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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 Guideline for Condition Assessment of the Building Envelope
- SEI/ASCE 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
- 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.

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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 provisions to the profession. His advice, counsel, and warm smile will be sorely missed.

CONTENTS

	Page
STANDARDS	iii
FOREWORD	v
ACKNOWLEDGEMENTS	vii
DEDICATION	ix
 STANDARD	
1 General	1
1.1 Scope	1
1.2 Definitions	1
1.3 Basic Requirements	1
1.3.1 Strength.	1
1.3.2 Serviceability.	1
1.3.3 Self-Straining Forces.	2
1.3.4 Analysis.	2
1.3.5 Counteracting Structural Actions.	2
1.4 General Structural Integrity	2
1.5 Classification of Buildings and Other Structures	2
1.5.1 Nature of Occupancy.	2
1.5.2 Toxic, Highly Toxic, and Explosive Substances.	2
1.6 Additions and Alterations to Existing Structures	2
1.7 Load Tests	3
1.8 Consensus Standards and Other Referenced Documents	3
 2 Combinations of Loads	 5
2.1 General	5
2.2 Symbols and Notation	5
2.3 Combining Factored Loads Using Strength Design	5
2.3.1 Applicability.	5
2.3.2 Basic Combinations.	5
2.3.3 Load Combinations Including Flood Load.	5
2.3.4 Load Combinations Including Atmospheric Ice Loads.	5
2.4 Combining Nominal Loads Using Allowable Stress Design	5
2.4.1 Basic Combinations.	5
2.4.2 Load Combinations Including Flood Load.	6
2.4.3 Load Combinations Including Atmospheric Ice Loads.	6
2.5 Load Combinations for Extraordinary Events	6
 3 Dead Loads, Soil Loads, and Hydrostatic Pressure	 7
3.1 Dead Loads	7
3.1.1 Definition.	7
3.1.2 Weights of Materials and Constructions.	7
3.1.3 Weight of Fixed Service Equipment.	7
3.2 Soil Loads and Hydrostatic Pressure	7
3.2.1 Lateral Pressures.	7
3.2.2 Uplift on Floors and Foundations.	7
 4 Live Loads	 9
4.1 Definitions	9
4.2 Uniformly Distributed Loads	9
4.2.1 Required Live Loads.	9
4.2.2 Provision for Partitions.	9
4.3 Concentrated Loads	9

4.4	Loads on Handrails, Guardrail Systems, Grab Bar Systems, Vehicle Barrier Systems, and Fixed Ladders	9
4.4.1	Loads on Handrails and Guardrail Systems.	9
4.4.2	Loads on Grab Bar Systems.	9
4.4.3	Loads on Vehicle Barrier Systems.	9
4.4.4	Loads on Fixed Ladders.	9
4.5	Loads Not Specified	10
4.6	Partial Loading	10
4.7	Impact Loads	10
4.7.1	Elevators.	10
4.7.2	Machinery.	10
4.8	Reduction in Live Loads	10
4.8.1	General.	10
4.8.2	Heavy Live Loads.	10
4.8.3	Passenger Car Garages.	10
4.8.4	Special Occupancies.	10
4.8.5	Limitations on One-Way Slabs.	10
4.9	Reduction in Roof Live Loads	10
4.9.1	Flat, Pitched, and Curved Roofs.	10
4.9.2	Special Purpose Roofs.	11
4.10	Crane Loads	11
4.10.1	Maximum Wheel Load.	11
4.10.2	Vertical Impact Force.	11
4.10.3	Lateral Force.	11
4.10.4	Longitudinal Force.	11
4.11	Consensus Standards and Other Referenced Documents	11
5	Flood Loads	15
5.1	General	15
5.2	Definitions	15
5.3	Design Requirements	15
5.3.1	Design Loads.	15
5.3.2	Erosion and Scour.	15
5.3.3	Loads on Breakaway Walls.	15
5.4	Loads During Flooding	15
5.4.1	Load Basis.	15
5.4.2	Hydrostatic Loads.	15
5.4.3	Hydrodynamic Loads.	16
5.4.4	Wave Loads.	16
5.4.4.1	Breaking Wave Loads on Vertical Pilings and Columns.	16
5.4.4.2	Breaking Wave Loads on Vertical Walls.	16
5.4.4.3	Breaking Wave Loads on Nonvertical Walls.	17
5.4.4.4	Breaking Wave Loads from Obliquely Incident Waves.	17
5.4.5	Impact Loads.	17
5.5	Consensus Standards and Other Referenced Documents	17
6	Wind Loads	21
6.1	General	21
6.1.1	Scope.	21
6.1.2	Allowed Procedures.	21
6.1.3	Wind Pressures Acting on Opposite Faces of Each Building Surface.	21
6.1.4	Minimum Design Wind Loading.	21
6.1.4.1	Main Wind-Force Resisting System.	21
6.1.4.2	Components and Cladding.	21
6.2	Definitions	21
6.3	Symbols and Notation	22
6.4	Method 1—Simplified Procedure	23
6.4.1	Scope.	23
6.4.1.1	Main Wind-Force Resisting Systems.	24
6.4.1.2	Components and Cladding.	24

6.4.2	Design Procedure.	24
6.4.2.1	Main Wind-Force Resisting System.	24
6.4.2.1.1	Minimum Pressures.	24
6.4.2.2	Components and Cladding.	24
6.4.2.2.1	Minimum Pressures.	24
6.4.3	Air Permeable Cladding.	24
6.5	Method 2—Analytical Procedure	24
6.5.1	Scope.	24
6.5.2	Limitations.	24
6.5.2.1	Shielding.	25
6.5.2.2	Air Permeable Cladding.	25
6.5.3	Design Procedure.	25
6.5.4	Basic Wind Speed.	25
6.5.4.1	Special Wind Regions.	25
6.5.4.2	Estimation of Basic Wind Speeds from Regional Climatic Data.	25
6.5.4.3	Limitation.	25
6.5.4.4	Wind Directionality Factor.	25
6.5.5	Importance Factor.	25
6.5.6	Exposure.	25
6.5.6.1	Wind Directions and Sectors.	25
6.5.6.2	Surface Roughness Categories.	25
6.5.6.3	Exposure Categories	25
6.5.6.4	Exposure Category for Main Wind-Force Resisting System.	26
6.5.6.4.1	Buildings and Other Structures.	26
6.5.6.4.2	Low-Rise Buildings.	26
6.5.6.5	Exposure Category for Components and Cladding.	26
6.5.6.6	Velocity Pressure Exposure Coefficient.	26
6.5.7	Topographic Effects.	26
6.5.7.1	Wind Speed-Up over Hills, Ridges, and Escarpments.	26
6.5.7.2	Topographic Factor.	26
6.5.8	Gust Effect Factor.	26
6.5.8.1	Rigid Structures.	26
6.5.8.2	Flexible or Dynamically Sensitive Structures.	26
6.5.8.3	Rational Analysis.	27
6.5.8.4	Limitations.	27
6.5.9	Enclosure Classifications.	27
6.5.9.1	General.	27
6.5.9.2	Openings.	27
6.5.9.3	Wind-Borne Debris.	27
6.5.9.4	Multiple Classifications.	27
6.5.10	Velocity Pressure.	27
6.5.11	Pressure and Force Coefficients.	27
6.5.11.1	Internal Pressure Coefficient.	27
6.5.11.1.1	Reduction Factor for Large Volume Buildings, R_i	27
6.5.11.2	External Pressure Coefficients.	27
6.5.11.2.1	Main Wind-Force Resisting Systems.	27
6.5.11.2.2	Components and Cladding.	27
6.5.11.3	Force Coefficients.	27
6.5.11.4	Roof Overhangs.	27
6.5.11.4.1	Main Wind-Force Resisting System.	27
6.5.11.4.2	Components and Cladding.	27
6.5.11.5	Parapets.	27
6.5.11.5.1	Main Wind-Force Resisting System.	27
6.5.11.5.2	Components and Cladding.	28
6.5.12	Design Wind Loads on Enclosed and Partially Enclosed Buildings.	28
6.5.12.1	General.	28
6.5.12.1.1	Sign Convention.	28
6.5.12.1.2	Critical Load Condition.	28
6.5.12.1.3	Tributary Areas Greater than 700 ft ² (65 m ²).	28
6.5.12.2	Main Wind-Force Resisting Systems.	28
6.5.12.2.1	Rigid Buildings of All Heights.	28
6.5.12.2.2	Low-Rise Building.	28
6.5.12.2.3	Flexible Buildings.	28
6.5.12.2.4	Parapets.	28
6.5.12.3	Design Wind Load Cases.	28

