REVISION RECORD
FOR THE STATE OF CALIFORNIA

ERRATA

January 1, 2026

2025 Title 24, Part 2, Volume 2, California Building Code

General Information:

1. The date of this erratum is for identification purposes only. See the History Note Appendix on the backside or accompanying page.
2. This erratum is issued by the California Building Standards Commission to correct non-substantive printing errors or omissions in the 2025 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2. Instructions are provided below.
3. Health and Safety Code Section 18938.5 establishes that only building standards in effect at the time of the application for a building permit may be applied to the project plans and construction. This rule applies to both adoptions of building standards for Title 24 by the California Building Standards Commission, and local adoptions and ordinances imposing building standards. An erratum to Title 24 is a non-regulatory correction because of a printing error or omission that does not differ substantively from the official adoption by the California Building Standards Commission. Accordingly, the corrected code text provided by this erratum may be applied on and after the stated effective date.
4. You may wish to retain the superseded material with this revision record so that the prior wording of any section can be easily ascertained.

Title 24, Part 2, Volume 2

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CALIFORNIA CODE OF REGULATIONS, TITLE 24

California State Agency Contact List

The following state agencies may propose building standards for buildings, structures and applications under their authority for publication in Title 24. Notice of such proposals may be requested from each agency. See Sections 1.2 through 1.14 of the California Building Code (Part 2, T24) for detailed information on the regulatory authority of most state agencies summarized below. Note [agency acronyms] shown in banners/Matrix Adoption Tables in T24.

Board of State and Community Corrections [BSCC]
bscc.ca.gov — BSCC-Mail@bscc.ca.gov
(916) 445-5073 — *Local Detention Facilities*

Building Standards Commission [BSC, BSC-CG]
dgs.ca.gov/BSC — cbsc@dgs.ca.gov
(916) 263-0916 — *State Buildings including UC & CSU Nonresidential Green Building Standards*

Department of Consumer Affairs Boards/Bureaus:

Acupuncture Board [CA]
acupuncture.ca.gov — AcuPolicy@dca.ca.gov
(916) 515-5200 — *Acupuncture Offices*

Board of Pharmacy [CA]
pharmacy.ca.gov
(916) 518-3100 — *Pharmacies*

Board of Barbering and Cosmetology [CA]
barbercosmo.ca.gov — barbercosmo@dca.ca.gov
(916) 574-7570 — *Barber, Cosmetology & Electrolysis Establishments*

Bureau of Household Goods and Services [CA]
bhgs.dca.ca.gov
(916) 999-2041 — *Insulation Testing*

Structural Pest Control Board [CA]
pestboard.ca.gov — pestboard@dca.ca.gov
(800) 737-8188 — *Structural Pest Control Locations*

Veterinary Medical Board [CA]
vmb.ca.gov — vmb@dca.ca.gov
(916) 515-5220 — *Veterinary Facilities*

Department of Food and Agriculture [AGR]
cdfa.ca.gov
(916) 900-5004 — *Rendering & Collection Centers*
(916) 900-5064 — *Meat & Poultry Packing Plants*
(916) 900-5008 — *Milk & Dairy Food Safety*

Department of Health Care Access and Information
Office of Statewide Hospital Planning and Development
[OSHPD 1, 1R, 2, 3, 4, 5, 6]
hcai.ca.gov — regsunit@hcai.ca.gov
(916) 440-8300 — *Hospital Standards, Skilled Nursing Facility Standards & Clinic Standards*

Department of Public Health [DPH]
cdph.ca.gov (Recreational Health)
(916) 449-5661 — *Food Establishments, Organized Camps, Public Swimming Pools*

Department of Housing and Community Development
[HCD 1, 2, 1-AC]
hcd.ca.gov — Title24@hcd.ca.gov
(800) 952-8356
Option 5 > Option 2 — *State Housing Law: including Housing Accessibility, Hotels/Motels, Apartments/Condominiums, Dormitories, Single-Family Dwellings, ADUs, Permanent Structures in Mobile Home Parks*
Option 5 > Option 4 — *Factory-Built Housing*
Option 5 > Option 5 — *Employee Housing*

