# References and Conference Proceedings Towards the Understanding of FRACTURE MECHANICS

Toor/Hudson \_\_\_\_

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# REFERENCES AND CONFERENCE PROCEEDINGS TOWARDS THE UNDERSTANDING OF FRACTURE MECHANICS

Sponsored by

ASTM Subcommittee E-24.06 on Fracture Mechanics Applications ASTM Committee E-24 on Fracture Testing

ASTM Data Series Publication DS 63 Pir M. Toor, Vice-Chairman of ASTM Subcommittee E-24.06, Bettis Atomic Power Laboratory, West Mifflin, PA C. Michael Hudson, Chairman of ASTM Subcommittee E-24.06, NASA-Langley Research Center, Hampton, VA; authors

ASTM Publication Code Number (PCN) 05-063000-30



# Library of Congress Cataloging in Publication Data

Toor, Pir M. References and conference proceedings towards the understanding of fracture mechanics.

(ASTM data series publication ; 63)
"ASTM publication code number (PCN) 05-063000-30." Includes index.
1. Fracture mechanics—Bibliography. I. Hudson,
C.M. II. Title. III. Series: ASTM data series
publication ; DS 63.
Z5853.M38T66 1985 [TA409] 016.6201'126 85-26713
ISBN 0-8031-0466-9

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> Printed in Mars, PA November, 1985

# Contents

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SECT	ION DESCRIPTION	PAGE
1.0	Introduction	1
2.0	Books on the General Subject of Fracture	3
3.0	National and International Journals on Fracture	6
4.0	Fracture Symposia	8
5.0	International Conferences on Fracture	9
6.0	International Conferences on Mechanical Behavior	
	of Materials	10
7.0	International Conferences on Structural Mechanics	
	in Reactor Technology	11
8.0	Related Conferences on Fracture	12
9.0	Basic References on the Development of Fracture	
	Toughness	14
10.0	Basic References on Stress Intensity Factors	23
11.0	<b>References on the Application of Fracture Mechanics</b>	30
12.0	General Fracture Related ASTM - STPs	35
13.0	ASTM Standards on Fracture and Fatigue-Crack Growth	38
14.0	Basic References on Fatigue-Crack Growth	39
15.0	Basic References on Fracture of Brittle Materials	
	(Glass, Ceramics, Rocks, and Concrete)	48
16.0	Basic References on Fatigue-Crack Growth and	
	Fracture Toughness Data	49
17.0	Basic References on Fractography	50
18.0	Introductory References on Fracture Mechanics and Fracture	
	Testing	51

# 1.0 INTRODUCTION

Castastrophic failure of Liberty Ships and T-2 tankers during Word War II and many ships' failures thereafter instigated extensive research into the problem of brittle fracture. Later, the failure of missiles and aircraft gave a new boost to fracture research in the late 50's and 60's. New concepts of fatigue analysis and fracture are being continuously established and refined.

American Society of Testing and Materials (ASTM) Committee E-24 (Fracture Testing) is responsible for developing standard test specimens, test methods, as well as technology development in the field of fracture testing. This committee is the direct descendent of the special ASTM Committee on fracture testing which started in 1959 to search for means of characterizing the resistance of thin sheet materials to the catastrophic type of fracture which takes place without warning and at stress levels below those anticipated from the usual engineering properties.

Although far from complete, fracture mechanics now offers quantitative solutions to many crack growth and fracture problems that could not be handled two decades ago. Several areas require further refinements, but many of the limitations of the technology are due to engineering judgements associated with any technical design procedures. The application to a new area of technology usually requires some development of specific data and techniques, but most of the principles are available for use by knowledgeable engineers.

ASTM Subcommittee E24-06 is devoted to the application of fracture mechanics to real hardware, and is chartered to educate its members in the areas of fracture application. Hence the need was felt to gather some basic references in the development of fracture mechanics. The references are compiled in chronological order in three distinct stages as:

- (1) Development of fracture toughness.
- (2) Evaluation of stress intensity factors.
- (3) Application of fracture mechanics.

Additionally, various journals devoted to the publication of fracture articles and various symposia and conferences discussing the fracture phenomena are listed.

This is a first effort by E24-06 to compile the references and undoubtedly some important references have been omitted. When these references are identified, they will, of course, be included in the compilation. Any other recommendations and suggestions for improving the compilation will also be welcomed by the Chairman and Vice-Chairman of ASTM Subcommittee E24-06, Drs. C. Michael Hudson and Pir M. Toor.

# ] NOTE [

All references listed in this publication are in chronological rather than alphabetical order.

A large number of E24 members contributed importantly to this compilation, and their efforts are sincerely appreciated. We would especially like to thank the E24 Executive Subcommittee members who contributed to the compilation. The efforts of P. Albrecht, W. E. Anderson, F. I. Baratta, J. M. Barsom, J. M. Bloom, W. F. Brown, R. J. Bucci, A. K. Chakrabarti, J. B. Chang, J. C. Crespi, T. W. Crooker, T. A. Cruce, M. G. Dawes, R. de Wit, S. W. Freiman, J. P. Gallagher, U. G. Goranson, C. K. Gunther, C. G. Interrante, D. E. McCabe, D. A. Meyn, J. C. Newman, S. R. Novak, T. W. Orange, S. T. Rolfe, K. H. Schwalbe, J. E. Srawley, J. L. Swedlow, E. E. Underwood, J. H. Underwood, and R. D. Zipp are especially appreciated.