	6.5.12.4	Components and Cladding.	28
	6.5.12.4.1	Low-Rise Buildings and Buildings with $h \leq 60$ ft (18.3 m).	28
	6.5.12.4.2	Buildings with $h > 60$ ft (18.3 m).	29
	6.5.12.4.3	Alternative Design Wind Pressures for Components and Cladding in Buildings with 60 ft (18.3 m) $< h < 90$ ft (27.4 m).	29
	6.5.12.4.4	Parapets.	29
	6.5.13	Design Wind Loads on Open Buildings with Monoslope, Pitched, or Troughed Roofs.	29
	6.5.13.1	General.	29
	6.5.13.1.1	Sign Convention.	29
	6.5.13.1.2	Critical Load Condition.	29
	6.5.13.2	Main Wind-Force Resisting Systems.	29
	6.5.13.3	Component and Cladding Elements.	29
	6.5.14	Design Wind Loads on Solid Freestanding Walls and Solid Signs.	29
	6.5.15	Design Wind Loads on Other Structures.	29
	6.5.15.1	Rooftop Structures and Equipment for Buildings with $h \leq 60$ ft (18.3 m).	30
6.6	Method 3—Wind Tunnel Procedure		30
	6.6.1	Scope.	30
	6.6.2	Test Conditions.	30
	6.6.3	Dynamic Response.	30
	6.6.4	Limitations.	30
	6.6.4.1	Limitations on Wind Speeds.	30
	6.6.5	Wind-Borne Debris.	30
6.7	Consensus Standards and Other Referenced Documents		30
7	Snow Loads		81
	7.1	Symbols and Notation	81
	7.2	Ground Snow Loads, p_g	81
	7.3	Flat Roof Snow Loads, p_f	81
	7.3.1	Exposure Factor, C_e	81
	7.3.2	Thermal Factor, C_t	81
	7.3.3	Importance Factor, I	81
	7.3.4	Minimum Values of p_f for Low-Slope Roofs.	81
	7.4	Sloped Roof Snow Loads, p_s	81
	7.4.1	Warm Roof Slope Factor, C_w	81
	7.4.2	Cold Roof Slope Factor, C_c	82
	7.4.3	Roof Slope Factor for Curved Roofs.	82
	7.4.4	Roof Slope Factor for Multiple Folded Plate, Sawtooth, and Barrel Vault Roofs.	82
	7.4.5	Ice Dams and Icicles Along Eaves.	82
	7.5	Partial Loading	82
	7.5.1	Continuous Beam Systems.	82
	7.5.2	Other Structural Systems.	82
	7.6	Unbalanced Roof Snow Loads	82
	7.6.1	Unbalanced Snow Loads for Hip and Gable Roofs.	82
	7.6.2	Unbalanced Snow Loads for Curved Roofs.	82
	7.6.3	Unbalanced Snow Loads for Multiple Folded Plate, Sawtooth, and Barrel Vault Roofs.	82
	7.6.4	Unbalanced Snow Loads for Dome Roofs.	82
	7.7	Drifts on Lower Roofs (Aerodynamic Shade)	82
	7.7.1	Lower Roof of a Structure.	83
	7.7.2	Adjacent Structures and Terrain Features.	83
	7.8	Roof Projections	83
	7.9	Sliding Snow	83
	7.10	Rain-on-Snow Surcharge Load	83
	7.11	Ponding Instability	83
	7.12	Existing Roofs	83
8	Rain Loads		95
	8.1	Symbols and Notation	95
	8.2	Roof Drainage	95
	8.3	Design Rain Loads	95
	8.4	Ponding Instability	95
	8.5	Controlled Drainage	95
9	Reserved for Future Provisions		97

10	Ice Loads—Atmospheric Icing	99
10.1	General	99
10.1.1	Site-Specific Studies.	99
10.1.2	Dynamic Loads.	99
10.1.3	Exclusions.	99
10.2	Definitions	99
10.3	Symbols and Notation	99
10.4	Ice Loads Due to Freezing Rain	100
10.4.1	Ice Weight.	100
10.4.2	Nominal Ice Thickness.	100
10.4.3	Height Factor.	100
10.4.4	Importance Factors.	100
10.4.5	Topographic Factor.	100
10.4.6	Design Ice Thickness for Freezing Rain.	100
10.5	Wind on Ice-Covered Structures	100
10.5.1	Wind on Ice-Covered Chimneys, Tanks, and Similar Structures.	100
10.5.2	Wind on Ice-Covered Solid Freestanding Walls and Solid Signs.	100
10.5.3	Wind on Ice-Covered Open Signs and Lattice Frameworks.	100
10.5.4	Wind on Ice-Covered Trussed Towers.	100
10.5.5	Wind on Ice-Covered Guys and Cables.	100
10.6	Partial Loading	100
10.7	Design Procedure	101
10.8	Consensus Standards and other Referenced Documents	101
11	Seismic Design Criteria	109
11.1	General	109
11.1.1	Purpose.	109
11.1.2	Scope.	109
11.1.3	Applicability.	109
11.1.4	Alternate Materials and Methods of Construction.	109
11.2	Definitions	109
11.3	Notation	112
11.4	Seismic Ground Motion Values	115
11.4.1	Mapped Acceleration Parameters.	115
11.4.2	Site Class.	115
11.4.3	Site Coefficients and Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameters.	115
11.4.4	Design Spectral Acceleration Parameters.	115
11.4.5	Design Response Spectrum.	115
11.4.6	MCE Response Spectrum.	116
11.4.7	Site-Specific Ground Motion Procedures.	116
11.5	Importance Factor and Occupancy Category	116
11.5.1	Importance Factor.	116
11.5.2	Protected Access for Occupancy Category IV.	116
11.6	Seismic Design Category	116
11.7	Design Requirements for Seismic Design Category A	116
11.7.1	Applicability of Seismic Requirements for Seismic Design Category A Structures.	116
11.7.2	Lateral Forces.	117
11.7.3	Load Path Connections.	117
11.7.4	Connection to Supports.	117
11.7.5	Anchorage of Concrete or Masonry Walls.	117
11.8	Geologic Hazards and Geotechnical Investigation	117
11.8.1	Site Limitation for Seismic Design Categories E and F.	117
11.8.2	Geotechnical Investigation Report for Seismic Design Categories C through F.	117
11.8.3	Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F.	117
12	Seismic Design Requirements for Building Structures	119
12.1	Structural Design Basis	119
12.1.1	Basic Requirements.	119
12.1.2	Member Design, Connection Design, and Deformation Limit.	119
12.1.3	Continuous Load Path and Interconnection.	119
12.1.4	Connection to Supports.	119

