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# **Effects of Aggregates and Mineral Fillers on**

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The background of the central section features a light gray stippled pattern. Overlaid on this are various dark gray and black shapes representing aggregates and mineral fillers, including angular particles, rounded grains, and clusters of fine particles.

# **Asphalt Mixture Performance**

**Richard C. Meininger, editor**



**STP 1147**

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# ***Effects of Aggregates and Mineral Fillers on Asphalt Mixture Performance***

*Richard C. Meininger, editor*

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#### **Peer Review Policy**

Each paper published in this volume was evaluated by three peer reviewers. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

# Foreword

This publication, *Effects of Aggregates and Mineral Fillers on Asphalt Mixture Performance*, contains papers presented at the symposium of the same name, held in San Diego, CA on 10 Dec., 1991. The symposium was sponsored by ASTM Committee D-4 on Road and Paving Materials. Richard C. Meininger of the National Ready Mixed Concrete Association in Silver Spring, MD presided as symposium chairman and is the editor of the resulting publication.

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# Overview

## Background

ASTM Committee D-4 on Road and Paving Materials is active in sponsoring symposia and the publication of technical papers related to the standardization work of the Committee. Subcommittee D04.92 is the coordinating group which works with Committee D-4's Officers, Executive Subcommittee, and the ASTM Staff in selecting topics of interest, presenting the symposium during an ASTM committee week, and then publishing peer-reviewed papers, usually in a Special Technical Publication (STP) such as this.

This STP, *Effects of Aggregates and Mineral Fillers on Asphalt Mixture Performance*, resulted from the Committee D-4 Symposium held on 10 Dec., 1991, at the ASTM Standardization Meetings in San Diego, CA. This critical topic was chosen because of the recent interest and research concerned with the importance and influence which aggregates and fine mineral fillers have on the long-term durability and performance of hot mix asphalt pavements, particularly resistance to rutting of the pavement and stripping of asphalt from aggregates when moisture is present. The call for papers brought in 40 abstracts from authors all over the world who wished to present papers at the symposium. Of the 19 papers included in the STP, twelve were accepted for presentation at the symposium and, due to time limitations, an additional seven were accepted for publication only.

## SHRP and Other Research

Prior to, and during the time of the organization of this symposium, a great deal of research had been in progress relating to asphalt cement binders (including fillers), methods of asphalt mixture evaluation, and the properties of fine and coarse aggregates, principally grading, particle shape, and the interaction at the asphalt-aggregate interface. Much of the recent research in the United States has been sponsored by the Strategic Highway Research Program (SHRP), the National Cooperative Highway Research Program (NCHRP), and various state highway agencies. This certainly has heightened interest in the symposium and the technical papers included herein. Also, in light of the prospects for additional research, such as the Long Term Pavement Performance Study and highway funding aimed at helping repair the highway infrastructure, it is important to make best use of aggregate resources in asphalt overlays which can represent some of the most critical performance challenges for asphalt-aggregate mixtures.

New ASTM standards are needed and existing standards for tests and specifications must adapt to new technology reported here, and yet to come, as other recent research initiatives are reported. There is much urgency now in the highway materials community to understand and incorporate improved technology as it is developed because of the economic benefits to be derived through better highway pavement surfaces and reduced maintenance expenditures.

This volume provides, in one place, a cross section of research and practice on the use of aggregates and mineral fillers in asphalt paving mixtures. It has international perspective as well as providing insight into SHRP and state agency research and technology needs. It also presents the recent work and thinking of important research organizations, such as the National Center for Asphalt Technology at Auburn University and the laboratories of the Asphalt Institute.

The papers are arranged in four groups designed to aid the reader in locating papers of interest and to compare and contrast the range of work and opinions presented:

- (1) *Aggregates*—The first section relates directly to the practical use of aggregates in asphalt pavements and includes papers by aggregate and hot mix asphalt producers, as well as researchers that examine the performance of aggregates both in the laboratory and in existing pavements.
- (2) *Mineral Fillers*—The next grouping includes researchers who have made extensive investigations of the properties of mineral fillers and their effect on asphalt mixtures performance. Better understanding of the roll of fine material (passing the No. 200 sieve) on the performance of asphalt mixtures is an important new frontier in paving material research.
- (3) *Mixture Evaluation*—This group includes papers relating to the need for the design and evaluation of asphalt-aggregate mixtures. New and improved laboratory and field methods and concepts for evaluation and control of mixtures are described.
- (4) *Fatigue, Modeling, and Theoretical*—The last group of papers concerns the use of aggregate and mixture properties to develop systems of predicting or modeling the long-term performance of asphalt pavements in terms of fatigue, fracture mechanics, and prediction of long-term rutting performance.

While many of the papers might have been placed in several groups, it is hoped that this organization will help the reader understand and use the technology presented and to help Committee D-4 in developing the new standards and tests needed to advance materials technology in the highway community.

### **Importance of Mixture Performance**

In the long run, it is important to develop test methods and specifications for constituent materials and for combinations of materials that are related to pavement performance. For example, with respect to grading and particle shape characteristics of aggregates, rather than place rigid limits on aggregate grading, blend percentages, or particle shape properties, the objective should be to link tests and specifications to meaningful performance criteria. The measured properties of individual materials would then serve as guides in the materials selection and mix design processes and not an end in themselves. The key is developing evaluation procedures which will give an accurate indication of the long-term performance of a mixture when produced, placed, and compacted properly. An important corollary is the employment of reliable procedures for verification of mix performance as it is produced through the hot mix plant, and the use of quick quality control tests which will verify that the desired mixture is being produced in a consistent manner.

### **Future Symposia**

Committee D-4 is planning several future symposia on topics related to the production and evaluation of Hot Mix Asphalt. In December of 1992, a symposium on A Critical Look at the Use of Waste Materials in Hot Mix Asphalt will be held in Miami, FL. Plans for other future symposia include Physical Properties of Asphalt Cement Binders in 1993. Also, there are plans to have a symposium on asphalt-aggregate mixture design in 1994.



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