Department of Water Resources [DWR]
water.ca.gov — DWRwebcomment@water.ca.gov
(916) 653-5791 — *Plumbing for Recycled Water, Floodplain Construction*

Division of the State Architect
dgs.ca.gov/DSA
(916) 445-8100

Access Compliance [DSA-AC]
(916) 445-5827 — DSAaccess@dgs.ca.gov
Access for Persons with Disabilities

Structural Safety [DSA-SS, DSA-SS/CC]
Public Schools & Community Colleges, State Essential Services Buildings

State Historical Building Safety Board [SHBSB]
(916) 445-7627 — shbsb@dgs.ca.gov
Historical Building Rehabilitation, Preservation, Restoration or Relocation

Energy Commission [CEC]
energy.ca.gov — Title24@energy.ca.gov
(800) 772-3300 — *Building Energy Efficiency, Compliance Manual & Compliance Forms*

Office of the State Fire Marshal [SFM]
osfm.fire.ca.gov — codedevelopment@fire.ca.gov
(916) 568-3800 — *Fire & Life Safety*

State Lands Commission [SLC]
slc.ca.gov — MOTEMS.Public@slc.ca.gov
(510) 741-4950 — *Marine Oil Terminals*

State Librarian [SL]
library.ca.gov — csllaw@library.ca.gov
(916) 323-9843 — *Public Library Construction & Renovation*

How to Distinguish Between Model Code Language and California Amendments

To distinguish between model code language and the incorporated California amendments, including exclusive California standards, California amendments will appear in italics.

***[BSC]** This is an example of a state agency acronym used to identify an adoption or amendment by the agency. The acronyms will appear at California Amendments and in the Matrix Adoption Tables. Sections 1.2 through 1.14 in Chapter 1, Division 1 of this code, explain the used acronyms, the application of state agency adoptions to building occupancies or building features, the enforcement agency as designated by state law (may be the state adopting agency or local building or fire official), the authority in state law for the state agency to make the adoption, and the specific state law being implemented by the agency's adoption. The following acronyms are used in Title 24 to identify the state adopting agency making an adoption.*

Legend of Acronyms of Adopting State Agencies

BSC	*California Building Standards Commission (see Section 1.2)*
BSC-CG	*California Building Standards Commission-CALGreen (see Section 1.2.2)*
BSCC	*Board of State and Community Corrections (see Section 1.3)*
SFM	*Office of the State Fire Marshal (see Section 1.11)*
HCD 1	*Department of Housing and Community Development (see Section 1.8.2.1.1)*
HCD 2	*Department of Housing and Community Development (see Section 1.8.2.1.3)*
HCD 1/AC	*Department of Housing and Community Development (see Section 1.8.2.1.2)*
DSA-AC	*Division of the State Architect-Access Compliance (see Section 1.9.1)*
DSA-SS	*Division of the State Architect-Structural Safety (see Section 1.9.2)*
DSA-SS/CC	*Division of the State Architect-Structural Safety/Community Colleges (see Section 1.9.2.2)*
OSHPD 1	*Office of Statewide Hospital Planning and Development (see Section 1.10.1)*
OSHPD 1R	*Office of Statewide Hospital Planning and Development (see Section 1.10.1)*
OSHPD 2	*Office of Statewide Hospital Planning and Development (see Section 1.10.2)*
OSHPD 3	*Office of Statewide Hospital Planning and Development (see Section 1.10.3)*
OSHPD 4	*Office of Statewide Hospital Planning and Development (see Section 1.10.4)*
OSHPD 5	*Office of Statewide Hospital Planning and Development (see Section 1.10.5)*
OSHPD 6	*Office of Statewide Hospital Planning and Development (see Section 1.10.6)*
DPH	*Department of Public Health (see Section 1.7)*
AGR	*Department of Food and Agriculture (see Section 1.6)*
CEC	*California Energy Commission (see Section 100 in Part 6, the California Energy Code)*
CA	*Department of Consumer Affairs (see Section 1.4):* *Board of Barbering and Cosmetology* *Board of Examiners in Veterinary Medicine* *Board of Pharmacy* *Acupuncture Board* *Bureau of Household Goods & Services* *Structural Pest Control Board (SPCB)*
SL	*State Library (see Section 1.12)*
SLC	*State Lands Commission (see Section 1.14)*
DWR	*Department of Water Resources (see Section 1.13 of Chapter 1 of the California Plumbing Code in Part 5 of Title 24)*

The state agencies are available to answer questions about their adoptions. Contact information is provided on page v of this code.