	12.1.5	Foundation Design.	119
	12.1.6	Material Design and Detailing Requirements.	119
12.2		Structural System Selection	119
	12.2.1	Selection and Limitations.	119
	12.2.2	Combinations of Framing Systems in Different Directions.	119
	12.2.3	Combinations of Framing Systems in the Same Direction.	119
	12.2.3.1	R , C_d , and Ω_0 Values for Vertical Combinations.	122
	12.2.3.2	R , C_d , and Ω_0 Values for Horizontal Combinations.	123
	12.2.4	Combination Framing Detailing Requirements.	123
	12.2.5	System Specific Requirements.	123
	12.2.5.1	Dual System.	123
	12.2.5.2	Cantilever Column Systems.	123
	12.2.5.3	Inverted Pendulum-Type Structures.	123
	12.2.5.4	Increased Building Height Limit for Steel Braced Frames and Special Reinforced Concrete Shear Walls.	123
	12.2.5.5	Special Moment Frames in Structures Assigned to Seismic Design Categories D through F.	123
	12.2.5.6	Single-Story Steel Ordinary and Intermediate Moment Frames in Structures Assigned to Seismic Design Category D or E.	123
	12.2.5.7	Other Steel Ordinary and Intermediate Moment Frames in Structures Assigned to Seismic Design Category D or E.	123
	12.2.5.8	Single-Story Steel Ordinary and Intermediate Moment Frames in Structures Assigned to Seismic Design Category F.	124
	12.2.5.9	Other Steel Intermediate Moment Frame Limitations in Structures Assigned to Seismic Design Category F.	124
	12.2.5.10	Shear Wall-Frame Interactive Systems.	124
12.3		Diaphragm Flexibility, Configuration Irregularities, and Redundancy	124
	12.3.1	Diaphragm Flexibility.	124
	12.3.1.1	Flexible Diaphragm Condition.	124
	12.3.1.2	Rigid Diaphragm Condition.	124
	12.3.1.3	Calculated Flexible Diaphragm Condition.	124
	12.3.2	Irregular and Regular Classification.	124
	12.3.2.1	Horizontal Irregularity.	124
	12.3.2.2	Vertical Irregularity.	124
	12.3.3	Limitations and Additional Requirements for Systems with Structural Irregularities.	124
	12.3.3.1	Prohibited Horizontal and Vertical Irregularities for Seismic Design Categories D through F.	124
	12.3.3.2	Extreme Weak Stories.	125
	12.3.3.3	Elements Supporting Discontinuous Walls or Frames.	125
	12.3.3.4	Increase in Forces Due to Irregularities for Seismic Design Categories D through F.	125
	12.3.4	Redundancy.	125
	12.3.4.1	Conditions Where Value of ρ is 1.0.	126
	12.3.4.2	Redundancy Factor, ρ , for Seismic Design Categories D through F.	126
12.4		Seismic Load Effects and Combinations	126
	12.4.1	Applicability.	126
	12.4.2	Seismic Load Effect.	126
	12.4.2.1	Horizontal Seismic Load Effect.	126
	12.4.2.2	Vertical Seismic Load Effect.	126
	12.4.2.3	Seismic Load Combinations.	126
	12.4.3	Seismic Load Effect Including Overstrength Factor.	127
	12.4.3.1	Horizontal Seismic Load Effect with Overstrength Factor.	127
	12.4.3.2	Load Combinations with Overstrength Factor.	127
	12.4.3.3	Allowable Stress Increase for Load Combinations with Overstrength.	127
	12.4.4	Minimum Upward Force for Horizontal Cantilevers for Seismic Design Categories D through F.	127
12.5		Direction of Loading	127
	12.5.1	Direction of Loading Criteria.	127
	12.5.2	Seismic Design Category B.	127
	12.5.3	Seismic Design Category C.	127
	12.5.4	Seismic Design Categories D through F.	128
12.6		Analysis Procedure Selection	128
12.7		Modeling Criteria	128
	12.7.1	Foundation Modeling.	128
	12.7.2	Effective Seismic Weight.	128
	12.7.3	Structural Modeling.	128
	12.7.4	Interaction Effects.	129

12.8	Equivalent Lateral Force Procedure	129
12.8.1	Seismic Base Shear.	129
12.8.1.1	Calculation of Seismic Response Coefficient.	129
12.8.1.2	Soil Structure Interaction Reduction.	129
12.8.1.3	Maximum S_s Value in Determination of C_s	129
12.8.2	Period Determination.	129
12.8.2.1	Approximate Fundamental Period.	129
12.8.3	Vertical Distribution of Seismic Forces.	130
12.8.4	Horizontal Distribution of Forces.	130
12.8.4.1	Inherent Torsion.	130
12.8.4.2	Accidental Torsion.	130
12.8.4.3	Amplification of Accidental Torsional Moment.	130
12.8.5	Overturning.	130
12.8.6	Story Drift Determination.	130
12.8.6.1	Minimum Base Shear for Computing Drift.	131
12.8.6.2	Period for Computing Drift.	131
12.8.7	P-Delta Effects.	131
12.9	Modal Response Spectrum Analysis	132
12.9.1	Number of Modes.	132
12.9.2	Modal Response Parameters.	132
12.9.3	Combined Response Parameters.	132
12.9.4	Scaling Design Values of Combined Response.	132
12.9.5	Horizontal Shear Distribution.	132
12.9.6	P-Delta Effects.	132
12.9.7	Soil Structure Interaction Reduction.	132
12.10	Diaphragms, Chords, and Collectors	132
12.10.1	Diaphragm Design.	132
12.10.1.1	Diaphragm Design Forces.	132
12.10.2	Collector Elements.	133
12.10.2.1	Collector Elements Requiring Load Combinations with Overstrength Factor for Seismic Design Categories C through F.	133
12.11	Structural Walls and Their Anchorage	133
12.11.1	Design for Out-of-Plane Forces.	133
12.11.2	Anchorage of Concrete or Masonry Structural Walls.	133
12.11.2.1	Anchorage of Concrete or Masonry Structural Walls to Flexible Diaphragms.	133
12.11.2.2	Additional Requirements for Diaphragms in Structures Assigned to Seismic Design Categories C through F.	133
12.11.2.2.1	Transfer of Anchorage Forces into Diaphragm.	133
12.11.2.2.2	Steel Elements of Structural Wall Anchorage System.	133
12.11.2.2.3	Wood Diaphragms.	133
12.11.2.2.4	Metal Deck Diaphragms.	133
12.11.2.2.5	Embedded Straps.	133
12.11.2.2.6	Eccentrically Loaded Anchorage System.	133
12.11.2.2.7	Walls with Pilasters.	134
12.12	Drift and Deformation	134
12.12.1	Story Drift Limit.	134
12.12.1.1	Moment Frames in Structures Assigned to Seismic Design Categories D through F.	134
12.12.2	Diaphragm Deflection.	134
12.12.3	Building Separation.	134
12.12.4	Deformation Compatibility for Seismic Design Categories D through F.	134
12.13	Foundation Design	134
12.13.1	Design Basis.	134
12.13.2	Materials of Construction.	134
12.13.3	Foundation Load-Deformation Characteristics.	134
12.13.4	Reduction of Foundation Overturning.	134
12.13.5	Requirements for Structures Assigned to Seismic Design Category C.	135
12.13.5.1	Pole-Type Structures.	135
12.13.5.2	Foundation Ties.	135
12.13.5.3	Pile Anchorage Requirements.	135
12.13.6	Requirements for Structures Assigned to Seismic Design Categories D through F.	135
12.13.6.1	Pole-Type Structures.	135
12.13.6.2	Foundation Ties.	135
12.13.6.3	General Pile Design Requirement.	135
12.13.6.4	Batter Piles.	135

	12.13.6.5	Pile Anchorage Requirements.	135
	12.13.6.6	Splices of Pile Segments.	135
	12.13.6.7	Pile Soil Interaction.	135
	12.13.6.8	Pile Group Effects.	135
12.14		Simplified Alternative Structural Design Criteria for Simple Bearing Wall or Building Frame Systems	135
	12.14.1	General.	135
	12.14.1.1	Simplified Design Procedure.	135
	12.14.1.2	Reference Documents.	138
	12.14.1.3	Definitions.	138
	12.14.1.4	Notation.	138
	12.14.2	Design Basis.	138
	12.14.3	Seismic Load Effects and Combinations.	138
	12.14.3.1	Seismic Load Effect.	138
	12.14.3.1.1	Horizontal Seismic Load Effect.	139
	12.14.3.1.2	Vertical Seismic Load Effect.	139
	12.14.3.1.3	Seismic Load Combinations.	139
	12.14.3.2	Seismic Load Effect Including a 2.5 Overstrength Factor.	139
	12.14.3.2.1	Horizontal Seismic Load Effect with a 2.5 Overstrength Factor.	139
	12.14.3.2.2	Load Combinations with Overstrength Factor.	139
	12.14.3.2.3	Allowable Stress Increase for Load Combinations with Overstrength.	139
	12.14.4	Seismic Force-Resisting System.	140
	12.14.4.1	Selection and Limitations.	140
	12.14.4.2	Combinations of Framing Systems.	140
	12.14.4.2.1	Horizontal Combinations.	140
	12.14.4.2.2	Vertical Combinations.	140
	12.14.4.2.3	Combination Framing Detailing Requirements.	140
	12.14.5	Diaphragm Flexibility.	140
	12.14.6	Application of Loading.	140
	12.14.7	Design and Detailing Requirements.	140
	12.14.7.1	Connections.	140
	12.14.7.2	Openings or Reentrant Building Corners.	140
	12.14.7.3	Collector Elements.	140
	12.14.7.4	Diaphragms.	140
	12.14.7.5	Anchorage of Concrete or Masonry Structural Walls.	140
	12.14.7.5.1	Transfer of Anchorage Forces into Diaphragms.	141
	12.14.7.5.2	Wood Diaphragms.	141
	12.14.7.5.3	Metal Deck Diaphragms.	141
	12.14.7.5.4	Embedded Straps.	141
	12.14.7.6	Bearing Walls and Shear Walls.	141
	12.14.7.7	Anchorage of Nonstructural Systems.	141
	12.14.8	Simplified Lateral Force Analysis Procedure.	141
	12.14.8.1	Seismic Base Shear.	141
	12.14.8.2	Vertical Distribution.	141
	12.14.8.3	Horizontal Shear Distribution.	141
	12.14.8.3.1	Flexible Diaphragm Structures.	141
	12.14.8.3.2	Structures with Diaphragms That Are Not Flexible.	141
	12.14.8.3.2.1	Torsion.	142
	12.14.8.4	Overtuning.	142
	12.14.8.5	Drift Limits and Building Separation.	142

