FACT SHEET

In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations

RESEARCH PROJECT TITLE

In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations

STUDY TIMELINE

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MORE INFORMATION

NETC Coordinator will add link to the final report on NETC website

The New England Transportation Consortium, a cooperative effort of the transportation agencies of the six New England States, funded this research. Through the Consortium, the states pool professional, academic and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system.

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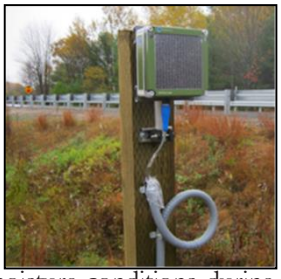
Introduction



New England State transportation agencies have adopted the use of recycled pavement layers in highway rehabilitation. Techniques such as full depth reclamation (FDR) with or without stabilization additives, plant mix cold recycled asphalt pavement (RAP), blending RAP with unbound subbase layers and substitution of unbound subbase layers with RAP are being used effectively. The in-place properties of these materials can be significantly different than traditional unbound granular materials, and change significantly with variations in temperature and moisture conditions during different seasons. To effectively design pavements using recycled materials, an understanding of the in-place properties of these materials is needed. The primary objective of this research project was to determine the in-place properties of recycled materials common to the New England region, and to relate changes in those properties to variations in temperature and moisture.

Methodology

Determination of the in-place properties of pavement layers containing recycled materials was accomplished by instrumenting pavements to record changes in temperature and regular non-destructive testing using a Falling Weight Deflectometer (FWD) to monitor the seasonal variation in pavement stiffness due to temperature and moisture. Two sites in NH and two sites in ME were selected for evaluation in this study. Modulus values for the layers were determined through linear elastic analysis using back calculation and forward calculation techniques.

Conclusions

Results of this study show that the in-place modulus values of base layers containing recycled materials can vary significantly depending upon the material type and the recycling method. The results also show that materials that are classified similarly can have very different modulus values. Furthermore, the relative sensitivity of the different materials to changes in temperature and moisture can vary significantly.

Condition	Recommended Modulus Value (psi)				
	Full Depth Reclamation			Plant-Mixed RAP	
	Cement Treated	Untreated	Foamed asphalt treated		
	Kanc 2	Kanc 3	Auburn	Waterford	Warren Flats
Baseline	100,000	55,000	300,000	160,000	20,000
Frozen	200,000	60,000	300,000	350,000	80,000
End of thaw weakest	80,000	12,000	200,000	90,000	15,000

What are potential impacts?

The reported modulus values can be used to more efficiently design pavements and evaluate various alternatives to ensure adequate performance over the design life of the pavement. The results also emphasize the need for accurate characterization of specific materials to be used for a particular project.