Measuring Road Roughness and Its Effects on User Cost and Comfort

Gillespie/Sayers editors

ASTM STP 884
Measuring road roughness and its effects on user cost and comfort.

(ASTM special technical publication; 884)
"ASTM publication code number (PCN) 04-884000-37."
Includes bibliographies and index.
TE153.M46 1985 625.8'028'7 85-17206
ISBN 0-8031-0428-6

Copyright © by AMERICAN SOCIETY FOR TESTING AND MATERIALS 1985
Library of Congress Catalog Card Number: 85-17206

NOTE
The Society is not responsible, as a body, for the statements and opinions advanced in this publication.

Printed in Baltimore, MD (b)
November 1985
Foreword

This publication, *Measuring Road Roughness and Its Effects on User Cost and Comfort*, contains papers presented at the symposium on Roughness Methodology, which was held on 7 Dec. 1983 in Bal Harbour, Florida. The event was sponsored by ASTM Committee E-17 on Traveled Surface Characteristics. Thomas D. Gillespie and Michael Sayers, both of the University of Michigan Transportation Research Institute, presided as cochairmen of the symposium and also served as editors of this publication.
Related ASTM Publications

Frictional Interaction of Tire and Pavement, STP 793 (1983), 04-793000-37

Tire Reinforcement and Tire Performance, STP 694 (1980), 04-694000-37

Pavement Surface Characteristics and Materials, STP 763 (1982), 04-763000-47

Surface Texture Versus Skidding, STP 583 (1975), 04-583000-37
A Note of Appreciation to Reviewers

The quality of the papers that appear in this publication reflects not only the obvious efforts of the authors but also the unheralded, though essential, work of the reviewers. On behalf of ASTM we acknowledge with appreciation their dedication to high professional standards and their sacrifice of time and effort.

ASTM Committee on Publications
ASTM Editorial Staff

Helen P. Mahy
Janet R. Schroeder
Kathleen A. Greene
William T. Benzing
Contents

Overview 1

Root-Mean-Square Vertical Acceleration as a Summary Roughness Statistic—W. RONALD HUDSON, DAN HALBACH, JOHN P. ZANIEWSKI, AND LEN MOSER 3

Development, Implementation, and Application of the Reference Quarter-Car Simulation—MICHAEL SAYERS 25

Simulation of Road Meters by Separate Analysis of Accelerometer and Height Sensor Data—GAMAGE K. WATUGALA AND GORDON F. HAYHOE 48

Accuracy of Calibrated Roughness Surveys—WILLIAM D. O. PATERSO 66

Relationships Between Vehicle Speed, Ride Quality, and Road Roughness—WILLIAM D. O. PATerson AND THAWAT WATANATADA 89

Effects of Vehicle and Driver Characteristics on the Subjective Evaluation of Road Roughness—MICHAEL S. JANOFF AND JAMES B. NICK 111

Vehicle Operating Costs Related to Operating Mode, Road Design, and Pavement Condition—JOHN P. ZANIEWSKI AND BERT C. BUTLER 127

Effects of Road Roughness on Vehicular Rolling Resistance—XIAO-PEI LU 143

Analytical Determination of Normal Contact Stresses for Arbitrary Geometries with Application to the Tire/Pavement Interaction Mechanism—TIMOTHY G. CLAPP, CARL T. KELLEY, AND ALLEN C. EBERHARDT 162

Road Roughness Effects on Vehicle Dynamics—JAMES C. WAMBOLD 179

Index 000