

Recent Research – TRB Compendium of Papers 2006

Test Method to Determine Aggregate/Asphalt Adhesion Properties and Potential Moisture Damage WHRP Project [0092-05-12](#)

The paper(s) abstracted below report recent research that may be related to the subject matter or methodologies of this WHRP project. For access to the CD-ROM and full text of the paper, contact Hussain Bahia (bahia@engr.wisc.edu) or Greg Waidley (gwaidley@engr.wisc.edu) at WHRP or John Cherney (john.cherney@dot.state.wi.us) at the WisDOT Library.

Detection of Stripping in Hot-Mix Asphalt

Paper No. 06-0658

Authors: Michael I. Hammons, Harold Von Quintus, Georgene M Geary, Peter Y. Wu, David M. Jared
Abstract: Damage mechanisms that lead to stripping significantly affect the dynamic modulus and tensile strength of hot mix asphalt (HMA). When stripped HMA is unexpectedly encountered below the planned milling depth during routine mill and overlay rehabilitation projects, it must be removed and replaced, causing significant cost overruns and time delays. This research has developed a procedure to identify the extent and depth of stripping in in-place HMA pavement sections. Several non-destructive survey methods were analyzed to determine their capability to locate areas of stripping, either by themselves, or in various combinations. Cores were extracted and used to calibrate the methods. Visual inspections of the cores and laboratory tests on selected cores were used to validate the results. The procedure involves observation of surface distresses, complete ground penetrating radar (GPR) survey, seismic testing of selected areas, limited coring and laboratory testing of selected cores. By following these procedures, areas with stripping can be discriminated so that effective rehabilitation strategies can be developed.

Laboratory Evaluation of Long-Term Effectiveness of Antistripping Additives

Paper No. 06-2282

Authors: Qing Lu, John T. Harvey

Abstract: Hydrated lime and liquid antistripping agents are often used as additives in asphalt concrete mixes to improve their resistance to moisture damage. Most laboratory studies evaluated the effectiveness of these additives based upon a short-period intensive moisture conditioning procedure, usually a freeze-thaw cycle. Whether this short-term conditioning sufficiently simulates the actual field conditions is unknown. Recent field sampling of dry cores of asphalt mixes in California revealed that moisture widely exists in asphalt pavements around the year. There arose the questions about the performance of asphalt mixes exposed to moisture for a long period, and the effectiveness of antistripping additives after long-term conditioning. This research was conducted in the laboratory to answer these questions to some extent, by use of two test methods: the indirect tensile strength ratio test and the flexural beam fatigue test. A moisture sensitive mix was treated with the hydrated lime and liquid antistripping agents, vacuum saturated and conditioned in a humid environment for a period up to one year. Mix properties were measured and analyzed every four months. It was found that most of the detrimental effect of moisture occurred in the first four months, while the reduction of strength or stiffness in the late stages became very small. Both tests revealed that the antistripping additives were effective even after one-year moisture conditioning, including both the hydrated lime and the liquid additives. Equivalency between the short-term intensive conditioning and the long-term mild conditioning was also found in this study.

Limits on Adhesive Bond Energy for Improved Resistance of Hot-Mix Asphalt to Moisture Damage

Paper No. 06-1460

Authors: Amit Bhasin, Eyad Masad, Dallas Little, Robert Lytton

Abstract: Loss of physical adhesion between the aggregate and asphalt binder is one of the important mechanisms that accelerates moisture damage in hot mix asphalt (HMA) pavements. In this study, two bond energy related parameters; adhesive bond energy between the aggregate and asphalt, and reduction of free energy when asphalt debonds from the aggregate surface in the presence of moisture

were quantified using surface energies of both materials. Threshold values of these parameters to identify asphalt-aggregate combinations susceptible to premature moisture damage were derived based on comparison of the values of these parameters with observed field performance for several mixes. Results show significant differences in bond energies developed between various aggregates and a given binder. This illustrates the importance of binder aggregate compatibility and the sensitivity of calculated bond strength to surface energy measurements. Asphalt binders from different sources with the same Performance Grade (PG) were also found to develop different bond energies with any given aggregate. The results show that binders differ in their sensitivity to changes in aggregate source in terms of the developed bond energy. This paper discusses the methodology of using surface energy and concomitant bond energy calculations to assess the moisture sensitivity of asphalt concrete mixes. Advantages of using this technique over conventional mechanical tests are also discussed.