13		Seismic Design Requirements for Nonstructural Components	143
	13.1	General	143
	13.1.1	Scope.	143
	13.1.2	Seismic Design Category.	143
	13.1.3	Component Importance Factor.	143
	13.1.4	Exemptions.	143
	13.1.5	Applicability of Nonstructural Component Requirements.	143
	13.1.6	Reference Documents.	143
	13.1.7	Reference Documents Using Allowable Stress Design.	143
	13.2	General Design Requirements	143
	13.2.1	Applicable Requirements for Architectural, Mechanical, and Electrical Components, Supports, and Attachments.	143
	13.2.2	Special Certification Requirements for Designated Seismic Systems.	144

13.2.3	Consequential Damage.	144
13.2.4	Flexibility.	144
13.2.5	Testing Alternative for Seismic Capacity Determination.	144
13.2.6	Experience Data Alternative for Seismic Capacity Determination.	144
13.2.7	Construction Documents.	144
13.3	Seismic Demands on Nonstructural Components	144
13.3.1	Seismic Design Force.	144
13.3.2	Seismic Relative Displacements.	145
13.3.2.1	Displacements within Structures.	145
13.3.2.2	Displacements between Structures.	145
13.4	Nonstructural Component Anchorage	145
13.4.1	Design Forces.	145
13.4.2	Anchors in Concrete or Masonry.	145
13.4.3	Installation Conditions.	146
13.4.4	Multiple Attachments.	146
13.4.5	Power Actuated Fasteners.	146
13.4.6	Friction Clips.	146
13.5	Architectural Components	146
13.5.1	General.	146
13.5.2	Forces and Displacements.	146
13.5.3	Exterior Nonstructural Wall Elements and Connections.	146
13.5.4	Glass.	147
13.5.5	Out-of-Plane Bending.	147
13.5.6	Suspended Ceilings.	147
13.5.6.1	Seismic Forces.	147
13.5.6.2	Industry Standard Construction.	147
13.5.6.2.1	Seismic Design Category C.	147
13.5.6.2.2	Seismic Design Categories D through F.	147
13.5.6.3	Integral Construction.	147
13.5.7	Access Floors.	147
13.5.7.1	General.	147
13.5.7.2	Special Access Floors.	147
13.5.8	Partitions.	148
13.5.8.1	General.	148
13.5.8.2	Glass.	148
13.5.9	Glass in Glazed Curtain Walls, Glazed Storefronts, and Glazed Partitions.	148
13.5.9.1	General.	148
13.5.9.2	Seismic Drift Limits for Glass Components.	148
13.6	Mechanical and Electrical Components	148
13.6.1	General.	148
13.6.2	Component Period.	148
13.6.3	Mechanical Components.	149
13.6.4	Electrical Components.	149
13.6.5	Component Supports.	150
13.6.5.1	Design Basis.	150
13.6.5.2	Design for Relative Displacement.	150
13.6.5.3	Support Attachment to Component.	150
13.6.5.4	Material Detailing Requirements.	150
13.6.5.5	Additional Requirements.	150
13.6.6	Utility and Service Lines.	150
13.6.7	HVAC Ductwork.	150
13.6.8	Piping Systems.	151
13.6.8.1	ASME Pressure Piping Systems.	151
13.6.8.2	Fire Protection Sprinkler Systems in Seismic Design Category C.	151
13.6.8.3	Fire Protection Sprinkler Systems in Seismic Design Categories D through F.	151
13.6.8.4	Other Piping Systems.	151
13.6.9	Boilers and Pressure Vessels.	151
13.6.10	Elevator and Escalator Design Requirements.	151
13.6.10.1	Escalators, Elevators, and Hoistway Structural System.	151
13.6.10.2	Elevator Equipment and Controller Supports and Attachments.	151
13.6.10.3	Seismic Switches.	151
13.6.10.4	Retainer Plates.	152
13.6.11	Other Mechanical and Electrical Components.	152

14	Material-Specific Seismic Design and Detailing Requirements	153
14.0	Scope	153
14.1	Steel	153
14.1.1	Reference Documents.	153
14.1.2	Seismic Design Categories B and C.	153
14.1.3	Seismic Design Categories D through F.	153
14.1.4	Cold-Formed Steel.	153
14.1.4.1	Light-Framed Cold-Formed Construction.	153
14.1.5	Prescriptive Framing.	153
14.1.6	Steel Deck Diaphragms.	153
14.1.7	Steel Cables.	153
14.1.8	Additional Detailing Requirements for Steel Piles in Seismic Design Categories D through F.	153
14.2	Concrete	153
14.2.1	Reference Documents.	153
14.2.2	Modifications to ACI 318.	153
14.2.2.1	ACI 318, Section 7.10.	153
14.2.2.2	ACI 318, Section 10.5.	154
14.2.2.3	ACI 318, Section 11.11.	154
14.2.2.4	Definitions.	154
14.2.2.5	Scope.	154
14.2.2.6	Reinforcement in Members Resisting Earthquake-Induced Forces.	154
14.2.2.7	Anchorage for Unbonded Posttensioning Tendons.	154
14.2.2.8	Flexural Members of Special Moment Frames.	154
14.2.2.9	Wall Piers and Wall Segments.	154
14.2.2.10	Special Precast Structural Walls.	155
14.2.2.11	Foundations.	155
14.2.2.12	Members Not Designated as Part of the Lateral-Force-Resisting System.	155
14.2.2.13	Columns Supporting Reactions from Discontinuous Stiff Members.	155
14.2.2.14	Intermediate Precast Structural Walls.	155
14.2.2.15	Detailed Plain Concrete Shear Walls.	155
14.2.2.16	Plain Concrete in Structures Assigned to Seismic Design Category C, D, E, or F.	155
14.2.2.17	General Requirements for Anchoring to Concrete.	156
14.2.2.18	Strength Requirements for Anchors.	156
14.2.3	Additional Detailing Requirements for Concrete Piles.	156
14.2.3.1	Concrete Pile Requirements for Seismic Design Category C.	156
14.2.3.1.1	Anchorage of Piles.	156
14.2.3.1.2	Reinforcement for Uncased Concrete Piles (SDC C).	156
14.2.3.1.3	Reinforcement for Metal-Cased Concrete Piles (SDC C).	156
14.2.3.1.4	Reinforcement for Concrete-Filled Pipe Piles (SDC C).	156
14.2.3.1.5	Reinforcement for Precast Nonprestressed Concrete Piles (SDC C).	156
14.2.3.1.6	Reinforcement for Precast Prestressed Piles (SDC C).	156
14.2.3.2	Concrete Pile Requirements for Seismic Design Categories D through F.	157
14.2.3.2.1	Site Class E or F Soil.	157
14.2.3.2.2	Nonapplicable ACI 318 Sections for Grade Beam and Piles.	157
14.2.3.2.3	Reinforcement for Uncased Concrete Piles (SDC D through F).	157
14.2.3.2.4	Reinforcement for Metal-Cased Concrete Piles (SDC D through F).	157
14.2.3.2.5	Reinforcement for Precast Concrete Piles (SDC D through F).	157
14.2.3.2.6	Reinforcement for Precast Prestressed Piles (SDC D through F).	157
14.3	Composite Steel and Concrete Structures	158
14.3.1	Reference Documents.	158
14.3.2	Metal-Cased Concrete Piles.	158
14.4	Masonry	158
14.4.1	Reference Documents.	158
14.4.2	<i>R</i> factors.	158
14.4.3	Classification of Shear Walls.	158
14.4.4	Anchorage Forces.	158
14.4.5	Modifications to Chapter 1 of ACI 530/ASCE 5/TMS 402.	158
14.4.5.1	Separation Joints.	158
14.4.5.2	Flanged Shear Walls.	158
14.4.6	Modifications to Chapter 2 of ACI 530/ASCE 5/TMS 402.	158
14.4.6.1	Stress Increase.	158
14.4.6.2	Reinforcement Requirements and Details.	158
14.4.6.2.1	Reinforcing Bar Size Limitations.	158
14.4.6.2.2	Splices.	158
14.4.6.2.3	Maximum Area of Flexural Tensile Reinforcement.	159

