



U.S. Department of Transportation  
**Federal Highway Administration**

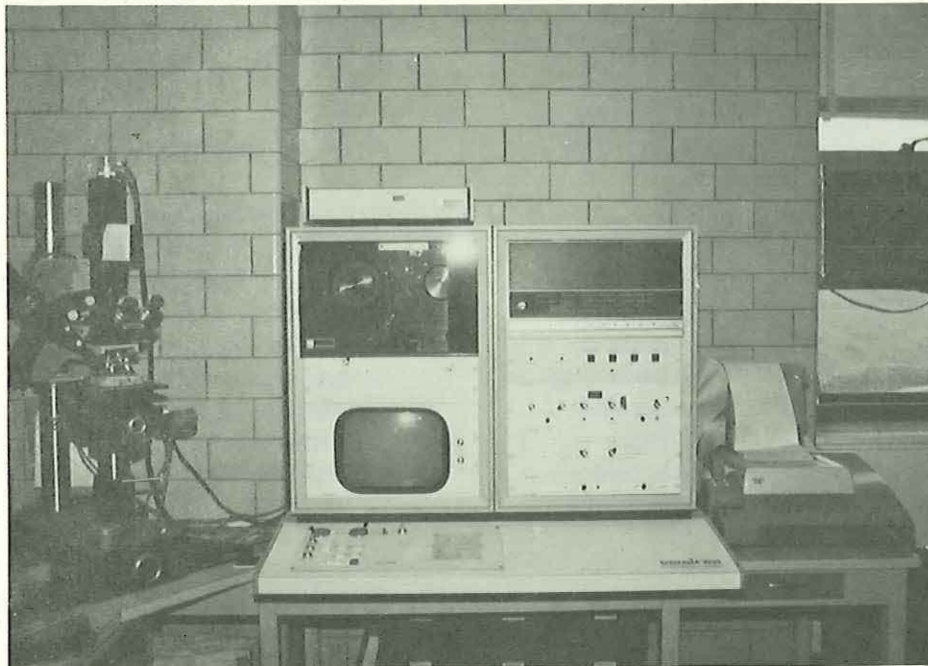
Research, Development,  
and Technology

Turner-Fairbank Highway  
Research Center  
6300 Georgetown Pike  
McLean, Virginia 22101  
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## PETROGRAPHIC LABORATORY

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Automated Image Analysis System

### INTRODUCTION

The Petrographic 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 determine the suitability of aggregates for use in various highway materials, to evaluate the frictional properties of aggregate and pavement samples, and to determine the durability and distress of pavement samples.

### FEATURES

The Petrographic Laboratory includes a series of optical microscopes for examining aggregate and pavement samples over a range of magnifications. A petrographic microscope is available for examining thin sections and powdered samples in polarized light to aid in identification.

Air void systems of concrete samples are evaluated using an automated image analysis system. Polishing equipment is

available to prepare samples for examination by the system.

The image analysis system is also used to examine microtexture of aggregate and pavement samples. Equipment is available in the laboratory to conduct the British Polishing Wheel Test and Sand Patch texture measurements.

## REPRESENTATIVE STUDIES

### Assistance to the Field

One of the primary duties of the laboratory is to assist FHWA field offices and State highway agencies with problems encountered with in-service materials. Some examples include:

- o Cores were examined from a Portland cement concrete pavement which became slippery prematurely in spite of retention of some of the original tined surface texture. The examination revealed surface polishing due to the use of a very polish susceptible limestone for both the coarse and fine aggregate. It was recommended that this aggregate not be used in the future unless blended with a more polish resistant aggregate. For the pavement already in place, a very thin Portland cement mortar overlay was recommended to restore the frictional properties of the pavement surface.

- o A number of States have submitted concrete samples for air void analysis. These analyses were requested because of concern that the air content in the concrete in question did not meet specification requirements, or the distribution of air voids was not uniform throughout the concrete. Based on examination of the concrete samples and measured parameters of the air void system, advice was given concerning the adequacy of the air void system for freeze-thaw protection in the environment to which it was exposed.

- o When premature distress occurs in concrete pavements and the cause is not obvious, samples are often sent to the laboratory. These samples are examined to determine the origin of the problem, and

means to avoid the problem in future construction are recommended.

### Surface Texture

Since the automated image analysis system was installed in the Petrographic Laboratory during the late 1970's, a series of studies have been conducted on aggregate and pavement microtexture, and its relation to pavement friction and skid resistance. The image analysis system was used to measure microtexture and to quantify changes in microtexture resulting from polishing.

## FUTURE RESEARCH

The laboratory will continue to be used for research concerning surface texture measurement and its relation to skid resistance. The automated image analysis system will be upgraded in the near future to enhance its capabilities and reliability. Continued support concerning aggregate and pavement problems will be provided to FHWA field and Headquarters offices.

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