

**American Society of Civil Engineers**

# **Minimum Design Loads for Buildings and Other Structures**

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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 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)
- ASCE/SEI 7-05 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
- 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 Guidelines for Condition Assessment of the Building Envelope
- SEI/ASCE 31-00 Seismic Evaluation of Existing Buildings
- SEI/ASCE 32-00 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
- ASCE/EWRI 40-03 Regulated Riparian Model Water Code
- ASCE/EWRI 42-04 Standard Practice for the Design and Operation of Precipitation Enhancement Projects
- ASCE/SEI 43-05 Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities
- ASCE/EWRI 44-05 Standard Practice for the Design and Operation of Supercooled Fog Dispersal Projects

## FOREWORD

The material presented in this standard has been prepared in accordance with recognized engineering principles. This standard 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

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In the margin of Chapters 1 through 10, a bar has been placed to indicate a substantial technical revision in the standard from the 2002 edition. Because of the reorganization of the seismic provisions, these bars are not used in Chapters 11 through 23. Likewise, bars are not used to indicate changes in the Commentary.

## ACKNOWLEDGEMENTS

The American Society of Civil Engineers (ASCE) acknowledges the work of the Minimum Design Loads on Buildings and Other Structures 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 revision of the standard began in 2003 and incorporates information as described in the commentary.

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## DEDICATION



The members of the Standards Committee, *Minimum Design Loads for Buildings and Other Structures*, and its task committees respectfully dedicate this standard in memory of James Merriam Delahay, P.E., who passed away unexpectedly on April 16, 2005 at the age of 46. Through his technical ability, leadership, and good humor, Jim contributed greatly to improving the technical requirements of this standard, most specifically the wind load provisions. It was primarily through his efforts that the simplified wind load requirements, Method 1, were introduced into this standard in 1998. Jim contributed substantial time and talent to improve the clarity and usefulness of the standard, and he worked hard to bring knowledge about the wind load profession to the profession. His advice, counsel, and warm smile will be sorely missed.

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# Chapter 1

## GENERAL

### 1.1 SCOPE

This standard provides minimum load requirements for the design of buildings and other structures that are subject to building code requirements. Loads and appropriate load combinations, which have been developed to be used together, are set forth for strength design and allowable stress design. For design strengths and allowable stress limits, design specifications for conventional structural materials used in buildings and modifications contained in this standard shall be followed.

### 1.2 DEFINITIONS

The following definitions apply to the provisions of the entire standard.

**ALLOWABLE STRESS DESIGN:** A method of proportioning structural members such that elastically computed stresses produced in the members by nominal loads do not exceed specified allowable stresses (also called “working stress design”).

**AUTHORITY HAVING JURISDICTION:** The organization, political subdivision, office, or individual charged with the responsibility of administering and enforcing the provisions of this standard.

**BUILDINGS:** Structures, usually enclosed by walls and a roof, constructed to provide support or shelter for an intended occupancy.

**DESIGN STRENGTH:** The product of the nominal strength and a resistance factor.

**ESSENTIAL FACILITIES:** Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from wind, snow, or earthquakes.

**FACTORED LOAD:** The product of the nominal load and a load factor.

**HIGHLY TOXIC SUBSTANCE:** As defined in 29 CFR 1910.1200 Appendix A with Amendments as of February 1, 2000.

**LIMIT STATE:** A condition beyond which a structure or member becomes unfit for service and is judged either to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).

**LOAD EFFECTS:** Forces and deformations produced in structural members by the applied loads.

**LOAD FACTOR:** A factor that accounts for deviations of the actual load from the nominal load, for uncertainties in the analysis that transforms the load into a load effect, and for the probability that more than one extreme load will occur simultaneously.

**LOADS:** Forces or other actions that result from the weight of all building materials, occupants and their possessions, environmental effects, differential movement, and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude. All other loads are variable loads (see also “nominal loads”).

**NOMINAL LOADS:** The magnitudes of the loads specified in this standard for dead, live, soil, wind, snow, rain, flood, and earthquake.

**NOMINAL STRENGTH:** The capacity of a structure or member to resist the effects of loads, as determined by computations using specified material strengths and dimensions and formulas derived from accepted principles of structural mechanics or by field tests or laboratory tests of scaled models, allowing for modeling effects and differences between laboratory and field conditions.

**OCCUPANCY:** The purpose for which a building or other structure, or part thereof, is used or intended to be used.

**OTHER STRUCTURES:** Structures, other than buildings, for which loads are specified in this standard.

**P-DELTA EFFECT:** The second order effect on shears and moments of frame members induced by axial loads on a laterally displaced building frame.

**PHYSICAL HAZARD:** Chemicals or substances in a liquid, solid, or gaseous form that are classified by the authority having jurisdiction as combustible, flammable, explosive, oxidizer, pyrophoric, unstable (reactive), or water reactive.

**RESISTANCE FACTOR:** A factor that accounts for deviations of the actual strength from the nominal strength and the manner and consequences of failure (also called “strength reduction factor”).

**STRENGTH DESIGN:** A method of proportioning structural members such that the computed forces produced in the members by the factored loads do not exceed the member design strength (also called “load and resistance factor design”).

**TEMPORARY FACILITIES:** Buildings or other structures that are to be in service for a limited time and have a limited exposure period for environmental loadings.

**TOXIC SUBSTANCE:** As defined in 29 CFR 1910.1200 Appendix A with Amendments as of February 1, 2000.

### 1.3 BASIC REQUIREMENTS

**1.3.1 Strength.** Buildings and other structures, and all parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this document without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and all parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this document without exceeding the appropriate specified allowable stresses for the materials of construction.

**1.3.2 Serviceability.** Structural systems, and members thereof, shall be designed to have adequate stiffness to limit deflections, lateral drift, vibration, or any other deformations that adversely affect the intended use and performance of buildings and other structures.