RMRC

Recycled Materials Resource Center

Research Project 83

Incorporating a Fly Ash Stabilized Layer into Pavement Design

Project Objectives

- Quantify the viability of using a fly ash stabilized layer in pavement design for use in a residential subdivision and a secondary highway
- Compare this to a conventional cut-and-fill approach on a secondary highway

Project Summary

As of the writing of this paper, there was no standard or accpeted method for using fly ash stabilized soil in pavement design. Two test sections in southern Wisconsin were paved using fly ash stabilized soils. – one being a 0.3 km section of STH 60 between Lodi and Prarie du Sac, WI, the other a 0.7 km city street in Cross Plains, WI.

Unconfined compression tests were conducted to see the effects of variables such as as fly ash content, molding water content and compaction delay on the strength.

Using the results of the unconfined compression tests, California Bearingn Ratio (CBR) tests and Resilient Modulus tests were utilized to find the fly ash content required for optimum layer coefficient for the stablized layer. The designs followed the 1993 AASHTO method for flexible pavements.

Based on test results, a subgrade stabilized with 12% fly ash content was chosen for the Scenic Edge site, and 10% for the STH 60 site, assuming a two hour delay between mixing and compaction.

Nuclear density gages were used to measure the dry unit weight and the water content achieved.

Samples were collected pre and post compaction. The pre-compaction grab samples were compacted into CBR molds and CBR tests were conducted after they cured for seven days in a wet room. The post-compaction samples used thin wall sampling tubes, and were subject to unconfined compression tests after curing. Some samples were brittle so a pocket penetrometer was used to estimate unconfined compressive strength instead.

Falling weight deflectometer tests (FWD) and distress surveys were conducted at the STH 60 site semi-annually. The distress survey was used to calculate the pavement distress index (PDI).

Project Partners

US Department of Energy, Combustion Byproducts Recycling Consortium, University of Wisconsin-Madison Consortium for Fly Ash Use in Geotechnical Applications, Mineral Solutions, Inc., Alliant Energy Corporation, Excel Energy Services, Inc., Wisconsin Department of Transportation.

End Results

Stabilization with fly ash significantly improved the strength and stiffness of the subgrade, however the CBR of the field mixture was around two-thirds of that measured during the design at both sites. The increase in strength was enough to support construction equipment, and the increase in stiffness resulted in small pavement deflections during testing with a falling weight deflectometer of less than 2mm with a 90 kN load. FWD testing on STH 60 showed similar centerline deflections and stiffness for the fly ash and control sections.

Further Information

The Recycled Materials Resource Center (RMRC) is a national center that promotes the appropriate use of recycled materials in the highway environment. It focuses on the long-term performance and environmental implications of using recycled materials.

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