Publication No. FHWA-SA-98-042

U.S. Department
of Transportation

Federal Highway
Administration

December 1997

Pavement Recycling Guidelines for State and Local Governments

National Center for Asphalt Technology
211 Ramsay Hall
AUBURN UNIVERSITY, AL 36849-5354

Participant's Reference Book

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. FHWA-SA-97-	2. Government Accession No.	3. Recipient's Catalog No.
4. Titles and Subtitle Pavement Recycling Guidelines for State and Local Governments - Participant's Reference Book		5. Report Date December 1997 6. Performing Organization Code
7. Author(s) Prithvi S. Kandhal, and Rajib B. Mallick		8. Performing Organization Report No.
9. Performing Organization Name and Address National Center for Asphalt Technology 211 Ramsay Hall Auburn University, AL 36849		10. Work Unit No. (TRAIS) 11. Contract or Grant No. DTFH61-95-C-00006
12. Sponsoring Agency Name and Address Federal Highway Administration Office of Engineering/Office of Technology Applications 400 Seventh Street, S.W. Washington, DC 20590		13. Type of Report and Period Covered Final Report September 1995 - December 1997 14. Sponsoring Agency Code

15. Supplementary Notes

Contracting Officer's Technical Representative - Mike Moravec; phone: 202-366-6626

16. Abstract

Recycling or reuse of existing asphalt pavement materials to produce new pavement materials has the following advantages: (a) reduced costs of construction, (b) conservation of aggregate and binder, (c) preservation of the existing pavement geometrics, (d) preservation of the environment, and (e) conservation of energy. This document was prepared to provide the following information on recycling of asphalt pavements: (a) performance data, (b) legislation/specification limits, (c) selection of pavement for recycling and recycling strategies, (d) economics of recycling, and (e) structural design of recycled pavements. The following recycling methods have been included: hot-mix asphalt recycling (both batch and drum plants), asphalt surface recycling, hot-in-place recycling, cold-mix asphalt recycling, and full depth reclamation. Materials and mix design, construction methods and equipment, case histories and quality control/quality assurance have been discussed for all recycling methods.

This participant's reference book was developed to support a 2-day workshop on pavement recycling guidelines for state and local governments.

17. Key Words	18. Distribution Statement		
Pavement recycling, asphalt pavements, hot recycling, cold recycling, selection, economics, pavement design, performance	No restrictions. This document is available to the public from the National Technical Information Service, Springfield, Virginia 22161		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages	22. Price

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

ACKNOWLEDGMENTS

Sincere appreciation and acknowledgment is given to the following companies who furnished materials used in the development of this course.

Alliance for Transportation Research
Asphalt Recycling & Reclaiming Association
Astec Industries
Brown and Brown, Inc.
Cedarapids, Inc.
CMI Corporation
Cutler Repaving Inc.
Dustrol, Inc.
E.J. Breneman, Inc.
Gorman Bros., Inc.
Hamm Compactors, Inc.
Highway Rehabilitation Corporation
Martec Recycling Corporation
Midland Machinery Co.
Pavement Recycling Technologies, Inc.
Remixer Contracting Company, Inc.
Terrel Research
Valentine Surfacing
Wirtgen America, Inc.

FOREWORD

Recycling of existing asphalt pavements for pavement rehabilitation or reconstruction has the following advantages: (a) reduced costs of construction, (b) conservation of asphalt and aggregate, (c) preservation of the existing pavement geometrics, (d) preservation of the environment, and (e) conservation of energy. Recycling is no longer considered an experimental process by many highway agencies. These agencies permit recycling alternate on a routine basis in their standard highway construction specifications and/or special provisions. There is a need to train government highway officials and engineers in pavement recycling so that its use becomes wide spread and benefits are realized at all levels.

This participant's reference book has been developed to support a 2-day workshop on all aspects of recycling of asphalt pavements.

The objectives of this 2-day training course are to provide participants with:

1. An understanding of the various methods and technology (hot and cold) of recycling asphalt pavements.
2. The ability to determine when asphalt recycling is a viable pavement rehabilitation alternative.
3. The knowledge of how to select the most appropriate asphalt recycling method.
4. Information on equipment, construction methods, and QC/QA involved in recycling.

The 2-day training will provide an in-depth technical knowledge of the following recycling methods: hot mix asphalt recycling (both batch and drum plants), hot in-place recycling, cold-mix asphalt recycling (both in-place and central plant), and full depth reclamation of asphalt pavements. The training will also include the following topics: performance data of recycled mixes, selection of pavements for recycling and recycling strategies, and economics of recycling. Although mix design and structural design of recycled pavement are not included in the 2-day workshop, information on these topics are included in the participant's handbook and a set of visual aids is available for mix design and pavement design engineers.

The training can be divided into independent, self contained session modules capable of being added or deleted depending on the participants' needs and time constraints. For example, session modules can be put together to address the following audience: (1) administrators, (2) pavement design engineers, (3) mix design engineers/technicians, and (4) construction engineers/inspectors.

Each chapter in this participant's reference book represents a corresponding workshop session in the 2-day workshop. Some repetitions in a few chapters are inevitable because some participants may not be interested to read all chapters if they are attending a specialized, shorter version of the 2-day workshop. Each chapter contains a list of references at the end for further reading if so desired.

Mr. Mike Moravec of FHWA's Office of Technology Applications is the Contracting Officer's Technical Representative for this project. This manual was co-authored by:

Prithvi S. Kandhal
Associate Director, NCAT

Rajib B. Mallick
Senior Research Associate, NCAT

December 1997

TABLE OF CONTENTS