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Volume II:	Mathematical Fundamentals
Volume III:	Engineering Fundamentals and Environmental Effects
Volume IV:	Engineering Fracture Design
Volume V:	Fracture Design of Structures
Volume VI:	Fracture of Metals
Volume VII:	Fracture of Nonmetals and Composites

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Journal of Applied Mechanics, The American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

Journal of Engineering for Industry, The American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

Journal of Engineering Materials and Technology, The American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

Journal of Pressure Vessel Technology, The American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

Engineering Fracture Mechanics, Pergamon Press, Inc., Fairview Park, Elsford, NY 10523

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International Journal of Pressure Vessels and Piping, Elsevier Applied Science Publishers Ltd., Crown House, Linton Road, Barking, Essex 16118JU, England.

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Journal of Strain Analysis, Mechanical Engineering Publications Ltd.; 1 Birdcage Walk, Westminster, London S1N1, England. Materials Science and Engineering, The Institute of Metals, 1 Carlton House Terrace, London SW1, England. Metal Construction. Welding Institute, Abington Hall, Cambridge CBI-6AL, England. Metallurgical Transactions A, American Society for Metals, Metal Park, Ohio 44073, U.S.A. Metals Progress, American Society for Metals, Metals Park, Ohio 44073, U.S.A. Material Science, Chapman and Hall, 11 New Fetter Lane, London EC4P4EE, England. Nuclear Science and Technology, Atomic Energy Society of Japan, No. 1-1-13, Shimbashi, Minato-ku, Tokyo, Japan. Welding Journal, Research Supplement,

The Institute of Metals,

1 Carlton House Terrace, London SW1, England.

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# 4.0 FRACTURE SYMPOSIA

In 1965 the American Society of Testing and Materials Committee E24 (Fracture Testing) started conducting symposia on Fracture Mechanics. The papers presented in the first four symposia were published in the Engineering Fracture Mechanics Journal. In 1972, starting with the Fifth National Symposium, ASTM decided to publish Special Technical Publications (STPs) of the papers presented in the symposia. The following are the lists of these ASTM Special Technical Publications:

- (1) FIFTH NATIONAL SYMPOSIUM 1972 Part 1: <u>Stress Analysis and Growth of Cracks</u> - STP 513 Part 2: Fracture Toughness - STP 514
- (2) SIXTH NATIONAL SYMPOSIUM 1973 Progress in Flaw Growth and Fracture Toughness Testing - STP 536
- (3) SEVENTH NATIONAL SYMPOSIUM 1974
   Part 1: Fracture Toughness and Slow Stable Cracking STP 559
   Part 2: Fracture Analysis STP 560
- (4) EIGHT NATIONAL SYMPOSIUM 1975 Mechanics of Crack Growth - STP 590
- (5) NINTH NATIONAL SYMPOSIUM 1976 Crack and Fracture - STP 601
- (6) TENTH NATIONAL SYMPOSIUM 1977 Flaw Growth and Fracture - STP 631
- (7) ELEVENTH NATIONAL SYMPOSIUM 1979
   Part 1: Fracture Mechanics STP 677
   Part 2: Fracture Mechanics Applied to Brittle Materials STP 678
- (8) TWELFTH NATIONAL SYMPOSIUM 1980 Fracture Mechanics - STP 700
- (9) THIRTEENTH NATIONAL SYMPOSIUM 1981 Fracture Mechanics - STP 743
- (10) FOURTEENTH NATIONAL SYMPOSIUM 1983
   Fracture Mechanics STP 791
   Part 1: Theory and Analysis
   Part 2: Testing and Application
- (11) FIFTEENTH NATIONAL SYMPOSIUM 1984 Fracture Mechanics - STP 833
- (12) SIXTEENTH NATIONAL SYMPOSIUM 1985 Fracture Mechanics - STP 868

# 5.0 INTERNATIONAL CONFERENCES ON FRACTURE

First International Conference on Fracture, Sendai, Japan, 1965 Second International Conference on Fracture, London, England, 1969 Third International Conference on Fracture, Munich, Germany, 1973 Fourth International Conference on Fracture, Waterloo, Canada, 1977 European Conference on Fracture, 2, Darmstadt, West Germany, 1978 European Conference on Fracture, 3, London, England, 1980 Fifth International Conference on Fracture, Cannes, France, 1981 European Conference on Fracture, 4, Leoben, Austria, 1982 European Conference on Fracture, 5, Lisbon, Portugal, 1984 Sixth International Conference on Fracture, New Delhi, India, 1984

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# 6.0 INTERNATIONAL CONFERENCES ON MECHANICAL BEHAVIOR OF MATERIALS

- (1) First International Conference on Mechanical Behavior of Materials, Kyoto, Japan, 1972.
- (2) Second International Conference on Mechanical Behavior of Materials, Boston, USA, 1976.
- (3) Third International Conference on Mechanical Behavior of Materials, Cambridge, England, 1980.
- (4) Fourth International Conference on Mechanical Behavior of Materials, Stockholm, Sweden, 1983.

# ] NOTE [

# 7.0 INTERNATIONAL CONFERENCES ON STRUCTURAL MECHANICS IN REACTOR TECHNOLOGY

- (1) First International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, Sept. 20-24, 1971.
- (2) Second International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, Sept. 1973.
- (3) Third International Conference on Structural Mechanics in Reactor Technology, London, England, Sept 1-5, 1975.
- (4) Fourth International Conference on Structural Mechanics in Reactor Technology, San Francisco, CA, USA, August 15-19, 1977.
- (5) Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 13-17, 1979.
- (6) Sixth International Conference on Structural Mechanics in Reactor Technology, Paris, France, August 7-21, 1981.
- (7) Seventh International Conference on Structural Mechanics in Reactor Technology, Chicago, Illinois, USA, August 22-26, 1983.

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# 8.0 RELATED CONFERENCES ON FRACTURE

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ISBN 0-8031-0466-9

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