14.4.7	Modifications to Chapter 3 of ACI 530/ASCE 5/TMS 402.	159
14.4.7.1	Walls with Factored Axial Stress Greater Than $0.05 f'_m$	159
14.4.7.2	Splices in Reinforcement.	159
14.4.7.3	Coupling Beams.	159
14.4.7.4	Deep Flexural Members.	159
14.4.7.5	Shear Keys.	159
14.4.7.6	Anchoring to Masonry.	160
14.4.7.7	Anchor Bolts.	160
14.4.7.8	Nominal Shear Strength of Headed and Bent-Bar Anchor Bolts.	160
14.4.8	Modifications to Chapter 6 of ACI 530/ASCE 5/ TMS 402.	160
14.4.8.1	Corrugated Sheet Metal Anchors.	160
14.4.9	Modifications to ACI 530.1/ASCE 6/TMS 602.	160
14.4.9.1	Construction Procedures.	160
14.5	Wood	160
14.5.1	Reference Documents.	160
14.5.2	Framing.	160
14.5.3	Modifications to AF&PA SDPWS.	160
14.5.3.1	AF&PA SDPWS, Section 4.3.3.2.	160
15	Seismic Design Requirements for Nonbuilding Structures	161
15.1	General	161
15.1.1	Nonbuilding Structures.	161
15.1.2	Design.	161
15.1.3	Structural Analysis Procedure Selection.	161
15.2	Reference Documents	161
15.3	Nonbuilding Structures Supported by Other Structures	161
15.3.1	Less Than 25 percent Combined Weight Condition.	161
15.3.2	Greater Than or Equal to 25 percent Combined Weight Condition.	161
15.3.3	Architectural, Mechanical, and Electrical Components.	161
15.4	Structural Design Requirements	162
15.4.1	Design Basis.	162
15.4.1.1	Importance Factor.	164
15.4.2	Rigid Nonbuilding Structures.	164
15.4.3	Loads.	164
15.4.4	Fundamental Period.	164
15.4.5	Drift Limitations.	164
15.4.6	Materials Requirements.	164
15.4.7	Deflection Limits and Structure Separation.	164
15.4.8	Site-Specific Response Spectra.	164
15.5	Nonbuilding Structures Similar to Buildings	164
15.5.1	General.	164
15.5.2	Pipe Racks.	164
15.5.2.1	Design Basis.	164
15.5.3	Steel Storage Racks.	164
15.5.3.1	General Requirements.	165
15.5.3.2	Operating Weight.	165
15.5.3.3	Vertical Distribution of Seismic Forces.	165
15.5.3.4	Seismic Displacements.	165
15.5.4	Electrical Power Generating Facilities.	165
15.5.4.1	General.	165
15.5.4.2	Design Basis.	165
15.5.5	Structural Towers for Tanks and Vessels.	165
15.5.5.1	General.	165
15.5.6	Piers and Wharves.	165
15.5.6.1	General.	165
15.5.6.2	Design Basis.	165
15.6	General Requirements for Nonbuilding Structures not Similar to Buildings	165
15.6.1	Earth-Retaining Structures.	165
15.6.2	Stacks and Chimneys.	166
15.6.3	Amusement Structures.	166
15.6.4	Special Hydraulic Structures.	166
15.6.4.1	Design Basis.	166
15.6.5	Secondary Containment Systems.	166
15.6.5.1	Freeboard.	166

15.6.6	Telecommunication Towers.	166
15.7	Tanks and Vessels	166
15.7.1	General.	166
15.7.2	Design Basis.	166
15.7.3	Strength and Ductility.	167
15.7.4	Flexibility of Piping Attachments.	167
15.7.5	Anchorage.	168
15.7.6	Ground-Supported Storage Tanks for Liquids.	168
15.7.6.1	General.	168
15.7.6.1.1	Distribution of Hydrodynamic and Inertia Forces.	169
15.7.6.1.2	Sloshing.	169
15.7.6.1.3	Equipment and Attached Piping.	169
15.7.6.1.4	Internal Components.	169
15.7.6.1.5	Sliding Resistance.	169
15.7.6.1.6	Local Shear Transfer.	169
15.7.6.1.7	Pressure Stability.	170
15.7.6.1.8	Shell Support.	170
15.7.6.1.9	Repair, Alteration, or Reconstruction.	170
15.7.7	Water Storage and Water Treatment Tanks and Vessels.	170
15.7.7.1	Welded Steel.	170
15.7.7.2	Bolted Steel.	170
15.7.7.3	Reinforced and Prestressed Concrete.	170
15.7.8	Petrochemical and Industrial Tanks and Vessels Storing Liquids.	170
15.7.8.1	Welded Steel.	170
15.7.8.2	Bolted Steel.	170
15.7.8.3	Reinforced and Prestressed Concrete.	170
15.7.9	Ground-Supported Storage Tanks for Granular Materials.	170
15.7.9.1	General.	170
15.7.9.2	Lateral Force Determination.	170
15.7.9.3	Force Distribution to Shell and Foundation.	170
15.7.9.3.1	Increased Lateral Pressure.	171
15.7.9.3.2	Effective Mass.	171
15.7.9.3.3	Effective Density.	171
15.7.9.3.4	Lateral Sliding.	171
15.7.9.3.5	Combined Anchorage Systems.	171
15.7.9.4	Welded Steel Structures.	171
15.7.9.5	Bolted Steel Structures.	171
15.7.9.6	Reinforced Concrete Structures.	171
15.7.9.7	Prestressed Concrete Structures.	171
15.7.10	Elevated Tanks and Vessels for Liquids and Granular Materials.	171
15.7.10.1	General.	171
15.7.10.2	Effective Mass.	171
15.7.10.3	P-Delta Effects.	171
15.7.10.4	Transfer of Lateral Forces into Support Tower.	171
15.7.10.5	Evaluation of Structures Sensitive to Buckling Failure.	171
15.7.10.6	Welded Steel Water Storage Structures.	172
15.7.10.7	Concrete Pedestal (Composite) Tanks.	172
15.7.10.7.1	Analysis Procedures.	172
15.7.10.7.2	Structure Period.	172
15.7.11	Boilers and Pressure Vessels.	172
15.7.11.1	General.	172
15.7.11.2	ASME Boilers and Pressure Vessels.	172
15.7.11.3	Attachments of Internal Equipment and Refractory.	172
15.7.11.4	Coupling of Vessel and Support Structure.	172
15.7.11.5	Effective Mass.	172
15.7.11.6	Other Boilers and Pressure Vessels.	172
15.7.11.7	Supports and Attachments for Boilers and Pressure Vessels.	172
15.7.12	Liquid and Gas Spheres.	173
15.7.12.1	General.	173
15.7.12.2	ASME Spheres.	173
15.7.12.3	Attachments of Internal Equipment and Refractory.	173
15.7.12.4	Effective Mass.	173
15.7.12.5	Post and Rod Supported.	173
15.7.12.6	Skirt Supported.	173
15.7.13	Refrigerated Gas Liquid Storage Tanks and Vessels.	173
15.7.13.1	General.	173

