



TECHSUMMARY *August 2008*

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Evaluation of Stone/RAP Interlayers Under Accelerated Loading

INTRODUCTION

The first Louisiana accelerated loading experiment, Evaluation of Louisiana's Conventional and Alternative Base Courses, showed that pavement performance could be enhanced significantly if a layer of stone was placed over the cement stabilized subgrade and below the flexible hot mix asphalt concrete (HMAC) layer. The concept is referred to as "stone interlayer design." The increase in performance level could be attributed to strengthening the area between the soil cement and the flexible layer and providing a medium for moisture discharge. Although the stone interlayer could not be effectively evaluated in an accelerated test, the stone interlayer should reduce the reflective soil cement shrinkage cracking.

Currently, the Louisiana Department of Transportation and Development (LADOTD) is in possession of large quantities of reclaimed asphalt pavement (RAP) produced from various rehabilitation jobs throughout the state. LADOTD allows incorporating RAP into all asphalt mixes for pavement construction. The amount of RAP allowed is 30 percent RAP (by weight of the total mix) in base courses, 20 percent in binder courses, and 30 percent in flexible base courses. In this project, RAP was used in its raw form (100 percent RAP), without any rejuvenating or stabilizing agents as an alternate replacement of an aggregate base layer. This was done to provide answers to several concerns regarding pavement performance as well as cost savings. The potential for improved pavement life using RAP base materials in lieu of the stone base was investigated in this project.

The performance of RAP base materials in the stone interlayer pavement design was compared to that of the stone in the interlayer design. Additionally, a thicker Portland cement treated subgrade soil with reduced Portland cement content (5 percent by volume) was compared to the thinner Portland cement stabilized subgrade soil with standard Portland cement content (10 percent by volume), both having the interlayer RAP base materials.

OBJECTIVE

The primary objective of this study was to determine the effectiveness of using an untreated RAP interlayer in lieu of a stone interlayer in a soil-cement asphalt pavement structure under accelerated loading. The secondary objective was to investigate the performance of soil cement subbase courses by varying layer thickness and cement content.

METHODOLOGY

Three asphalt pavement test lanes were constructed with different interlayer and soil cement subbase courses. Each lane had a similar HMA top layer paved in two courses: 1.5-in. conventional Louisiana Type 8F wearing course and 2.0-in. Type 8F binder course. The interlayers and subbases for Lanes 1, 2, and 3 were 3.5 in. untreated RAP and 10.0 in., 5 percent cement stabilized soil; 3.5 in. untreated RAP and 6.0 in., 10 percent cement

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stabilized soil; and 3.5 in. crushed stone and 6.0 in., 10 percent cement stabilized soil, respectively. All three lanes had a silty clay embankment. Lanes 1 and 2 had different soil cement sub-base courses; whereas, Lanes 2 and 3 had different interlayer courses.

Each test lane was loaded using Louisiana’s Accelerated Loading Facility (ALF). Falling weight deflectometer (FWD) and DYNAFLECT tests were conducted on each test lane at every 25,000 ALF loading passes.

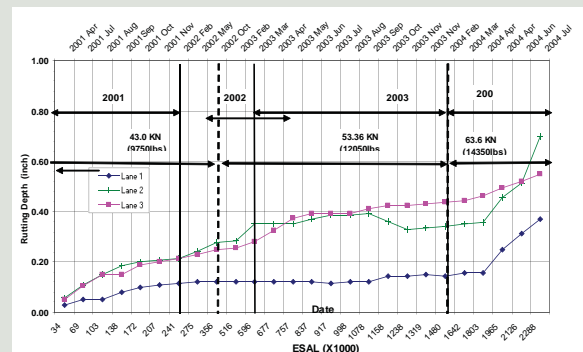


ALF loading device

Rutting and surface cracking were periodically measured. In addition, a suite of laboratory materials characterization tests was performed. The asphalt mixture tests included indirect tensile strength, indirect tensile resilient modulus, indirect tensile and axial creep test, and repeated shear at constant height test. Furthermore, repeated load triaxial tests were performed on the base course materials.

RECOMMENDATIONS

RAP is recommended as an interlayer base course over cement stabilized or cement treated layers for construction of flexible pavements. The present research was limited to the loading capacity of the pavement structure due to the nature of accelerated loading. Future research should be carried out to investigate the long-term influence of environmental conditions on the performance of pavement containing an RAP interlayer. Also, additional laboratory analysis on the compactive efforts of RAP would be beneficial in developing specifications for the use of RAP as a raw base material.



Average rut depth

CONCLUSIONS

Laboratory and field test results indicated that the performance of RAP and crushed stone are similar when used as an interlayer over cement stabilized or treated base layers. This study also confirmed the results from the first ALF experiments, which showed that a stronger layer was achieved when a thicker layer of Portland cement treated subgrade soil was utilized. Therefore, another primary conclusion drawn from this study is that the thickness of subgrade soil layer containing Portland cement plays an important role in determining its capacity along with the Portland cement content. In addition, an RAP interlayer is more cost effective than a stone interlayer in terms of initial cost and life cycle cost.