ASCE/SEI 31-03

ASCE
STANDARD

American Society of Civil Engineers

Seismic Evaluation of Existing Buildings

ASCE

SEI
Structural Engineering Institute

ASCE/SEI 31-03

American Society of Civil Engineers

Seismic Evaluation of Existing Buildings

This document uses both the International System of Units (SI) and customary units.

Published by the American Society of Civil Engineers

Library of Congress Cataloging-in-Publication Data

Seismic evaluation of existing buildings / American Society of Civil Engineers.
p. cm. -- (ASCE standard)
Includes bibliographical references and index.
"SEI/ASCE 31/02."
ISBN 0-7844-0670-7
1. Buildings--Earthquake effects. I. Structural Engineering Institute II. American Society of Civil Engineers.

TH1095.S3842 2003
693.8'52--dc21

2003041921

Published by the American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia 20191
www.asce pubs.asce.org

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Library of Congress Catalog Card No: 2003041921
ISBN 0-7844-0670-7
Manufactured in the United States of America.

STANDARDS

In April 1980, the Board of Direction approved ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by the Society. All such standards are developed by a consensus standards process managed by the Codes and Standards Activities Committee. The consensus process includes balloting by the balanced standards committee, which is composed of Society members and nonmembers, balloting by the membership of ASCE as a whole, and balloting by the public. All standards are updated or reaffirmed by the same process at intervals not exceeding 5 years.

The following standards have been issued:

ANSI/ASCE 1-82 N-725	Guideline for Design and Analysis of Nuclear Safety Related Earth Structures
ANSI/ASCE 2-91	Measurement of Oxygen Transfer in Clean Water
ANSI/ASCE 3-91	Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs
ASCE 4-98	Seismic Analysis of Safety-Related Nuclear Structures
Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-02) and	Specifications for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02)
SEI/ASCE 7-02	Minimum Design Loads for Buildings and Other Structures
ASCE 8-02	Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members
ANSI/ASCE 9-91	Listed with ASCE 3-91
ASCE 10-97	Design of Latticed Steel Transmission Structures
SEI/ASCE 11-99	Guideline for Structural Condition Assessment of Existing Buildings
ANSI/ASCE 12-91	Guideline for the Design of Urban Subsurface Drainage
ASCE 13-93	Standard Guidelines for Installation of Urban Subsurface Drainage
ASCE 14-93	Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage
ASCE 15-98	Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)
ASCE 16-95	Standard for Load and Resistance Factor Design (LRFD) of Engineered Wood Construction
ASCE 17-96	Air-Supported Structures
ASCE 18-96	Standard Guidelines for In-Process Oxygen Transfer Testing
ASCE 19-96	Structural Applications of Steel Cables for Buildings
ASCE 20-96	Standard Guidelines for the Design and Installation of Pile Foundations
ASCE 21-96	Automated People Mover Standards—Part 1
ASCE 21-98	Automated People Moves Standards—Part 2
ASCE 21-00	Automated People Mover Standards—Part 3
SEI/ASCE 23-97	Specification for Structural Steel Beams with Web Openings
SEI/ASCE 24-98	Flood Resistant Design and Construction

ASCE 25-97	Earthquake-Actuated Automatic Gas Shut-Off Devices
ASCE 26-97	Standard Practice for Design of Buried Precast Concrete Box Sections
ASCE 27-00	Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
ASCE 28-00	Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction
SEI/ASCE/SFPE 29-99	Standard Calculation Methods for Structural Fire Protection
SEI/ASCE 30-00	Guideline for Condition Assessment of the Building Envelope
ASCE/SEI 31-03	Seismic Evaluation of Existing Buildings
SEI/ASCE 32-01	Design and Construction of Frost-Protected Shallow Foundations
EWRI/ASCE 33-01	Comprehensive Transboundary International Water Quality Management Agreement
EWRI/ASCE 34-01	Standard Guidelines for Artificial Recharge of Ground Water
EWRI/ASCE 35-01	Guidelines for Quality Assurance of Installed Fine-Pore Aeration Equipment
CI/ASCE 36-01	Standard Construction Guidelines for Microtunneling
SEI/ASCE 37-02	Design Loads on Structures During Construction
CI/ASCE 38-02	Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data
EWRI/ASCE 39-03	Standard Practice for the Design and Operation of Hail Suppression Projects

FOREWORD

The material presented in this publication has been prepared in accordance with recognized engineering principles. This Standard and Commentary should not be used without first securing competent advice with respect to their suitability for any given application. The publication of the material contained herein is not intended as a representation or warranty on the part of the American Society of Civil Engineers, or of any other person named herein, that this information is suitable for any general or particular use or promises freedom from infringement of any patent or patents. Anyone making use of this information assumes all liability from such use.

ACKNOWLEDGEMENTS

The American Society of Civil Engineers (ASCE) acknowledges the work of the Seismic Rehabilitation of Existing Buildings Standards Committee of the Codes and Standards Activities Division of the Structural Engineering Institute. This group comprises individuals from many backgrounds including: consulting engineering, research, construction industry, education, government, design, and private practice. This Standard process began in 1998 and incorporates information as described in the commentary.

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1.0 General Provisions

1.1 Scope

This standard provides a three-tiered process for seismic evaluation of existing buildings in any level of seismicity (Section 2.5). Buildings are evaluated to either the Life Safety or Immediate Occupancy Performance Level (Section 2.4). The design of mitigation measures is not addressed in this standard.

This standard does not preclude a building from being evaluated by other well-established procedures based on rational methods of analysis in accordance with principles of mechanics and approved by the authority having jurisdiction (if any).

C1.1 Scope

This standard provides a process for seismic evaluation of existing buildings. It is intended to serve as a nationally applicable tool for design professionals, code officials, and building owners looking to seismically evaluate existing buildings. This standard may be used on a voluntary basis or may be required by the authority having jurisdiction. A major portion is dedicated to instructing the evaluating design professional on how to determine if a building is adequately designed and constructed to resist seismic forces. All aspects of building performance are considered and defined in terms of structural, nonstructural, and foundation/ geologic hazard issues. Lifelines such as water, electrical, natural gas supply lines, and waste disposal lines beyond the perimeter of the building, which may be necessary for buildings to be occupied, are not considered in this document.

The evaluation procedures include a consideration of ground shaking and to a limited extent other seismic hazards such as liquefaction, slope failure, surface fault rupture, and effects of neighboring structures. Other phenomena such as tsunami, lateral spreading, and local topological effects are not considered.

The need for evaluation using this standard may have been indicated by rapid visual screening using FEMA 154, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook* (FEMA, 1988a).

Mitigation strategies for rehabilitating buildings found to be deficient are not included in this standard; additional resources should be consulted for information regarding mitigation strategies.

Standard Basis

This standard has evolved from and is intended to replace FEMA 310, *Handbook for Seismic Evaluation of Buildings—A Prestandard* (FEMA, 1998). This standard was written to:

- Reflect advancements in technology,
- Incorporate the experience of design professionals,
- Incorporate lessons learned during recent earthquakes,
- Be compatible with FEMA 356, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings* (FEMA, 2000c),
- Be suitable for adoption in building codes and contracts,
- Be nationally applicable, and
- Provide evaluation techniques for varying levels of building performance.