To learn more about the use of this code, refer to pages vii through ix. Training materials on the application and use of this code are available at the website of the California Building Standards Commission www.dgs.ca.gov/bsc.

MARGINAL MARKINGS

Symbols in the margin indicate the status of code changes as follows:

‖ This symbol indicates that a change has been made to a California amendment.

> This symbol indicates deletion of California amendment language.

| This symbol indicates that a change has been made to International Code Council model language.

➡ This symbol indicates deletion of International Code Council model language.

A single asterisk [*] placed in the margin indicates that text or a table has been relocated within the code. A double asterisk [**] placed in the margin indicates that the text or table immediately following it has been relocated there from elsewhere in the code.

RELOCATION OF TEXT OR TABLES

The following table indicates relocation of sections and tables in the 2024 edition of the IBC from the 2021 edition.

RELOCATIONS	
2024 LOCATION	**2021 LOCATION**
104.2.3	104.11
104.2.3.5	104.11.2
104.2.3.6	104.11.1
104.2.4	104.10
104.2.4.1	104.10.1
104.4	104.6
705.1	705.9
705.11	705.1
1110.6	E105.2
1110.6.1	E105.2.1
1110.6.2	E105.2.2
1110.15	1110.12.2
1110.15.1	1110.12.2.1
1112.6	E107.2
1402.3.1	1403.14
1403.9	1403.10
1404.5	1404.17
1404.5.1	2603.11
1404.5.2	2603.12
1404.5.2.1	2603.12.1
Table 1404.5.2.1	Table 2603.12.1
1404.5.2.2	2603.12.2
Table 1404.5.2.2	Table 2603.12.2
1404.5.3	2603.13
1404.5.3.1	2603.13.1
Table 1404.5.3.1	Table 2603.13.1
1404.5.3.2	2603.13.2
Table 1404.5.3.2	Table 2603.13.2
1607.22	1607.14.3
1607.22.1	1607.14.3.1
1607.22.2	1607.14.3.2
1607.22.3	1607.14.3.3
1607.22.4	1607.14.3.4
1607.22.5	1607.14.3.5
1607.10	1607.17
1607.11	1607.10
1607.17	1607.18
1607.19	1607.20

RELOCATIONS—continued	
2024 LOCATION	**2021 LOCATION**
1607.20	1607.21
1607.21	1607.22
1613.3	1613.2.5.2
2214	2208
2308.7	2308.3
2308.8	2308.4
2308.9	2308.5
2308.10	2308.6
2308.11	2308.7
3301.3	3301.2.1
3301.4	3302.1

ABOUT THE I-CODES

The 2024 I-Codes, published by the ICC, are 15 fully compatible titles intended to establish provisions that adequately protect public health, safety and welfare; that do not unnecessarily increase construction costs; that do not restrict the use of new materials, products or methods of construction; and that do not give preferential treatment to particular types or classes of materials, products or methods of construction.

The I-Codes are updated on a 3-year cycle to allow for new construction methods and technologies to be incorporated into the codes. Alternative materials, designs and methods not specifically addressed in the I-Code can be approved by the building official where the proposed materials, designs or methods comply with the intent of the provisions of the code.

The I-Codes are used as the basis of laws and regulations in communities across the US and in other countries. They are also used in a variety of nonregulatory settings, including:

- Voluntary compliance programs.
- The insurance industry.
- Certification and credentialing for building design, construction and safety professionals.
- Certification of building and construction-related products.
- Facilities management.
- “Best practices” benchmarks for designers and builders.
- College, university and professional school textbooks and curricula.
- Reference works related to building design and construction.

