

Geofoam by Falcon Foam Leaves Grand Rapids Waterline Undisturbed

When the Michigan Department of Transportation decided a road-widening project along a 6.75-mile stretch of Lake Michigan Drive (M45) through the town of Allendale would be necessary, that meant leveling several hills and valleys along the two-lane rural road to create a divided four-lane boulevard.

An expansion of the busy rural artery could not happen until the load on a nearby buried water main—that supplies up to 45 million gallons per day of the vital resource to the greater Grand Rapids area—was also lessened.

A traditional sand fill would exert a 2,000-pound-per-square-foot load on the 1939 waterline and that would present too much of a rupture risk to the 46" diameter, wire wound reinforced concrete waterline. So road engineers turned to a less traditional, more innovative fill for the job.

MDOT specified Geofoam, the generic name for large blocks of expanded polystyrene, which were manufactured by Falcon Foam. Falcon Foam is a division of Atlas Roofing Corporation that specializes in the development and manufacture of quality HCFC-Free Expanded Polystyrene insulation products.

Geofoam is an environmentally responsible fill option that does not contaminate ground water or soil, according to a representative for Falcon Foam in Byron Center, Michigan.

This was not the first time Geofoam has been used in Michigan, says the Rep. The transportation department has found many applications for Geofoam on its road building projects.

“They have put a lot of foam in the ground for a lot of reasons,” said the Representative. Geofoam is also used in road projects over underlying soft soils that cannot carry the designed loads. Geofoam also is installed alongside bridge and foundation walls as a soil substitute to reduce horizontal loading.

In some cases, the foam can reduce the amount of steel reinforcement and concrete needed to build bridges because of a reduction in the lateral load, the Rep noted.

For the M45 project, Geofoam greatly reduced the weight over the waterline. For example, a 20-foot by 1-square-foot column of Geofoam weighs just 31 pounds, the Company explained. Over the entire project, the foam blocks weighed a combined 533,000 pounds and represented just 1.5 percent of the nearly 36 million pounds of sand fill that the Geofoam replaced.

For perspective on how much foam was placed under Lake Michigan Drive, the Company offered the following: “The 4,100 blocks of Geofoam used in the project would cover a football field stacked over 87 feet tall.”

Geofoam blocks can carry the enormous weight of a four-lane boulevard and the traffic it carries because over the surface of the blocks they can withstand a tremendous amount of pressure, a

member of the Engineering Team explained. The blocks for the M45 project were at 1.54 pcf density EPS, but density can be adjusted to specifications.

Each block was molded at Falcon's Byron Center plant and then cut to size before they were delivered. Field cutting was easily achieved on site, especially to fit around manholes.

Each block on the M45 project weighed 130 pounds and was 32" x 48" x 96" in size, making installation easily to accomplish with two workers.

Before the road could be surfaced, the sides and top of the blocks were wrapped in a PVC liner to prevent degradation if a petroleum spill occurred on the highway. Dirt was moved to road level to secure the blocks from side-to-side movement. On top of the blocks, a minimum 3-foot layer of sand and gravel kept the foam below the frost line.

Bruce Morren was project manager with the project's general contractor, Nagel Construction Inc. of Wayland, Michigan. He saw the project to completion in November 2002.

The foam blocks left the factory and arrived at the job site in August 2001 by flatbed truck consisting of 36 blocks per delivery.

Morren said he enjoyed working with Falcon Foam, which delivered enough Geofoam to cover a nearby 10,000 square yard, where it was covered to prevent UV light degradation.

"They made it faster than anybody else could in the area," Morren said.

The advantage to Geofoam was safety, according to Morren. "The labor cost is probably about the same but the safety factor is key."

As the Geofoam was laid, about 40 to 45 million gallons per day of water flowed through the City of Grand Rapids waterline, Morren noted. A heavier fill or dirt moving equipment could have punctured the line, and it would have taken two to three hours to shut off the water.

"When you put the foam over the line you know you are not going to disturb it," Morren said.

The team noted that Geofoam is also the more cost effective choice of fill when sand fill requires long-distance transportation.

Other benefits include a reduction of labor costs and project schedules, according to Federal Highway Administration officials. Geofoam also can be constructed easily in limited right-of-way areas and in adverse weather conditions, officials said.

Installation of the Geofoam was a snap, according to Morren. Each foam block was fastened into place with 4" by 4" galvanized steel connector plates. The blocks were laid perpendicular to the previous layer with the vertical joints offset to the greatest extent practical. Morren compared it to building a brick wall.

The multi-layered foam blocks were placed in trenches that had been cleared of vegetation and any large sharp-edged soil particles prior to placing a geotextile and/or sand-bedding layer. The plastic liner was installed in 20-foot lengths and overlapped by 18 inches. The foam was then covered by 5 feet of sand and gravel. The road was surfaced with bituminous asphalt.

This was the second road project incorporating Geof foam that was successfully completed by Nagel Construction. The firm has been in the road, water and sewer excavation business since 1958.

The first Geof foam application by Falcon Foam was in 1996 for a bridge approach in northern Michigan. Since then Falcon, has provided Geof foam blocks, technical assistance and engineering for road and underground construction projects throughout the United States and Puerto Rico.

The first ever application of foam in highway construction dates back 40 years and was installed in Finland. Styrofoam was first use in road building in the United States 20 years ago.

According to the U.S. Department of Transportation's Federal Highway Administration, the foam has been used on higher profile jobs in the United States by comparison to the Lake Michigan Drive project. The larger ones include the Interstate 15 project in Utah and the Big Dig in Massachusetts.

Both projects turned to EPS Geof foam to complete large embankment sections under extremely tight construction schedules that would not have allowed enough time for conventional embankment construction, according to the federal agency.

Geof foam embankments can be covered to look like normal sloped embankments or finished to look like a wall. Geof foam can be used to repair landslides, lighten loads over culverts or other structures.

"We're up to eight to 10 states that have used Geof foam with success," said Silas Nichols, a geotechnical engineer for the Federal Highway Administration.

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