15.7.14	Horizontal, Saddle Supported Vessels for Liquid or Vapor Storage.	173
15.7.14.1	General.	173
15.7.14.2	Effective Mass.	173
15.7.14.3	Vessel Design.	173
16	Seismic Response History Procedures	175
16.1	Linear Response History Procedure	175
16.1.1	Analysis Requirements.	175
16.1.2	Modeling.	175
16.1.3	Ground Motion.	175
16.1.3.1	Two-Dimensional Analysis.	175
16.1.3.2	Three-Dimensional Analysis.	175
16.1.4	Response Parameters.	175
16.2	Nonlinear Response History Procedure	175
16.2.1	Analysis Requirements.	175
16.2.2	Modeling.	175
16.2.3	Ground Motion and Other Loading.	176
16.2.4	Response Parameters.	176
16.2.4.1	Member Strength.	176
16.2.4.2	Member Deformation.	176
16.2.4.3	Story Drift.	176
16.2.5	Design Review.	176
17	Seismic Design Requirements for Seismically Isolated Structures	177
17.1	General	177
17.1.1	Variations in Material Properties.	177
17.1.2	Definitions.	177
17.1.3	Notation.	177
17.2	General Design Requirements	178
17.2.1	Importance Factor.	178
17.2.2	MCE Spectral Response Acceleration Parameters, S_{MS} and S_{M1}	178
17.2.3	Configuration.	179
17.2.4	Isolation System.	179
17.2.4.1	Environmental Conditions.	179
17.2.4.2	Wind Forces.	179
17.2.4.3	Fire Resistance.	179
17.2.4.4	Lateral Restoring Force.	179
17.2.4.5	Displacement Restraint.	179
17.2.4.6	Vertical-Load Stability.	179
17.2.4.7	Overturning.	179
17.2.4.8	Inspection and Replacement.	179
17.2.4.9	Quality Control.	179
17.2.5	Structural System.	179
17.2.5.1	Horizontal Distribution of Force.	179
17.2.5.2	Building Separations.	179
17.2.5.3	Nonbuilding Structures.	179
17.2.6	Elements of Structures and Nonstructural Components.	179
17.2.6.1	Components at or above the Isolation Interface.	179
17.2.6.2	Components Crossing the Isolation Interface.	180
17.2.6.3	Components below the Isolation Interface.	180
17.3	Ground Motion for Isolated Systems	180
17.3.1	Design Spectra.	180
17.3.2	Ground Motion Histories.	180
17.4	Analysis Procedure Selection	180
17.4.1	Equivalent Lateral Force Procedure.	180
17.4.2	Dynamic Procedures.	180
17.4.2.1	Response-Spectrum Procedure.	180
17.4.2.2	Response History Procedure.	180
17.5	Equivalent Lateral Force Procedure	180
17.5.1	General.	180
17.5.2	Deformation Characteristics of the Isolation System.	180
17.5.3	Minimum Lateral Displacements.	180
17.5.3.1	Design Displacement.	180

	17.5.3.2	Effective Period at Design Displacement.	181
	17.5.3.3	Maximum Displacement.	181
	17.5.3.4	Effective Period at Maximum Displacement.	181
	17.5.3.5	Total Displacement.	181
	17.5.4	Minimum Lateral Forces.	181
	17.5.4.1	Isolation System and Structural Elements below the Isolation System.	181
	17.5.4.2	Structural Elements above the Isolation System.	182
	17.5.4.3	Limits on V_s	182
	17.5.5	Vertical Distribution of Force.	182
	17.5.6	Drift Limits.	182
17.6		Dynamic Analysis Procedures	182
	17.6.1	General.	182
	17.6.2	Modeling.	182
	17.6.2.1	Isolation System.	182
	17.6.2.2	Isolated Structure.	182
	17.6.2.2.1	Forces and Displacements in Key Elements.	182
	17.6.3	Description of Procedures.	182
	17.6.3.1	General.	182
	17.6.3.2	Input Earthquake.	182
	17.6.3.3	Response Spectrum Procedure.	182
	17.6.3.4	Response History Procedure.	183
	17.6.4	Minimum Lateral Displacements and Forces.	183
	17.6.4.1	Isolation System and Structural Elements below the Isolation System.	183
	17.6.4.2	Structural Elements above the Isolation System.	183
	17.6.4.3	Scaling of Results.	183
	17.6.4.4	Drift Limits.	183
17.7		Design Review	184
17.8		Testing	184
	17.8.1	General.	184
	17.8.2	Prototype Tests.	184
	17.8.2.1	Record.	184
	17.8.2.2	Sequence and Cycles.	184
	17.8.2.3	Units Dependent on Loading Rates.	184
	17.8.2.4	Units Dependent on Bilateral Load.	184
	17.8.2.5	Maximum and Minimum Vertical Load.	184
	17.8.2.6	Sacrificial Wind-Restraint Systems.	184
	17.8.2.7	Testing Similar Units.	184
	17.8.3	Determination of Force-Deflection Characteristics.	185
	17.8.4	Test Specimen Adequacy.	185
	17.8.5	Design Properties of the Isolation System.	185
	17.8.5.1	Maximum and Minimum Effective Stiffness.	185
	17.8.5.2	Effective Damping.	185
18		Seismic Design Requirements for Structures with Damping Systems	187
	18.1	General	187
	18.1.1	Scope.	187
	18.1.2	Definitions.	187
	18.1.3	Notation.	187
	18.2	General Design Requirements	189
	18.2.1	Seismic Design Category A.	189
	18.2.2	System Requirements.	189
	18.2.2.1	Seismic Force-Resisting System.	189
	18.2.2.2	Damping System.	189
	18.2.3	Ground Motion.	189
	18.2.3.1	Design Spectra.	189
	18.2.3.2	Ground Motion Histories.	189
	18.2.4	Procedure Selection.	189
	18.2.4.1	Nonlinear Procedures.	189
	18.2.4.2	Response Spectrum Procedure.	189
	18.2.4.3	Equivalent Lateral Force Procedure.	190
	18.2.5	Damping System.	190
	18.2.5.1	Device Design.	190
	18.2.5.2	Multiaxis Movement.	190

	18.2.5.3	Inspection and Periodic Testing.	190
	18.2.5.4	Quality Control.	190
18.3	Nonlinear Procedures		190
	18.3.1	Nonlinear Response History Procedure.	190
	18.3.1.1	Damping Device Modeling.	190
	18.3.1.2	Response Parameters.	190
	18.3.2	Nonlinear Static Procedure.	191
18.4	Response Spectrum Procedure		191
	18.4.1	Modeling.	191
	18.4.2	Seismic Force–Resisting System.	191
	18.4.2.1	Seismic Base Shear.	191
	18.4.2.2	Modal Base Shear.	191
	18.4.2.3	Modal Participation Factor.	191
	18.4.2.4	Fundamental Mode Seismic Response Coefficient.	191
	18.4.2.5	Effective Fundamental Mode Period Determination.	191
	18.4.2.6	Higher Mode Seismic Response Coefficient.	191
	18.4.2.7	Design Lateral Force.	192
	18.4.3	Damping System.	192
	18.4.3.1	Design Earthquake Floor Deflection.	192
	18.4.3.2	Design Earthquake Roof Displacement.	192
	18.4.3.3	Design Earthquake Story Drift.	192
	18.4.3.4	Design Earthquake Story Velocity.	192
	18.4.3.5	Maximum Earthquake Response.	192
18.5	Equivalent Lateral Force Procedure		192
	18.5.1	Modeling.	192
	18.5.2	Seismic Force–Resisting System.	193
	18.5.2.1	Seismic Base Shear.	193
	18.5.2.2	Fundamental Mode Base Shear.	193
	18.5.2.3	Fundamental Mode Properties.	193
	18.5.2.4	Fundamental Mode Seismic Response Coefficient.	193
	18.5.2.5	Effective Fundamental Mode Period Determination.	193
	18.5.2.6	Residual Mode Base Shear.	193
	18.5.2.7	Residual Mode Properties.	193
	18.5.2.8	Residual Mode Seismic Response Coefficient.	193
	18.5.2.9	Design Lateral Force.	194
	18.5.3	Damping System.	194
	18.5.3.1	Design Earthquake Floor Deflection.	194
	18.5.3.2	Design Earthquake Roof Displacement.	194
	18.5.3.3	Design Earthquake Story Drift.	194
	18.5.3.4	Design Earthquake Story Velocity.	194
	18.5.3.5	Maximum Earthquake Response.	194
18.6	Damped Response Modification		195
	18.6.1	Damping Coefficient.	195
	18.6.2	Effective Damping.	195
	18.6.2.1	Inherent Damping.	195
	18.6.2.2	Hysteretic Damping.	195
	18.6.2.2.1	Hysteresis Loop Adjustment Factor.	195
	18.6.2.3	Viscous Damping.	196
	18.6.3	Effective Ductility Demand.	196
	18.6.4	Maximum Effective Ductility Demand.	196
18.7	Seismic Load Conditions and Acceptance Criteria		196
	18.7.1	Nonlinear Procedures.	196
	18.7.1.1	Seismic Force–Resisting System.	196
	18.7.1.2	Damping Systems.	196
	18.7.1.3	Combination of Load Effects.	196
	18.7.1.4	Acceptance Criteria for the Response Parameters of Interest.	197
	18.7.2	Response Spectrum and Equivalent Lateral Force Procedures.	197
	18.7.2.1	Seismic Force–Resisting System.	197
	18.7.2.2	Damping System.	197
	18.7.2.3	Combination of Load Effects.	197
	18.7.2.4	Modal Damping System Design Forces.	197
	18.7.2.5	Seismic Load Conditions and Combination of Modal Responses.	197
	18.7.2.6	Inelastic Response Limits.	198
18.8	Design Review		198

