

Expanded Polystyrene (EPS) as Lightweight Fill for Bridge Approach Abutments

Athar Khan
Chief Geotechnical Engineer
Materials and Tests Division
INDOT

"Expanded Polystyrene (EPS) As Lightweight Fill for Bridge Approach Abutments"

In 1998 Indiana Department of Transportation designed a ten span seamless bridge for SR 249 over US 12 and railroads in Porter County. A Geotechnical investigation was initiated and soil borings with split spoon sampling were performed. The soil borings were as deep as 150.0 feet depth. During the Geotechnical investigations, it was found that the existing bridge was built on 15 feet of sand fill underlain by 60.0 feet of peat, marl and soft silty clays.

The task of designing and building the bridge foundations over soft and questionable soils is very difficult to avoid any settlement, differential settlement, lateral squeeze, lateral deformation, and ultimately structural instability. The proposed design included integral abutments at both ends with about 24 to 30 feet high fill. The design of deep foundations for these abutments, with natural soil fill called for very heavy sections of piles due to inclusion of negative skin friction in the design of the piles.

Available Lightweight fill materials were assessed and it was found that EPS foam was the only feasible solution for this project. Expanded Polystyrene Foam with a minimum density of 1.35 pcf (ASTM C578 Type II) was selected for use on this project. The main benefits from using this material as fill behind the abutment were as follows:

1. Considerable reduction in bearing or contact pressure.
2. Lateral earth pressure reduction.
3. Accommodating detrimental structural movements.
4. Considerable reduction in settlement, and
5. Elimination of downdrag forces on deep foundations.

The construction of this project was completed late last year and it was opened to traffic in November 1999. The INDOT Geotechnical Section has installed inclinometers and settlement plates and they are being monitored. From our recent monitoring (February 24, 2000) the inclinometer shows a cumulative movement of 16 mm at the 1.5 meter depth below the profile grade of the roadway. A final performance report will be published after at least two years of careful and intensive monitoring.

The research results from this project will provide the designers for criterion for reducing active earth pressures on retaining structures and the reduction of settlement and the reduction of bearing stresses or contact pressures on the foundation soils.



Use of Expanded Polystyrene (EPS) as Lightweight Fill for Bridge Approach Abutments

Project Area in Porter County, Indiana

S.R. 249 over U.S. 12, And NICTD and Conrail Railways









