Wisconsin winters are notorious for the damage they can cause to roads. An example of winter’s influence was seen on Highway E, a winding, two-lane asphalt road that serves commuters between Little Chute and Oneida. Once called the worst stretch of road in Outagamie County, it was plagued by cracking and heaving during the winter months. Similar problems occur elsewhere in the region where sub-base sand silt pockets enclosed in the state’s thick clays become highly saturated and freeze.

The speed limit on a half-mile stretch of Highway E had to be reduced from its normal 55 mph to 15 mph during the winter months. “Heaving could start as early as November and be a problem through March,” said Mike Marsden, Outagamie County Highway Commissioner. “We could tell when the frost was out of the ground in the spring because the road would flatten out. We’d put up flashing barriers and advance warning signs. It was really difficult to plow snow in the area.”

Little did Marsden know that he’d find a solution to the heaving problem in his own county. The corporate offices of Presto Products Company and the Geosystems group are located in Appleton, Wis. Presto Products Company helped pioneer cellular confinement technology in cooperation with the Army Corps of Engineers in the late ’70s. The company’s Presto Geoweb Cellular Con-

The confinement System is designed to strengthen structural fill by increasing its shear strength and stiffness.

The system originally was developed for building roads across insufficiently supported grounds, such as beach sands. The system was used to build sand roads for rubber-tired vehicles during the Persian Gulf War.

“Our first project with Outagamie County was at the county landfill site,” said Gary Bach, product manager. “We used the system to construct an access road into one of the landfill cells. That application was a success and led us to the Highway E project.” To combat Highway E’s washboarding pavement, the county worked with the company in 1984 to produce a cross-section design of the road. Presto staff were on site during installation.

**The system is** an expandable honeycomb-like structure made of high-density polyethylene. The system is designed to produce a stiff base with high flexural strength. According to the company, under load, the system generates powerful lateral confinement forces and high soil-to-cell wall friction. It is to provide a bridging action and improve the long-term load deformation performance of common granular fill materials.

On Highway E, an 8-in. deep system was installed in the problem area. The asphalt pavement was removed and stored for recycling and final topping after reconstruction. The silty clay subbase was cut down 18 in. below the water table level and covered with a geotextile. Next, a 6- to 8-in. layer of 3½-in. to 4½-in. clean crushed stone was added. The system was expanded, positioned and secured at the edges with granular fill. It was then infilled with sand and topped with a 15-in. base course of crushed stone. The completed area was then compacted with a vibratory roller and was immediately ready for traffic.

“Because of our soil conditions, we always use a 15-in. base course on all of our roads,” Marsden said. “We probably could have gotten by with less, but we decided not to. If we hadn’t used the confinement system, we probably would have reworked the subgrade and added 2 ft of base course. Even though we had fill material available just 6 miles away, it was less expensive to complete the renovation project with the Geoweb material than without it.”

Unpaved, the road performed well throughout the following winter, and was surfaced with the recycled asphalt in the summer of 1985.

The system was installed in Highway E in 1984. Now, more than 10 years later, the road still is level and holding up well under all weather conditions. The highway is scheduled to be rebuilt in 1997. The county will widen the highway, fill some valleys, improve sight distance and flatten curves.

“We’re not going to touch the section of the road that has the confinement system in it,” Marsden said. “The road will be widened, but we won’t alter the alignment or the system. We’re very pleased with the way it has solved the problems for us on Highway E.”

Reprinted from March 1996 *Roads & Bridges* Magazine