18.9	Testing	198
18.9.1	Prototype Tests.	198
18.9.1.1	Data Recording.	198
18.9.1.2	Sequence and Cycles of Testing.	198
18.9.1.3	Testing Similar Devices.	199
18.9.1.4	Determination of Force-Velocity-Displacement Characteristics.	199
18.9.1.5	Device Adequacy.	199
18.9.1.5.1	Displacement-Dependent Damping Devices.	199
18.9.1.5.2	Velocity-Dependent Damping Devices.	199
18.9.2	Production Testing.	199
19	Soil Structure Interaction for Seismic Design	201
19.1	General	201
19.2	Equivalent Lateral Force Procedure	201
19.2.1	Base Shear.	201
19.2.1.1	Effective Building Period.	201
19.2.1.2	Effective Damping.	202
19.2.2	Vertical Distribution of Seismic Forces.	202
19.2.3	Other Effects.	202
19.3	Modal Analysis Procedure	203
19.3.1	Modal Base Shears.	203
19.3.2	Other Modal Effects.	203
19.3.3	Design Values.	203
20	Site Classification Procedure for Seismic Design	205
20.1	Site Classification	205
20.2	Site Response Analysis for Site Class F Soil	205
20.3	Site Class Definitions	205
20.3.1	Site Class F.	205
20.3.2	Soft Clay Site Class E.	205
20.3.3	Site Classes C, D, and E.	205
20.3.4	Shear Wave Velocity for Site Class B.	205
20.3.5	Shear Wave Velocity for Site Class A.	205
20.4	Definitions of Site Class Parameters	206
20.4.1	\bar{v}_s , Average Shear Wave Velocity.	206
20.4.2	\bar{N} , Average Field Standard Penetration Resistance and \bar{N}_{ch} , Average Standard Penetration Resistance for Cohesionless Soil Layers.	206
20.4.3	\bar{s}_u , Average Undrained Shear Strength.	206
21	Site-Specific Ground Motion Procedures for Seismic Design	207
21.1	Site Response Analysis	207
21.1.1	Base Ground Motions.	207
21.1.2	Site Condition Modeling.	207
21.1.3	Site Response Analysis and Computed Results.	207
21.2	Ground Motion Hazard Analysis	207
21.2.1	Probabilistic MCE.	207
21.2.2	Deterministic MCE.	207
21.2.3	Site-Specific MCE.	207
21.3	Design Response Spectrum	208
21.4	Design Acceleration Parameters	208
22	Seismic Ground Motion and Long-Period Transition Maps	209
23	Seismic Design Reference Documents	235
23.1	Consensus Standards and Other Reference Documents	235
Appendix 11A	Quality Assurance Provisions	239
11A.1	Quality Assurance	239
11A.1.1	Scope.	239

11A.1.2	Quality Assurance Plan.	239
11A.1.2.1	Details of Quality Assurance Plan.	239
11A.1.2.2	Contractor Responsibility.	239
11A.1.3	Special Inspection and Testing.	239
11A.1.3.1	Foundations.	239
11A.1.3.2	Reinforcing Steel.	240
11A.1.3.2.1	Periodic Special Inspection.	240
11A.1.3.2.2	Continuous Special Inspection.	240
11A.1.3.3	Structural Concrete.	240
11A.1.3.4	Prestressed Concrete.	240
11A.1.3.5	Structural Masonry.	240
11A.1.3.5.1	Periodic Special Inspection.	240
11A.1.3.5.2	Continuous Special Inspection.	240
11A.1.3.6	Structural Steel.	240
11A.1.3.6.1	Continuous Special Inspection.	240
11A.1.3.6.2	Periodic Special Inspection.	240
11A.1.3.7	Structural Wood.	240
11A.1.3.7.1	Continuous Special Inspection.	240
11A.1.3.7.2	Periodic Special Inspection for Components.	240
11A.1.3.7.3	Periodic Special Inspection for Wood Sheathing.	240
11A.1.3.8	Cold-Formed Steel Framing	240
11A.1.3.8.1	Periodic Special Inspection for Welding.	240
11A.1.3.8.2	Periodic Special Inspection for Components.	240
11A.1.3.9	Architectural Components.	240
11A.1.3.10	Mechanical and Electrical Components.	240
11A.1.3.11	Seismic Isolation System.	241
11A.2	Testing	241
11A.2.1	Reinforcing and Prestressing Steel.	241
11A.2.1.1	Certified Mill Test Reports.	241
11A.2.1.2	ASTM A615 Reinforcing Steel.	241
11A.2.1.3	Welding of ASTM A615 Reinforcing Steel.	241
11A.2.2	Structural Concrete.	241
11A.2.3	Structural Masonry.	241
11A.2.4	Structural Steel.	241
11A.2.5	Base Metal Testing.	241
11A.2.6	Seismic-Isolated Structures.	241
11A.2.7	Mechanical and Electrical Equipment.	241
11A.3	Structural Observations	241
11A.4	Reporting and Compliance Procedures	241
Appendix 11B	Existing Building Provisions	243
11B.1	Scope	243
11B.2	Structurally Independent Additions	243
11B.3	Structurally Dependent Additions	243
11B.4	Alterations	243
11B.5	Change of Use	243
Appendix C	Serviceability Considerations	245
C.1	Deflection, Vibration, and Drift	245
C.1.1	Vertical Deflections.	245
C.1.2	Drift of Walls and Frames.	245
C.1.3	Vibrations.	245
C.2	Design for Long-Term Deflection	245
C.3	Camber	245
C.4	Expansion and Contraction	245
C.5	Durability	245
 COMMENTARY		
C1	General	249
C1.1	Scope	249
C1.3	Basic Requirements	249
C1.3.1	Strength.	249

	C1.3.2	Serviceability.	249
	C1.3.3	Self-Straining Forces.	249
C1.4		General Structural Integrity	249
C1.5		Classification of Buildings and Other Structures	251
	C1.5.1	Nature of Occupancy.	251
	C1.5.2	Toxic, Highly Toxic, and Explosive Substances.	252
C1.7		Load Tests	253
		References	253
C2		Combinations of Loads	255
	C2.2	Symbols and Notation	255
	C2.3	Combining Factored Loads Using Strength Design	255
	C2.3.1	Applicability.	255
	C2.3.2	Basic Combinations.	255
	C2.3.3	Load Combinations Including Flood Load.	256
	C2.3.4	Load Combinations Including Atmospheric Ice Loads.	256
	C2.4	Combining Loads Using Allowable Stress Design	256
	C2.4.1	Basic Combinations.	256
	C2.4.2	Load Combinations Including Flood Load.	257
	C2.4.3	Load Combinations Including Atmospheric Ice Loads.	257
	C2.5	Load Combinations for Extraordinary Events	257
		References	258
C3		Dead Loads, Soil Loads, and Hydrostatic Pressure	261
	C3.1.2	Weights of Materials and Constructions	261
	C3.2	Soil Loads and Hydrostatic Pressure	261
	C3.2.1	Lateral Pressures.	261
	C3.2.2	Uplift on Floors and Foundations.	261
		Reference	261
C4		Live Loads	269
	C4.2	Uniformly Distributed Loads	269
	C4.2.1	Required Live Loads.	269
	C4.2.2	Provision for Partitions.	269
	C4.3	Concentrated Loads	270
	C4.4	Loads on Handrails, Guardrail Systems, Grab Bar Systems, Vehicle Barrier Systems, and Fixed Ladders	270
	C4.4.1	Loads on Handrails and Guardrail Systems.	270
	C4.4.2	Loads on Grab Bar Systems.	270
	C4.4.3	Loads on Vehicle Barrier Systems.	270
	C4.4.4	Loads on Fixed Ladders.	270
	C4.6	Partial Loading	270
	C4.7	Impact Loads	270
	C4.8	Reduction in Live Loads	270
	C4.8.1	General.	270
	C4.8.2	Heavy Live Loads.	271
	C4.8.3	Passenger Car Garages.	271
	C4.8.5	Limitations on One-Way Slabs.	271
	C4.9	Reduction in Roof Live Loads	271
	C4.9.1	Flat, Pitched, and Curved Roofs.	271
	C4.9.2	Special Purpose Roofs.	271
	C4.10	Crane Loads	271
		References	271
C5		Flood Loads	275
	C5.1	General	275
	C5.2	Definitions	275
	C5.3	Design Requirements	276
	C5.3.1	Design Loads.	276
	C5.3.2	Erosion and Scour.	276
	C5.3.3	Loads on Breakaway Walls.	276

