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Research, Development, and Technology

Turner-Fairbank Highway Research Center
6300 Georgetown Pike
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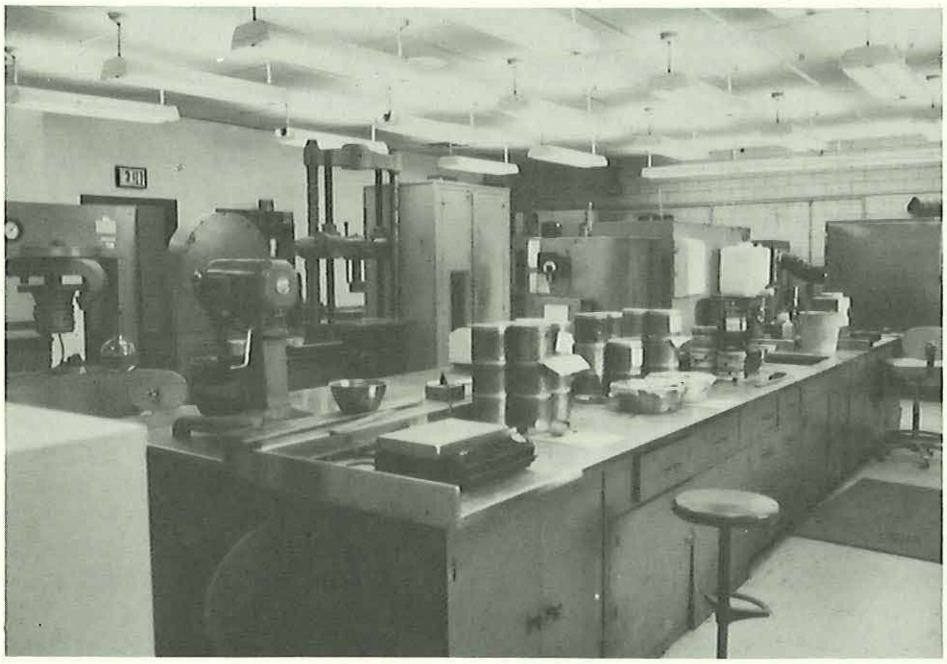
BITUMINOUS MIXTURES LABORATORY



Specimen Preparation Area

INTRODUCTION

The Bituminous Mixtures Laboratory is located at the Federal Highway Administration's (FHWA's) Turner-Fairbank Highway Research Center in McLean, Virginia. The primary functions of this laboratory are to design and analyze asphalt concrete mixtures, and to evaluate methods for testing asphalt concrete. Mixtures which are evaluated in this laboratory include: hot and cold asphalt concretes, Sulphlex, and mixes containing modified asphalts.

FEATURES

Most standard tests related to asphalt concrete mixtures can be performed in the Bituminous Mixtures Laboratory. In addition, the effectiveness of various laboratory testing procedures and their relationship with field performance can be evaluated. Facilities are available for asphalt concrete mixture design, density and voids analyses, moisture sensitivity analysis, asphalt extraction and recovery, and aggregate evaluation. The laboratory is also equipped

to fabricate various types of test specimens for evaluating the structural properties of bituminous mixtures.

REPRESENTATIVE STUDIES

Assistance to the Field

Samples of asphalt concrete and aggregates from various States and countries have been analyzed in the laboratory. The analyses were conducted to assist FHWA and State engineers evaluate specific asphalt concrete related pavement problems. Some examples include:

- o Evaluating rutting and tenderness.
- o Analyzing moisture damage.
- o Evaluating premature cracking.
- o Analyzing aggregate polishing.

Sulphlex and Sulfur-Extended Asphalt

The cost of asphalt cement rose dramatically after the 1973 oil crisis, generating interest in alternative binders for flexible pavements. Two alternatives involving sulfur were considered promising: Sulphlex and sulfur-extended asphalt (SEA). Sulphlex is a chemically-modified sulfur binder which can be combined with aggregate to produce a paving material similar to asphalt concrete. Sulfur-extended asphalt uses sulfur to replace a small portion (15 percent by volume) of the asphalt binder. For both materials, mixes have been designed and analyzed in the Bituminous Mixtures Laboratory. Additionally, the field performance of SEA pavements was evaluated to determine the effect of sulfur on pavement life. This evaluation involved experimental pavements with SEA and asphalt control sections, and included analyses of pavement performance, thickness, and mixture composition.

Mix Design

Mix design and analysis of various types of bituminous paving mixtures have been performed in the laboratory. Mixtures which have been analyzed include: typical hot and cold mix asphalt concrete; alternative binder-aggregate mixtures such as Sulphlex, SEA, and mixtures containing incinerator residue; and special bituminous mixtures such as asphalt coke-breeze overlays for cathodic protection systems, and open-graded asphalt friction courses. The work with open-graded friction courses resulted in the development and implementation of a mix design method for these materials.

Asphalt Additives

The effects of various asphalt additives on mixture properties have been evaluated in the Bituminous Mixtures Laboratory. Work in this area included: the evaluation of a sulfuric acid mixture to reduce asphalt content and mixing temperature, and the evaluation of two modifiers for retarding the formation of ice on pavement surfaces.

Evaluation of Test Procedures

Various procedures for testing asphalt concrete mixtures have been evaluated in the laboratory. Methylene chloride was investigated as a potential solvent for asphalt recovery, and Bioact DG-1 was evaluated as an extraction solvent. An evaluation of test procedures to predict moisture susceptibility of asphalt concrete mixtures was recently completed. Current studies include: investigating methods of extracting and recovering SEA binders, and the evaluation of procedures for measuring asphalt concrete moduli and permanent deformation characteristics.

FUTURE RESEARCH

The design and analysis of asphalt concrete mixtures, and the evaluation of test procedures will continue to be the main focus of the laboratory in the immediate future. One study being considered is the effect of mix parameters such as voids in the mineral aggregate (VMA) on the moisture susceptibility of asphalt concrete mixtures. The laboratory will also continue to provide technical assistance with mixture design and analysis to interested FHWA and State engineers.

For additional information, contact:
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