

Lime Kiln Dust for Treated Subgrades

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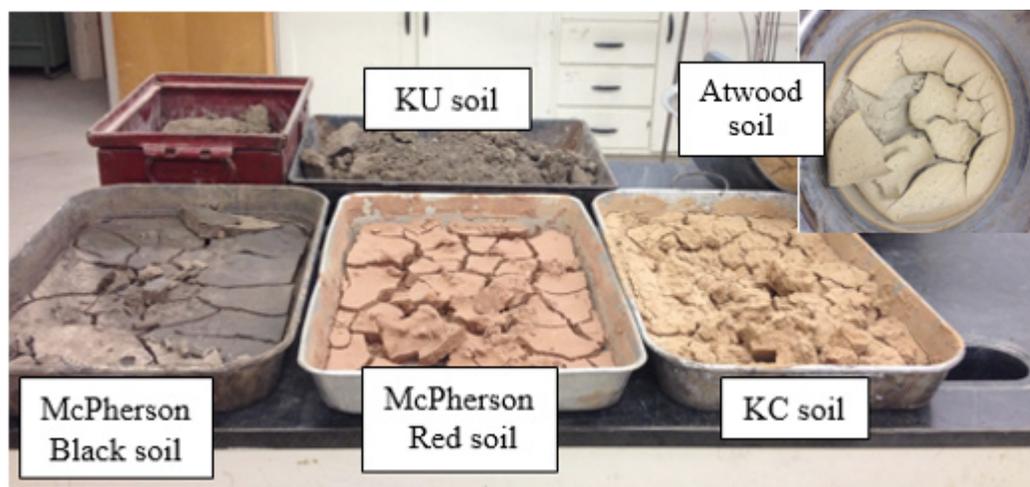
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Introduction

Chemical and cementitious materials are often used to modify and stabilize the subgrade soils that serve as foundations for pavements. Improvement of the subgrade provides a better working platform for construction of the layers above and improves the strength of the pavement structure. Lime, cement, and fly ash have all been successfully used for soil modification/stabilization; however, increasing material costs and availability concerns have motivated Departments of Transportation and the construction industry to investigate alternatives. This report describes the results of a laboratory and field investigation of the performance of lime kiln dust added as an alternative soil stabilization material.

Lime kiln dust (LKD) is a byproduct of lime production. It is sold in the form of a dry powder that contains a significant percentage of lime along with a substantial amount of inert material. It is currently used for subgrade improvement in multiple states. The purpose of this report is to describe the results of field investigations that took place at three construction sites where LKD was used and laboratory testing of five soils treated with LKD, lime, and fly ash.



Soil Types used in this Study

Project Description

Field testing methods included Shelby tube sampling and use of the dynamic cone penetrometer, light weight deflectometer, and falling weight deflectometer. Tests were conducted on the day of mixing and multiple days thereafter, so the benefits of curing could be evaluated. Lab testing included standard characterization tests followed by strength, swell, resilient modulus, and wet-dry testing. The testing results showed that, after a relatively short curing period, LKD provided substantial improvement to soil properties. Approximately 60% of this improvement was achieved after 1 day, and more than 80% was achieved after 3 days.

Project Results

During laboratory testing, LKD performed comparably with lime in reducing plasticity and swelling potential and increasing strength and durability. Addition of LKD substantially lowered the plasticity, free volume change, and swelling potential of the native soils tested in this report. Soils treated with LKD showed higher strength gain than unsoaked samples that were lime treated. However, lime-treated soil samples gained more strength for soaked conditions. Fly ash had the least strength gain. The effect of adding LKD on the durability of soil was comparable with lime, and much better than the performance of fly ash.

Based on the results of this research, consideration of the use of LKD as a soil stabilization agent was recommended.

Project Information

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