

Case Studies for

Fatigue Education

Ralph I. Stephens, editor

STP 1250



STP 1250

Case Studies for Fatigue Education

Ralph I. Stephens, Editor

ASTM Publication Code Number (PCN):
04-012500-30



ASTM
1916 Race Street
Philadelphia, PA 19103
Printed in the U.S.A.

Library of Congress Cataloging-in-Publication Data

Case studies for fatigue education / Ralph I. Stephens, editor.

(STP ; 1250)

"ASTM publication code number (PCN) 04-012500-30."

Includes bibliographical references.

ISBN 0-8031-1997-6

1. Materials—Fatigue—Case studies. I. Stephens, R. I. (Ralph Ivan) II. Series.

III. Series: ASTM special technical publication ; 1250.

TA418.38.C37 1994

620.1'126—dc20

94-41520

CIP

Copyright ©1994 AMERICAN SOCIETY FOR TESTING AND MATERIALS, Philadelphia, PA. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of the publisher.

Photocopy Rights

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by the AMERICAN SOCIETY FOR TESTING AND MATERIALS for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$2.50 per copy, plus \$0.50 per page is paid directly to CCC, 222 Rosewood Dr., Danvers, MA 01923; Phone: (508) 750-8400; Fax: (508) 750-4744. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Service is 0-8031-1997-6/94 \$2.50 + .50.

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 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, 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, *Case Studies for Fatigue Education*, contains papers presented at the symposium of the same name, held in Atlanta, GA, 18 May 1993. The symposium was sponsored by ASTM Committee E-8 on Fatigue and Fracture and its Subcommittee E-08.01 on Research and Education. Symposium session chairpersons were: R. I. Stephens, The University of Iowa; R. C. Rice, Battelle Memorial Institute; and N. C. Dowling, Virginia Polytechnic Institute and State University. R. I. Stephens presided as symposium chairperson and editor of this publication.

Contents

Overview —R. I. STEPHENS	1
1. Automotive Wheel Assembly: A Case Study in Durability Design — R. W. LANDGRAF, S. THANGJITHAM, AND R. L. RIDDER	5
2. The Use of Failure Analysis and Materials Testing in the Redesign of a Boat Trailer Roller Arm —G. C. SALIVAR	23
3. Design of a Composite Hip Prosthesis for Long-Term Performance —K. LIAO AND K. L. REIFSNIDER	32
4. Fatigue of a Landing Gear Actuator Beam in a Fighter Aircraft — S. KANTIMATHI AND T. N. WHITE	53
5. Fatigue Evaluation of Agitator Paddle Shafts —H. R. JHANSALE	67
6. Fatigue Cracking of a Welded Roll Used in a Paper-Mill Roll Press — J. E. ZAPATA AND S. C. ANDERSON	77
7. Welded Pipeline Fatigue Analysis —D. SOCIE AND E. SEGAN	86
8. Thermal Fatigue Analysis: A Case Study of Recuperators —S. P. BHAT	101
9. Shell and Detail Fracture Formation in Railroad Rails —R. C. RICE	109
10. Equating Damped Vibration to Constant Amplitude Fatigue Loading for a Thick-Walled Pressure Vessel —R. I. STEPHENS, T. B. ADAMS, AND S. L. CARLSON	139
11. Development of a Numerical Model for Predicting Fatigue Lives of Tubular Threaded Connections —T. D. LIEBSTER AND G. GLINKA	156
12. Fatigue Life Prediction for Wind Turbines: A Case Study on Loading Spectra and Parameter Sensitivity —H. J. SUTHERLAND, P. S. VEERS, AND T. D. ASHWILL	174
13. Fatigue Cases Involving the Use of Wood and a Wood Composite — G. H. KYANKA	208

ISBN 0-8031-1997-6