Code Development Process

The code development process regularly provides an international forum for building professionals to discuss requirements for building design, construction methods, safety, performance, technological advances and new products. Proposed changes to the I-Codes, submitted by code enforcement officials, industry representatives, design professionals and other interested parties are deliberated through an open code development process in which all interested and affected parties may participate.

Openness, transparency, balance, due process and consensus are the guiding principles of both the ICC Code Development Process and OMB Circular A-119, which governs the federal government’s use of private-sector standards. The ICC process is open to anyone without cost. Remote participation is available through cdpAccess®, the ICC’s cloud-based app.

In order to ensure that organizations with a direct and material interest in the codes have a voice in the process, the ICC has developed partnerships with key industry segments that support the ICC’s important public safety mission. Some code development committee members were nominated by the following industry partners and approved by the ICC Board:

- American Gas Association (AGA)
- American Institute of Architects (AIA)
- American Society of Plumbing Engineers (ASPE)
- International Association of Fire Chiefs (IAFC)
- National Association of Home Builders (NAHB)
- National Association of State Fire Marshals (NASFM)
- National Council of Structural Engineers Association (NCSEA)
- National Multifamily Housing Council (NMHC)
- Plumbing Heating and Cooling Contractors (PHCC)
- Pool and Hot Tub Alliance (PHTA), formerly The Association of Pool and Spa Professionals (APSP)

CONTENTS

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 16 – STRUCTURAL DESIGN

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter				**X**	**X**								**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)	**X**								**X**		**X**	**X**			**X**									
Adopt only those sections that are listed below						**X**	**X**																**X**	
Chapter / Section																								
1601.1.1									X		X	X			X									
1601.1.2									X		X	X			X									
1601.1.3									X		X	X			X									
1601.1.4									X															
1601.1.5									X		X	X			X									
1601.2									X		X	X			X									
1603.1											X	X			X									
Table 1604.5												X			X									
1605.2											X	X			X									
Table 1607.1											X	X			X									
1607.9						X																		
1607.9.2						X	X																	
1607.12.4	X																							
1607.22.5											X	X			X									
1612.3.2											X	X			X									
1613.1											X	X			X									
1613.1.1																							X	
1613.1.2	X																							
1613.1.3	X																							
1613.2											X	X			X									
1613.4											X	X			X									
1613.7											X	X			X									
1617									X															

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

2. Seismic importance factor, I_e.
3. Spectral response acceleration parameters, S_S and S_1.
4. Site class.
5. Design spectral response acceleration parameters, S_{DS} and S_{D1}.
6. Seismic design category.
7. Basic seismic force-resisting system(s).
8. Design base shear(s).
9. Seismic response coefficient(s), C_s.
10. Response modification coefficient(s), R.
11. Analysis procedure used.

1603.1.6 Geotechnical information. The design load-bearing values of soils shall be shown on the construction documents.

1603.1.7 Flood design data. For buildings located in whole or in part in flood hazard areas as established in Section 1612.3, the documentation pertaining to design, if required in Section 1612.4, shall be included and the following information, referenced to the datum on the community's Flood Insurance Rate Map (FIRM), shall be shown, regardless of whether flood loads govern the design of the building:

1. Flood design class assigned according to ASCE 24.
2. In flood hazard areas other than coastal high hazard areas or coastal A zones, the elevation of the proposed lowest floor, including the basement.
3. In flood hazard areas other than coastal high hazard areas or coastal A zones, the elevation to which any nonresidential building will be dry floodproofed.
4. In coastal high hazard areas and coastal A zones, the proposed elevation of the bottom of the lowest horizontal structural member of the lowest floor, including the basement.

1603.1.8 Special loads. Special loads that are applicable to the design of the building, structure or portions thereof, including but not limited to the loads of machinery or equipment, and that are greater than specified floor and roof loads shall be specified by their descriptions and locations.

1603.1.8.1 Photovoltaic panel systems. The dead load of rooftop-mounted photovoltaic panel systems, including rack support systems, shall be indicated on the construction documents.

1603.1.9 Roof rain load data. Design rainfall intensity, i (in/hr) (cm/hr), and roof drain, scupper and overflow locations shall be shown regardless of whether rain loads govern the design.

