RESEARCH
PROJECT CAPSULE [13-2GT]
September 2012
TECHNOLOGY TRANSFER PROGRAM

Implementation of Slag Stabilized Blended Calcium Sulfate (BCS) in a Pavement Structure

JUST THE FACTS:

Start Date:
July 1, 2012

Duration:
12 months

End Date:
June 30, 2013

Funding:
SPR: TT-Fed/TT-Reg

Principal Investigator:
Gavin P. Gautreau, P.E.
LTRC Senior Geotechnical Research Engineer

Administrative Contact:
Mark Morvant, P.E.
Associate Director, Research
225-767-9124

Technical Contact:
Zhongjie "Doc" Zhang, P.E., Ph.D.
LTRC Pavement & Geotech Administrator
225-767-9168

Louisiana Transportation Research Center
4101 Gourrier Ave
Baton Rouge, LA 70808

Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used Implementation Potential

PROBLEM

Blended calcium sulfate (BCS) is fluorogypsum (FG), an industrial byproduct, blended with lime or limestone. Approximately 90,000 metric tons (100,000 tons) of FG are generated annually in the United States, posing a serious problem for environmental disposal. The LADOTD has been using BCS in pavement construction for the last 15 years. While this material has performed satisfactorily after construction, its moisture sensitivity has concerned LADOTD engineers because of its construction difficulty in wet environments.

Therefore, the Louisiana Transportation Research Center (LTRC) research project 03-8GT, *Stability of Calcium Sulfate Base Course in a Wet Environment* (Final Report 419) sought to better understand the strength deterioration of BCS in a wet environment and ways to eliminate or reduce such deterioration by stabilizing BCS with various suitable cementitious agents.

In the 03-8GT study, 120-grade ground granulated blast furnace slag (GGBFS) was used to stabilize BCS to improve its water resistance. Laboratory tests identified factors that affected the strength development of raw BCS and researchers found that when combined, BCS and GGBFS created a very stable and durable material, comparable to lean concrete. This stabilization scheme reduced the water susceptibility of raw BCS. The study recommended that LADOTD consider building several field test sections in different traffic and environmental conditions using the GGBFS-stabilized BCS as pavement base course.

The 03-8GT report's tentative construction specifications proved adequate for construction of a full-scale test section at the LTRC Pavement Research Facility (PRF) site. The section was loaded using the LTRC Accelerated Loading Facility (ALF) and the performance was evaluated. Additional in-situ tests, such as DCP, FWD, and Dynaflect, were conducted to characterize the section's strength and structural properties. The PRF section achieved a fairly high stiffness and a structural layer coefficient of 0.30 that could be used for pavement design purposes. A major result from the 03-8GT research indicated that BCS stabilized by 10 percent 120-grade GGBFS by volume can serve as a good pavement base.

Tests sections, as requested in the 03-8GT study, will be constructed as part of this study. The application of the 03-8GT study specification will be evaluated, and additional laboratory studies will be conducted to refine the break point of moisture stability with additional percentages of the slag additive. Actual applications will need various strength requirements, while still meeting durability requirements. The need for strengths with varying slag percentages is needed and will aid in the implementation of slag treated BCS to provide an alternative base course material or even surface course (similar to lean concrete).

OBJECTIVE

The current project seeks to further the implementation of this stabilized material within LADOTD and to a broader, commercial market (nationally, locally, contractors, etc.)

This project will focus on the variation of strengths obtained through stabilization of BCS with GGBFS to meet the needs of highway and other commercial needs, like local roads, driveways, etc. The project will research and document slag-treated BCS test sections conducted by LTRC.

Objectives of the research are to determine the applicability and implementation of slag-treated BCS within LADOTD projects; develop potential applications for slag-treated BCS for lower volume and commercial applications; and research and document previous LTRC test sections and make them applicable GIS applications.

METHODOLOGY

Airline Highway (US 61) shoulders in Sorrento, Louisiana, just south of the intersection of LA Highway 22, will be utilized as test sites for the slag-treated BCS. The existing BCS shoulders that extend approximately one-half mile south of LA 22, have been in place for many years, and consist of approximately 3 in. of asphalt over about 8.5 in. of BCS atop untreated embankment. The shoulders have aged and now prevent water from draining on the road surface. Water collects along the road/shoulder joint and exacerbates a joint failure problem. District 61 intended to mill the asphalt, regrade the existing BCS, and overlay the shoulders; however, inquiries about the 03-8GT research as a possible remedy to the in-place BCS provide hopes of a more stable solution.

Field material will be stabilized with GGBFS and verified for strengths in the laboratory prior to field construction. Samples from the field construction will also be collected and tested for strength. Additional field-testing will be conducted to confirm the strengths (FWD, Dynaflect, DCP, etc.).

IMPLEMENTATION POTENTIAL

The technology of slag-treated BCS is not mainstream yet, but the advantages appear to be many, including the utilization of two byproducts to create a consistent and durable base course (and possibly surface course) material. The slag-stabilized BCS material may also provide an alternative to other, often more expensive, base course materials.