RMRC

Recycled Materials Resource Center

Research Project 55

Evaluation of Recycled Asphalt Shingles as Structural Fill

Project Objectives

- Evaluation of the geotechnical properties of recycled asphalt shingles (RAS) as structural fill material in highway embankments
- Evaluation of RAS as backfill material behind retaining structures and to provide relevant design guidelines

Project Summary

The amount and type of generated solid waste grow as the world population increases. While landfills are the primary end place of the majority of solid waste, there have been increasing motivation and research towards feasibility, and performance of reusing certain types of solid waste in highway construction. A wide variety of solid waste including coal combustion byproducts, foundry slags, tire shreds, and reclaimed paving materials have been studied and successfully used in the construction of highway embankment. In addition to promising a solution to the disposal problem and an economic alternative to natural soils, certain solid waste materials may have lower dry unit weight, which makes them favorable alternative to traditional material for construction of embankments over weak grounds.

Discarded asphalt shingles is another type of solid waste that has recently been prioritized by Environmental Protection Agency (EPA) and Federal Highway Administration (FHWA) for reuse application. Asphalt shingle waste is produced by removing the asphalt shingles from the roofs of existing structures during renovation or rejecting asphalt shingles/shingle tabs discarded in the manufacturing process of new asphalt shingles. Approximately 11 million Mg of asphalt roofing shingle waste are generated in the U.S. per year. Re-roofing jobs account for 10 million Mg, with another 1 million Mg manufacturing scrap. Different applications including as a component of hot mix asphalt (HMA), cement kiln fuel, cold patch in paved roads and dust control in gravel roads account for reuse only between 10 to 20% of the total asphalt shingle waste

The research outlined in this proposal addresses the following hypotheses:

- Since RAS contains asphalt cement and cellulose felt, the material may exhibit higher compressibility compared to traditional fill material.
- Addition of less compressible materials to RAS or stabilization of RAS can reduce the compressibility and increase shear strength and drainage capacity of RAS.
- Since RAS contains asphalt cement, temperature variation affects its engineering properties.
- Since RAS contains asphalt cement, time-dependent shear or volumetric strain under sustained deviatoric stress may be significant.

Project Partners

National Center for Freight and Infrastructure Research and Education, Coal Combustion Products Partnership

End Products

RAS:BA/FS mixtures have lower γdmax than typical compacted soils. Low dry unit weight of RAS:BA/FS mixtures make them favorable alternatives to natural compacted soils for construction of structural fill over soft soils

The short-term and long-term compressibility of pure RAS are significantly higher than those of compacted sandy soils. RAS also has significantly better drainage capabilities

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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