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Guideline for Structural Condition Assessment of Existing Buildings

This document uses both Système International (SI) units and customary units.

Structural Engineering Institute

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ABSTRACT

Changing economic conditions, concerns for historic preservation, emphasis on fully utilizing conveniently located structures, space shortages, and increasing cost of materials and products used in the construction of new buildings have resulted in a need to evaluate and more fully utilize the existing building inventory. To this end, the standard *Guideline for Structural Condition Assessment of Existing Buildings (ASCE 11-90)* was developed to provide the design community with guidelines for assessing the structural conditions of existing buildings constructed of combinations of material including concrete, masonry, metals, and wood. This edition (SEI/ASCE 11-99) replaces ASCE 11-90. It consists of an overview of preliminary and detailed assessment procedures, of materials properties and test methods, and of evaluation procedures for various physical conditions of the structure. The standard is not intended to be inclusive or prescriptive but is expected to serve as a resource document for engineers, owners, and regulatory officials.

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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 Management Group F (MGF), Codes and Standards. The consensus process includes balloting by the balanced standards committee made up 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 530-99/ASCE 5-99/TMS 402-99) and Specifications for Masonry Structures (ACI 530.1-99/ASCE 6-99/TMS 602-99)

ASCE 7-98 Minimum Design Loads for Buildings and Other Structures

ANSI/ASCE 8-90 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 Mover Standards—Part 2

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

DEDICATION TO JEROME S. B. IFFLAND

This second edition of ASCE Standard Guideline for Structural Condition Assessment of Existing Buildings is dedicated to the memory of Jerome S. B. Iffland, who passed away in February 1995. Jerry was a founding member of the committee established by ASCE in 1983 and served as its Vice-Chairman until his death. While providing overall direction to the committee based on his extensive professional experience with assessment and rehabilitation of structures, he was an active worker preparing important sections of the standard ready for consensus review. The completion of the 1990 edition of the standard was due in large part to his efforts.

Jerry will be especially remembered for drafting parts of this second edition of ASCE 11 while he was very ill. Much of this work was done while he was in the hospital. A special thanks goes to Jerry's wife, Helen, who assisted him in working on the standard during this difficult period.

It is with great pleasure that the ASCE Standards Committee on Structural Condition Assessment of Existing Buildings dedicates this standard to the memory of Jerry Iffland. He was an inspiration to the committee, setting an example that guided our work even after his death.

FOREWORD

Changing economic conditions, concern for historic preservation, emphasis on fully utilizing conveniently located structures, space shortages, and increasing cost of materials and products used in the construction of new buildings have resulted in a need to evaluate and more fully utilize the existing building inventory. Particularly in older cities, emphasis has shifted from replacement to preservation, rehabilitation, and strengthening of existing buildings.

New processes resulting in changes of building systems and business equipment frequently impose greater loads on an existing building structure and may require additional openings and restructuring. More stringent building code provisions for design load requirements or improved seismic resistance may also demand retrofitting of structural reinforcement. Also, any known site conditions should be reviewed to determine if modifications to structural systems are required.

Adaptive reuse, rehabilitation, and improvement of existing buildings all require an accurate assessment of present building performance and capability for use by owners, designers, building officials, and contractors. Current data for assessment is dispersed and not readily available to many of those making technical decisions. Such information has been compiled and subjected to a consensus review and approved by this committee to provide the design community with a resource standard on building condition assessment for selected materials and for other areas related to the structural performance of buildings. To that end, this Standard Guideline for Structural Condition Assessment of Existing Buildings has been prepared for use by qualified professional engineers and regulatory officials. This edition replaces ASCE 11, first published in 1990.

This Standard is not intended to be inclusive or prescriptive. Methods and procedures are presented as a resource for reference purposes. Other methods and procedures are not only permissible, but are encouraged, so long as they are deemed reliable and sufficient comparisons are available with other recognized methods.

