



***Background
Document***

**Selected Documents from the U.S.-Japan Workshop
on Steel Fracture Issues**

Report No. SAC/BD-96/03

SAC Joint Venture

A partnership of

Structural Engineers Association of California (SEAOC)

Applied Technology Council (ATC)

California Universities for Research in Earthquake Engineering (CUREe)

By

A Workshop held at the Earthquake Engineering Research Center

University of California at Berkeley

June 16-18, 1996

Submitted for distribution to

SAC Joint Venture

650-595-1542

<http://www.sacsteel.org>

July 1996

DISCLAIMER

This document is one of a series documenting background information related to Phase II of the FEMA-funded SAC Steel Project. It is being disseminated in the public interest to increase awareness of the many factors which contribute to the seismic performance of steel moment frame structures. The information contained herein is not for design use and is not acceptable to specific building projects. This report has not been reviewed for accuracy, and the SAC Joint Venture has not verified any of the results presented. **No warranty is offered with regard to the recommendations contained herein, by the Federal Emergency Management Agency, the SAC Joint Venture, the individual joint venture partners, or the partner's directors, members or employees. These organizations and their employees do not assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any of the information, products or processes included in this publication. The reader is cautioned to review carefully the material presented herein and exercise independent judgment as to its suitability for application to specific engineering projects.** This publication has been prepared by the SAC Joint Venture with funding provided by the Federal Emergency Management Agency, under contract number EMW-95-C-4770.



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THE SAC JOINT VENTURE

SAC is a joint venture of the Structural Engineers Association of California (SEAOC), the Applied Technology Council (ATC), and California Universities for Research in Earthquake Engineering (CUREe), formed specifically to address both immediate and long-term needs related to solving performance problems with welded, steel moment-frame connections discovered following the 1994 Northridge earthquake. SEAOC is a professional organization composed of more than 3,000 practicing structural engineers in California. The volunteer efforts of SEAOC's members on various technical committees have been instrumental in the development of the earthquake design provisions contained in the *Uniform Building Code* and the 1997 *National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions for Seismic Regulations for New Buildings and other Structures*. ATC is a nonprofit corporation founded to develop structural engineering resources and applications to mitigate the effects of natural and other hazards on the built environment. Since its inception in the early 1970s, ATC has developed the technical basis for the current model national seismic design codes for buildings; the *de facto* national standard for postearthquake safety evaluation of buildings; nationally applicable guidelines and procedures for the identification, evaluation, and rehabilitation of seismically hazardous buildings; and other widely used procedures and data to improve structural engineering practice. CUREe is a nonprofit organization formed to promote and conduct research and educational activities related to earthquake hazard mitigation. CUREe's eight institutional members are the California Institute of Technology, Stanford University, the University of California at Berkeley, the University of California at Davis, the University of California at Irvine, the University of California at Los Angeles, the University of California at San Diego, and the University of Southern California. These laboratory, library, computer and faculty resources are among the most extensive in the United States. The SAC Joint Venture allows these three organizations to combine their extensive and unique resources, augmented by subcontractor universities and organizations from across the nation, into an integrated team of practitioners and researchers, uniquely qualified to solve problems related to the seismic performance of steel moment-frame buildings.

ACKNOWLEDGEMENTS

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PREFACE

This report contains a series of selected documents from the U.S. Japan Workshop on Steel Fracture Issues, held in San Francisco and Los Angeles, California, from June 16-18, 1996. This meeting, attended by researchers, practitioners, and industry representatives from the United States and Japan, was convened to share information regarding the behavior of steel buildings in the Northridge and Hyogoken-Nanbu (Kobe) Earthquakes and to summarize current research activities in both countries.

A number of presentations were made concerning steel material properties, welding issues, analysis and testing of beam-column connections, behavior of structural systems, and post-earthquake damage surveys. Although construction practices in Japan and the United States are not identical, a number of topical areas were identified to be of common interest, and several subjects for joint research and coordination were proposed. These activities include testing of large-scale connections using various combinations of U.S. and Japanese steels and welding materials, comparative design of theme buildings according to regulations in the two countries, identification of reliable joint details for the design of new structures and the rehabilitation of existing structures, and development of performance-based design procedures for steel structures. To ensure ongoing coordination and communication between Japanese and U.S. participants, plans were made for a follow-up workshop to be held in the United States in February, 1997, and for a third workshop to be arranged in Japan sometime in 1998.

The first workshop was sponsored by the Kozai Club (a consortium of steel producers in Japan) as well as by the Japan Structural Consultant Association, the Japan Steel Construction Association, and the Building Research Institute of the Ministry of Construction. The SAC Joint Venture appreciates the support of these organizations and the enthusiastic efforts of all those who attended.