

fatigue testing of weldments

STP 648

D. W. HOEPPNER, EDITOR



AMERICAN SOCIETY FOR TESTING AND MATERIALS

FATIGUE TESTING OF WELDMENTS

A symposium
presented at
May Committee Week
AMERICAN SOCIETY FOR
TESTING AND MATERIALS
Toronto, Canada, 1-6 May 1977

ASTM SPECIAL TECHNICAL PUBLICATION 648
D. W. Hoepfner, University of Missouri,
editor

List price \$28.50
04-648000-30



AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race Street, Philadelphia, Pa. 19103

**Copyright © by American Society for Testing and Materials 1978
Library of Congress Catalog Card Number: 78-51630**

NOTE

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

**Printed in Mechanicsburg, Pa.
July 1978**

Foreword

The symposium on Fatigue Testing of Weldments was presented at the May Committee Week of the American Society for Testing and Materials held in Toronto, Canada, 1-6 May 1978. ASTM Committee E-9 on Fatigue sponsored the symposium. D. W. Hoepfner, University of Missouri, presided as symposium chairman and served as editor of this publication. C. Hartbower, U. S. Department of Transportation, H. Reemsnyder, Bethlehem Steel Corporation, and D. Mauney, Alcoa Laboratories, served as session chairmen.

Related ASTM Publications

**Achievement of High Fatigue Resistance in Metals and Alloys, STP 467
(1970), \$28.75, 04-467000-30**

Handbook of Fatigue Testing, STP 566 (1974), \$17.25, 04-566000-30

**Manual on Statistical Planning and Analysis for Fatigue Experiments, STP
588 (1975), \$15.00, 04-588000-30**

**Fatigue Crack Growth Under Spectrum Loads, STP 595 (1976), \$34.50,
04-595000-30**

A Note of Appreciation to Reviewers

This publication is made possible by the authors and, also, the unheralded efforts of the reviewers. This body of technical experts whose dedication, sacrifice of time and effort, and collective wisdom in reviewing the papers must be acknowledged. The quality level of ASTM publications is a direct function of their respected opinions. On behalf of ASTM we acknowledge their contribution with appreciation.

ASTM Committee on Publications

Editorial Staff

Jane B. Wheeler, *Managing Editor*

Helen M. Hoersch, *Associate Editor*

Ellen J. McGlinchey, *Senior Assistant Editor*

Sheila G. Pulver, *Assistant Editor*

Susan Ciccantelli, *Assistant Editor*

Contents

Introduction	1
Development and Application of Fatigue Data for Structural Steel Weldments—H. S. REEMSNYDER	3
Fatigue Behavior of Aluminum Alloy Weldments—W. W. SANDERS, JR. AND F. V. LAWRENCE, JR.	22
Investigations of the Short Transverse Monotonic and Fatigue Strengths of Various Ship-Quality Steels—K. J. PASCOE AND P. R. CHRISTOPHER	35
Low-Cycle Fatigue and Cyclic Deformation Behavior of Type 16-8-2 Weld Metal at Elevated Temperature—D. T. RASKE	57
Evaluation of Possible Life Improvement Methods for Aluminum-Zinc-Magnesium Fillet-Welded Details—DON WEBBER	73
Fatigue of Weldments—Tests, Design, and Service—W. H. MUNSE	89
Effect of Tungsten Inert Gas Dressing on Fatigue Performance and Hardness of Steel Weldments—P. J. HAAGENSEN	113
Estimating the Fatigue Crack Initiation Life of Welds—F. V. LAWRENCE, JR., R. J. MATTOS, Y. HIGASHIDA, AND J. D. BURK	134
Fatigue Crack Propagation in Aluminum-Zinc-Magnesium Alloy Fillet-Welded Joints—S. J. MADDOX AND D. WEBBER	159
Fatigue Crack Propagation in A537M Steel—J. P. SANDIFER AND G. E. BOWIE	185
A Study of Fatigue Striations in Weld Toe Cracks—PEDRO ALBRECHT	197
Elevated Temperature Fatigue Characterization of Transition Joint Weld Metal and Heat Affected Zone in Support of Breeder Steam Generator Development—C. R. BRINKMAN, J. P. STRIZAK, AND J. F. KING	218
Effect of Residual Stress from Welding on the Fatigue Strength of Notched 347 Austenitic Stainless Steel—L. ALBERTIN AND E. E. EIFFLER	235

Influence of Residual Stresses on Fatigue Crack Propagation in Electroslag Welds—B. M. KAPADIA	244
Fatigue Crack Growth in Low Alloy Steel Submerged Arc Weld Metals—R. R. SEELEY, L. KATZ, AND J. R. M. SMITH	261
Summary	285
Index	289