Inasmuch as interpretation of the results of the evaluation must be based on the professional experience and judgement of the practitioner, it is not a part of this Standard.

Utilization of this guideline may involve hazardous materials, operations and equipment. It does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this guideline to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

The material presented in this publication has been prepared in accordance with recognized engineering principles. This Standard Guideline should not be used without first securing competent advice with respect to its 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.

ACKNOWLEDGMENTS

The Structural Engineering Institute (SEI) and the American Society of Civil Engineers (ASCE) gratefully acknowledge the work of the SEI standards committee Structural Condition Assessment and Rehabilitation of Buildings. This committee comprises individuals from many backgrounds including: consulting engineering, research, construction industry, education, government, design and private practice.

This revision of the standard began in 1995 and incorporates information as described in the commentary.

This Standard was prepared through the consensus standards process by balloting in compliance with procedures of ASCE's Codes and Standards Activities Committee. Those individuals who served on the Structural Condition Assessment and Rehabilitation of Buildings Standards Committee are:

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Guideline for Structural Condition Assessment of Existing Buildings

1.0 GENERAL

1.1 SCOPE AND INTENT OF THE STANDARD

The intent of this Standard is to provide guidelines and methodology for assessing the structural condition of existing buildings constructed of combinations of materials including concrete, metals, masonry, and wood. This Standard establishes the assessment procedure including investigation, testing methods, and format for the report of the condition assessment.

Since any evaluation will involve engineering judgment and contains factors that cannot be readily defined and standardized, a Section providing guidance for evaluations is also included. This Section must be used by the professional engineer as part of an engineering evaluation. The Standard is intended as a guide to the engineer in providing comprehensive information for clients such as building owners, prospective purchasers, tenants, regulatory officials, and others.

Dimensions and quantities in this Standard are expressed in lb. units followed by conversion to SI units in parentheses.

1.2 PURPOSE OF ASSESSMENT

Structural condition assessment of an existing building can be undertaken for a number of purposes. These can include developing a performance report, establishing building use, serviceability, code compliance, life safety, durability, historic preservation, or a number of special purposes based on the specific building and its current or proposed occupancy or function. The engineer should consider the possibility of the presence of hazardous material when assessing an existing building, advise the client as necessary, and take or recommend appropriate precautions.

1.3 QUALIFICATIONS AND EQUIPMENT

1.3.1 Personnel Qualifications

All personnel involved in the assessment shall possess the technical qualifications, including practical experience, education, and professional judgment required to perform the individual technical tasks assigned. Interpretation of results and conclusions shall be performed by a registered professional engineer qualified in the appropriate discipline.

1.3.2 Equipment

Equipment shall be obtained as appropriate to accomplish or perform the various tests and inspection methods specified in the Standard. All equipment shall be in good working order. For equipment that can be calibrated, reports of calibration shall be available.

1.4 AGREEMENTS

1.4.1 Services

The scope of services for the structural condition assessment shall be defined by the qualified professional engineer, and all conditions, applicable codes and standards, and services shall be mutually agreed upon by the client and professional engineer. Services may include one or more of the identified purposes of the assessment and may involve more than one specific building component or system covered in the subsections of this Standard. Evaluation and acceptance criteria should be defined as part of the agreement. Clients should be advised of the possibility of hazardous material being present in an existing building unless a previous investigation has been completed.

1.4.2 Compensation

The client and the qualified professional engineer shall mutually agree upon the engineer's compensation for the services specified in Section 1.4.1. The agreement shall specify if it includes reimbursable expenses such as testing laboratory costs. Compensation provisions shall consider that, after review of the preliminary data, additional investigations may be required, thereby changing the scope of the project.

1.4.3 Authority and Accessibility

The agreement shall clearly identify the scope and authority of the professional engineer to perform the necessary investigation and tests and shall assure access to the site, the building, the various portions of the building requiring investigation, and drawings and documents required to perform the condition assessment. Responsibility for removal and repairs to