it could be absorbed.

The finished lot has stood up to a Minnesota winter and has shown some unexpected advantages. “We’ve had quite a bit of snow and some rain this winter, and there hasn’t been any problem,” Leuthold reported. “In fact, the snow doesn’t seem to stay as long on the lot. When it melts a little in the sun, the water filters through the pavement and doesn’t refreeze on the surface



when the temperature drops. Less ice means it is less slippery than a traditional parking lot.”

Porous parking lots should not be sanded in the winter, as sand would plug up the pores and prevent water from draining through. Periodic vacuuming of the pavement is recommended to prevent material from clogging the pavement.

Pine Bend Paving did the paving at the watershed district project. “The paving part of the project worked just like a normal paving job,” said Chris Mallinger, of Pine Bend. “We did it in just one three-inch lift.”

Porous pavements require some special materials including a geotextile fabric to line the stone bed and prevent soil from below working its way into the bed. “We put in a choker course of rock (AASHTO #57) on top of the stone

recharge bed to protect it," said Mallinger. "That helps prevent rutting from occurring during the paving process."

Pine Bend also took a final precaution to protect the unique pavement. Because of landscaping activities taking place near the parking lot, Pine Bend put a fabric over the lot to prevent dirt and sand from getting on the lot and plugging up its pores.

Grand Valley State

Porous asphalt pavements were installed in another northern location in 2004. Two parking lots were constructed at the south end of Grand Valley State University in Allendale, Mich. The project won an Award of Excellence from the Asphalt Pavement Association of Michigan. One of the lots was 8,445 square yards, sufficient for 100 parking spaces, and the second lot was 6,830 square yards, enough for 50 spaces.

Stormwater concerns were an important part of the project. The university decided it needed more parking for its students, and then discovered that it would be required to buy additional land because of the stormwater runoff from existing parking areas. A part of the addi-

tional land would be used to create a detention pond, lined with stone.

By specifying porous asphalt lots, the university did not need to purchase the additional land.

"The project went smoothly," said Doug Coleman, a consultant with Pavement Management Services, who was part of the team that designed the parking lot. "In the future, regular lots can be designed with a slope to direct water to a porous section where it can drain down into the recharge bed and from there to the water table."

Roger VanPutten of Michigan Paving & Materials in Grand Rapids, directed the paving operation. Michigan Paving & Materials also produced the mix. VanPutten considered the paving part a normal operation, with one exception. "We had to be very careful when operating our equipment on top of that 'open' aggregate," he said. "It was important to disturb that as little as possible."

The mix design had 18-22 percent voids, with a PG 70-28 binder. The finished pavement was 2.5 inches thick. Since completing the project, Michigan Paving has done six more porous lots in the Grand Rapids, Mich., area.

Walden Pond

When it comes to a porous asphalt parking lot with history, it's hard to beat the lot at Walden Pond State Reservation, near Concord, Mass. Constructed in 1977, the lot was New England's first porous pavement. The lot has withstood the freeze-thaw conditions of many severe Massachusetts winters and is still in good condition, according to A. Richard Miller, executive director of the Lake Cochituate Watershed Association.

The parking lot is for visitors to the national historic landmark. A porous asphalt lot was a good fit for the landmark since Henry David Thoreau, who lived at Walden Pond, is credited with helping to inspire awareness and respect for the natural environment.

Respect for the environment is an important attribute of porous asphalt pavements. The porous lot at Walden Pond was constructed on top of a permeable subgrade, with the pavement at least 2.5 inches thick throughout. The pavement was built by Warren Brothers Company. Engineering work and research was provided by Northeastern University Department of Civil Engineering.

"The lot at Walden Pond benefited from an unusual amount of professional engineering supervision and analysis," Miller wrote. "Despite repeated freeze/thaw conditions, the porous lot has shown no ill effects." **HMAT**

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