

An Introduction to the
Development and Use of the

MASTER CURVE METHOD

Donald E. McCabe
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Kim Wallin**

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Foreword

This publication, *An Introduction to the Development and Use of the Master Curve Method*, was sponsored by Committee E08 on Fatigue and Fracture and E10 on Nuclear Technology and Applications. It was authored by Donald E. McCabe, Consultant, Oak Ridge National Laboratory, Oak Ridge, Tennessee; John G. Merkle, Consultant, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and Professor Kim Wallin, VTT Industrial Systems, Espoo, Finland. This publication is Manual 52 of ASTM's manual series.

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Mr. McCabe is currently a consultant in the Metals & Ceramics Division of the Oak Ridge National Laboratory (ORNL). Although he graduated with a BS degree in Metallurgical Engineering at the University of Wisconsin, he decided to switch his interests to the new scientific discipline of fracture mechanics in 1960 and has participated in this field for 40 years. He has authored and co-authored more than 70 technical publications. He became active in ASTM committee

work and has served as Secretary to the Executive Committee of E24 (now E08) for 13 years and as Chairman of the task group. Mr. McCabe has received the George R. Irwin Medal, the Award of Merit, the Richard L. Templin Award, and four Awards of Appreciation.



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Mr. Merkle has over 40 years of experience in the fields of fracture mechanics and pressure vessel research. He worked on the Nuclear Regulatory Commission (NRC)-sponsored Heavy Section Steel Technology Program at the Oak Ridge National Laboratory (ORNL) and related projects from 1965 until his retirement in 1999. He continues to consult in the same fields at ORNL. Mr. Merkle has been a member of ASTM since 1967, serving as co-chairman of Task

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Dr. Kim Wallin

Dr. Kim Wallin, a research professor at VTT in Espoo, Finland, has been involved with different research topics related to experimental and theoretical fracture mechanics since 1982, and he has written more than 290 publications on the subject. Since 1993, he has held the position of research professor in fracture mechanics at VTT. He is responsible for the scientific level of the fracture mechanics research within VTT Industrial Systems. Additionally, he has had a

leading role in numerous international co-operative projects dealing with advanced fracture mechanics. Dr. Wallin has been a member of ASTM International since 1991. He holds a Doctorate degree in Process and Materials Technology from the Helsinki University of Technology, where he also earned his Master of Science degree in Physical Metallurgy. Dr. Wallin's most significant scientific achievements have been connected to the theoretical modeling of brittle fracture and to the development of new engineering applications, above all in the context of the so-called "Master Curve" methodology. His research has led to a global change of the principle of brittle fracture assessment and has also given novel insight to the failure mechanisms in the case of ductile fracture.