	C5.4.1	Load Basis.	276
	C5.4.2	Hydrostatic Loads.	276
	C5.4.3	Hydrodynamic Loads.	276
	C5.4.4	Wave Loads.	277
		C5.4.4.2 Breaking Wave Loads on Vertical Walls.	277
	C5.4.5	Impact Loads.	277
	References		279
C6	Wind Loads		281
	C6.1	General	281
		C6.1.4.1 Minimum Design Wind Loading on MWFRS.	281
	C6.2	Definitions	281
	C6.3	Symbols and Notation	282
	C6.4	Method 1—Simplified Procedure	282
	C6.5	Method 2—Analytical Procedure	283
		C6.5.1 Scope.	283
		C6.5.2 Limitations.	284
		C6.5.2.1 Shielding.	284
		C6.5.2.2 Air-Permeable Cladding.	284
		C6.5.4 Basic Wind Speed.	284
		C6.5.4.1 Special Wind Regions.	286
		C6.5.4.2 Estimation of Basic Wind Speeds from Regional Climatic Data.	286
		C6.5.4.3 Limitation.	286
		C6.5.4.4 Wind Directionality Factor.	286
		C6.5.5 Importance Factor.	286
		C6.5.6 Exposure Categories.	287
		C6.5.6.6 Velocity Pressure Exposure Coefficient.	291
		C6.5.7 Topographic Effects.	292
		C6.5.8 Gust Effect Factor.	293
		C6.5.9 Enclosure Classifications.	296
		C6.5.10 Velocity Pressure.	297
		C6.5.11 Pressure and Force Coefficients.	297
		C6.5.11.1 Internal Pressure Coefficients.	300
		C6.5.11.5 Parapets.	301
		C6.5.12 Design Wind Loads on Enclosed and Partially Enclosed Buildings.	301
		C6.5.12.3 Design Wind Load Cases.	302
		C6.5.13 Design Wind Loads on Open Buildings with Monoslope, Pitched, or Troughed Roofs.	302
	C6.6	Method 3—Wind-Tunnel Procedure	302
	References		303
C7	Snow Loads		323
	C7.0	Snow Loads	323
	C7.2	Ground Snow Loads, p_g	323
	C7.3	Flat-Roof Snow Loads, p_f	324
		C7.3.1 Exposure Factor, C_e	325
		C7.3.2 Thermal Factor, C_t	325
		C7.3.3 Importance Factor, I	326
		C7.3.4 Minimum Values of p_f for Low Slope Roofs.	326
	C7.4	Sloped-Roof Snow Loads, p_s	326
		C7.4.3 Roof Slope Factor for Curved Roofs.	327
		C7.4.4 Roof Slope Factor for Multiple Folded Plate, Sawtooth, and Barrel Vault Roofs.	327
		C7.4.5 Ice Dams and Icicles Along Eaves.	327
	C7.5	Unloaded Portions	327
	C7.6	Unbalanced Roof Snow Loads	327
		C7.6.1 Unbalanced Snow Loads on Hip and Gable Roofs.	327
		C7.6.2 Unbalanced Snow Loads for Curved Roofs.	327
		C7.6.3 Unbalanced Snow Loads for Multiple Folded Plate, Sawtooth, and Barrel Vault Roofs.	327
		C7.6.4 Unbalanced Snow Loads for Dome Roofs.	327
	C7.7	Drifts on Lower Roofs (Aerodynamic Shade)	327
	C7.8	Roof Projections	328
	C7.9	Sliding Snow	328
	C7.10	Rain-on-Snow Surcharge Load	329
	C7.11	Ponding Instability	329

C7.12	Existing Roofs	329
C7.13	Other Roofs and Sites	329
	References	331
C8	Rain Loads	337
C8.1	Symbols and Notation	337
C8.2	Roof Drainage	337
C8.3	Design Rain Loads	337
C8.4	Ponding Instability	337
C8.5	Controlled Drainage	337
	References	338
C10	Ice Loads—Atmospheric Icing	343
C10.1	General	343
	C10.1.1 Site-Specific Studies.	343
	C10.1.2 Dynamic Loads.	344
	C10.1.3 Exclusions.	344
C10.2	Definitions	344
C10.4	Ice Loads Due to Freezing Rain	345
	C10.4.1 Ice Weight.	345
	C10.4.2 Nominal Ice Thickness.	345
	C10.4.4 Importance Factors.	345
	C10.4.6 Design Ice Thickness for Freezing Rain.	346
C10.5	Wind on Ice-Covered Structures	346
	C10.5.5 Wind on Ice-Covered Guys and Cables.	346
C10.6	Partial Loading	347
	References	347
C11	Seismic Design Criteria	351
C11	General	351
	C11.1.1 Purpose.	353
C11.7	Design Requirements for Seismic Design Category A.	353
	C11.8.2 Geotechnical Investigation Report for Seismic Design Categories C through F.	353
	C11.8.3 Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F.	353
C12	Seismic Design Requirements for Building Structures	369
	C12.3.3.3 Elements Supporting Discontinuous Walls or Frames.	369
	C12.3.4 Redundancy.	369
	C12.4.3 Seismic Load Effect Including Overstrength Factor.	369
	C12.8.4.1 Inherent Torsion.	369
	C12.11.2.1 Anchorage of Concrete or Masonry Structural Walls to Flexible Diaphragms	369
C13	Seismic Design Requirements for Nonstructural Components	371
C13.0	Seismic Design Requirements for Nonstructural Components	371
	C13.3.2 Seismic Relative Displacements.	371
	C13.5.9 Glass in Glazed Curtain Walls, Glazed Storefronts, and Glazed Partitions.	371
C13.6	Mechanical and Electrical Components	371
C14	Material-Specific Seismic Design and Detailing Requirements	373
C14.2	Concrete	373
	C14.2.3.1.2 Reinforcement for Uncased Concrete Piles (SDC C).	373
	C14.2.3.1.5 Reinforcement for Precast Nonprestressed Concrete Piles (SDC C).	373
	C14.2.3.1.6 Reinforcement for Precast Prestressed Piles (SDC C).	373
	C14.2.3.2.3 Reinforcement for Uncased Concrete Piles (SDC D through F)	373
	C14.2.3.2.5 Reinforcement for Precast Concrete Piles (SDC D through F)	373
	C14.2.3.2.6 Reinforcement for Precast Prestressed Piles (SDC D through F)	373
C14.4	Masonry	373

C15	Seismic Design Requirements for Nonbuilding Structures	375
C15.0	Seismic Design Requirements for Nonbuilding Structures	375
C15.1.3	Structural Analysis Procedure Selection	375
C15.2	Reference Documents	376
C15.4.4	Fundamental Period	377
C15.6.5	Secondary Containment Systems	377
C15.6.6	Telecommunication Towers	377
C15.7	Tanks and Vessels	378
C15.7.2	Design Basis	378
C15.7.6	Ground-Supported Storage Tanks for Liquids	378
C15.7.6.1.4	Internal Components	378
C15.7.8.2	Bolted Steel	378
C19	Soil Structure Interaction for Seismic Design	381
C22	Seismic Ground Motion and Long Period Transition Maps	383
CC.1	Serviceability Considerations	384
CC.1.1	Vertical Deflections	384
CC.1.2	Drift of Walls and Frames	384a
CC.1.3	Vibrations	384a
CC.2	Design for Long-Term Deflection	384a
CC.3	Camber	384b
CC.4	Expansion and Contraction	384b
CC.5	Durability	384b
	References	384b
	Additional References of Interest	384b
Index	385

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.