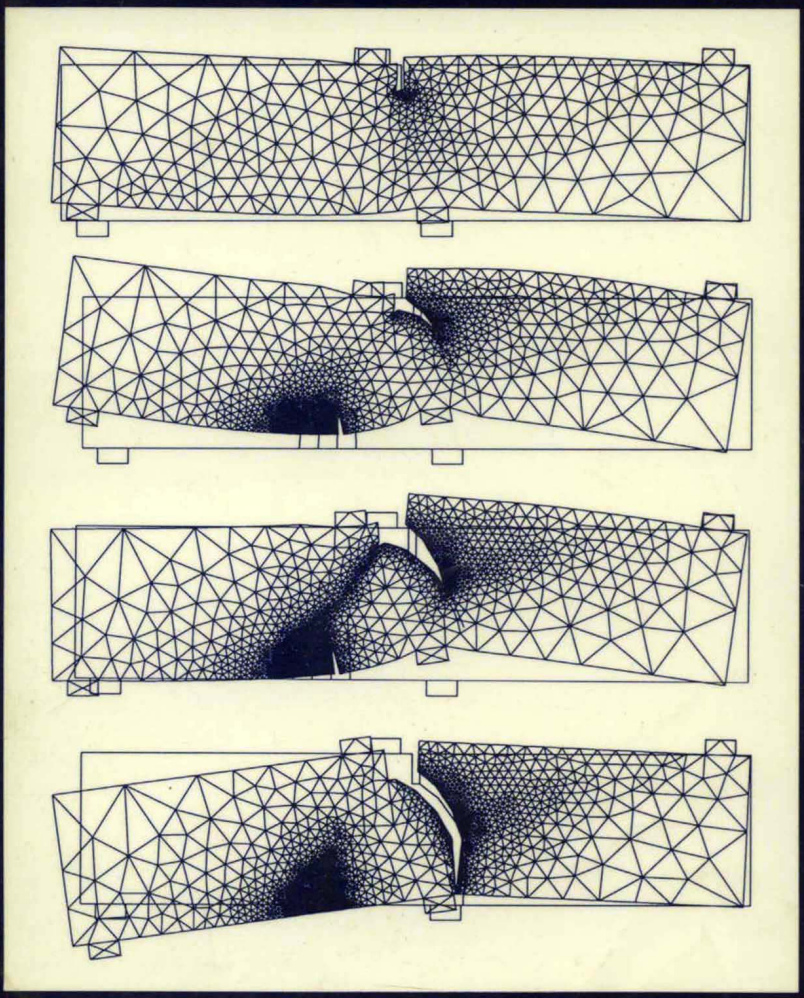
ENGINEERING MECHANICS

PROCEEDINGS OF 10TH CONFERENCE

VOLUME 1



EDITED BY STEIN STURE

ABSTRACT

This proceedings, *Engineering Mechanics:* Proceedings of the 10th Conference, contains papers presented at the Conference held in Boulder, Colorado, May 21 - 24, 1995. The purpose of the Conference was to examine current knowledge and recent advances in mechanics as applied to the various fields in civil engineering. With this in mind, papers covered diverse topics such as computational mechanics, dynamics, elasticity, experimental analysis and instrumentation, fluids, granular flows, inelastic behavior, probabilistic methods, and turbulence.

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PREFACE

Welcome to the 10th ASCE Engineering Mechanics Conference, held at the University of Colorado at Boulder, May 21–24, 1995. The technical program is rich and diverse and comprises over 400 presentations including three keynote lectures. The topics covered in the 80 sessions reflect activities of the Technical Committees of the Engineering Mechanics Division and include Computational Mechanics, Dynamics, Elasticity, Experimental Analysis and Instrumentation, Fluids, Granular Flows, Inelastic Behavior, Probabilistic Methods, Properties of Materials, Stability and Turbulence.

The purpose of the Conference is to examine current knowledge and recent advances in mechanics as applied to the various fields of civil engineering. Engineering mechanics is about discovering and developing new knowledge, and applying it for the good of the public. Our activities address both existing problems and fundamental issues. We provide the basic knowledge for designing, construction, and management of the infrastructure. We are also involved in protection or restoration of the integrity of the natural and man-made environments. We are experts in dealing with complex analysis problems, and we are the authorities when it comes to reconciling conflicts involving the quantifyable. As a profession and as individuals we are aware of the many societal issues, which shape our work. Based on these factors, we might conclude that the field of mechanics is flourishing; there is a demand for our services; and the opportunities for research and funding are bountiful. Yet, to paraphrase Charles Dickens, "These are the worst of times and the best of times." On one hand, current political realities have resulted in significantly diminished funding for research in mechanics, especially defense-oriented work. In the civilian sector we continuously read about down-sizing and reduction of traditional funding sources for fundamental as well as applied research. At the national level it is expected that the private sector somehow will provide support, especially in the form of industry-government-university collaboration, which is the current fashion in technology reinvestments and other programs. On the positive side, new initiatives are emerging, especially in the areas of materials, environmental mechanics, etc., which should cause excitement, especially for a young, enthusiastic and agile generation of mechanicians. The programs at recent mechanics conferences show richness and diversity in the profession, which demonstrates the vitality of our work. There is also hope, if we look at our fundamental mission to widen the knowledge base, and to extend technical concepts to new and innovative endeavors. This becomes apparent if we consider the rejuvenation of traditional fields such as mechanics and materials, and dynamics and controls, and interdisciplinary fields. In fact, the new emphasis by NSF on deterioration science, assessment technology, and renewal engineering are very much aligned with our current civil engineering research activities, although terminologies have changed and sound more inspired.

At the educational frontier we face an even more severe erosion of the role of engineering mechanics. Traditional values of quantitative analysis are challenged by superficial thinking in qualitative terms. Often it seems that we spoonfeed our students and grant credit for work that is no longer quantitative. Modern curricula seem to sidestep the rigors of traditional training in engineering mechanics in favor of virtual reality and glitzy topics. Concepts such as "teaching calculus on demand," sound like

teaching swimming to a drowning person. There is a need to reaffirm the virtues and role of engineering mechanics in the educational process. In fact, our alumni in engineering practice tell us to emphasize the fundamentals in our curricula rather than applications, which our graduates will have ample opportunities to pursue in their practice, if they have a solid analysis background. Clearly, we need to emphasize to our students that virtual work is far more real than virtual reality.

Stein Sture
Editor

Boulder, February, 1995

FOREWORD

The Proceedings represent the effort of a large number of EMD Technical Committee Chairs, session organizers, and authors. The Organizing Committee acknowledges the significant contributions made by those involved. The support of headquarters staff in producing the Program and Proceedings, and the work of the Office of Conference Services staff at the University of Colorado at Boulder are gratefully acknowledged.

For this Conference over 440 abstracts were received in response to the initial Call for Papers. These were reviewed by the EMD Technical Committees, and 403 were accepted for compact-paper submission. Each of the papers included in the proceedings has been accepted for publication by the Proceedings Editor. All papers are eligible for discussion in the *Journal of Engineering Mechanics* and eligible for ASCE awards.

The following have been actively involved in formulating the program for the Conference:

Ronald C. Averill
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Kaspar J. Willam

For any additional organizers or reviewers whose names were inadvertently omitt
I extend my thanks to you as well.

Stein Sture
Editor

Boulder, February, 19

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