

# RMRC



## Recycled Materials Resource Center



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## Research Project 82

# Fly Ash Stabilization of Gravel Road as Base for Pavement at Chisago County Road 53, MN

### Project Objectives

- Test the suitability of cementitious fly ash in stabilizing road-surface gravel (RSG) in the conversion of a gravel road to a paved road.
- Test the strength, stability of the pavement as well as water quality of leachate.

### Project Summary

Cementitious fly ash was used in stabilizing RSG on a 3.6 km section of gravel road in Chisago County, MN. A mixture of 10% fly ash and water was combined with the gravel to 254 mm and then compacted so that HMA could be paved later.

The stabilized RSG and RSG alone were both tested both in the field and in the laboratory. California bearing ratio (CBR), resilient modulus (Mr), and unconfined compression (qu) tests were conducted on both RSG and fly-ash stabilized RSG.

Freeze-thaw effects were also investigated using ASTM D 6035 as a guide. In situ testing with a soil stiffness gauge (SSG), dynamic cone penetrometer (DCP), and falling weight deflectometer (FWD). SSG and DCP tests were conducted 7 days after curing. FWD was conducted twice after the placement of HMA.

A pan lysimeter was installed underneath the road way to monitor water quality. The volume of water, concentrations of trace elements in leachate, temperatures and water contents within the pavement profile, and meteorological conditions (air temperature, humidity and precipitation) were also monitored. Two column leaching tests (CLTs) were also complete on samples of the stabilized RSG (S-RSG) collected during construction.

Long term monitoring would be needed to fully understand the potential for stabilized RSG to leach trace elements, as well as definition of leach testing protocols that more accurately simulate S-RSG trace element leaching.

### Project Partners

Minnesota Local Road Research Board (LRRB), Minnesota Department of Transportation (Mn/Dot), Chisago County Department of Public Works, Istanbul Technical University, The Scientific and Technological Research Council of Turkey.

### End Results

S-RSG prepared in the lab using samples from construction after 7 days of curing had a CBR of between 48 and 90, Mr between 96 and 195 MPa and an unconfined compressive strength between 197 and 812 kPa. The RSG alone had CBR of 24 and Mr of 51 MPa. Field-mix S-RSG had a higher CBR and Mr than unstabilized RSG. Trace element concentrations were steady towards the end of the monitoring period. All the concentrations were below USEPA maximum contaminant levels (MCLs) with the exception of Mn, and Minnesota health risk levels (HRLs). The CLT test results showed concentrations below USEPA MCLs and Minnesota HRLs except for B, Be, Cr, Ba, As, and Se.

### 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.