SECTION 1604—GENERAL DESIGN REQUIREMENTS

1604.1 General. Building, structures and parts thereof shall be designed and constructed in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable material chapters and referenced standards.

1604.2 Strength. Buildings and other structures, and parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this code without exceeding the appropriate specified allowable stresses for the materials of construction.

Loads and forces for occupancies or uses not covered in this chapter shall be subject to the approval of the building official.

1604.3 Serviceability. Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections as indicated in Table 1604.3.

TABLE 1604.3—DEFLECTION LIMITS[a, b, c, h, i]

CONSTRUCTION	L or L_r	S^{j} or W^{f}	$D + L^{d, g}$
Roof members:[e]			
Supporting plaster or stucco ceiling	$l/360$	$l/360$	$l/240$
Supporting nonplaster ceiling	$l/240$	$l/240$	$l/180$
Not supporting ceiling	$l/180$	$l/180$	$l/120$
Floor members	$l/360$	—	$l/240$
Exterior walls:			
With plaster or stucco finishes	—	$l/360$	—
With other brittle finishes	—	$l/240$	—
With flexible finishes	—	$l/120$	—
Interior partitions:[b]			
With plaster or stucco finishes	$l/360$	—	—
With other brittle finishes	$l/240$	—	—

TABLE 1604.3—DEFLECTION LIMITS[a, b, c, h, i]—continued			
CONSTRUCTION	L or L_r	S^{j} or W^{f}	$D + L^{d, g}$
With flexible finishes	$l/120$	—	—
Farm buildings	—	—	$l/180$
Greenhouses	—	—	$l/120$

For SI: 1 foot = 304.8 mm.

a. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed $l/60$. For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed $l/150$. For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed $l/90$. For roofs, this exception only applies when the metal sheets have no roof covering.

b. Flexible, folding and portable partitions are not governed by the provisions of this section. The deflection criterion for interior partitions is based on the horizontal load defined in Section 1607.16.

c. See Section 2403 for glass supports.

d. The deflection limit for the $D + (L$ or $L_r)$ load combination only applies to the deflection due to the creep component of long-term dead load deflection plus the short-term live load deflection. For lumber, structural glued laminated timber, prefabricated wood I-joists and structural composite lumber members that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection shall be permitted to be estimated as the immediate dead load deflection resulting from $0.5D$. For lumber and glued laminated timber members installed or used at all other moisture conditions or cross laminated timber and wood structural panels that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection is permitted to be estimated as the immediate dead load deflection resulting from D. The value of $0.5D$ shall not be used in combination with ANSI/AWC NDS provisions for long-term loading.

e. The preceding deflections do not ensure against ponding. Roofs that do not have sufficient slope or camber to ensure adequate drainage shall be investigated for ponding. See Chapter 8 of ASCE 7.

f. The wind load shall be permitted to be taken as 0.42 times the "component and cladding" loads or directly calculated using the 10-year mean return interval basic wind speed, V, for the purpose of determining deflection limits in Table 1604.3. Where framing members support glass, the deflection limit therein shall not exceed that specified in Section 1604.3.7

g. For steel structural members, the deflection due to creep component of long-term dead load shall be permitted to be taken as zero.

h. For aluminum structural members or aluminum panels used in skylights and sloped glazing framing, roofs or walls of sunroom additions or patio covers not supporting edge of glass or aluminum sandwich panels, the total load deflection shall not exceed $l/60$. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed $l/175$ for each glass lite or $l/60$ for the entire length of the member, whichever is more stringent. For aluminum sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed $l/120$.

i. l = Length of the member between supports. For cantilever members, l shall be taken as twice the length of the cantilever.

j. The snow load shall be permitted to be taken as 0.7 times the design snow load determined in accordance with Section 1608.1 for the purpose of determining deflection limits in Table 1604.3.

1604.3.1 Deflections. The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604.3.2 through 1604.3.5 or that permitted by Table 1604.3.

1604.3.2 Reinforced concrete. The deflection of reinforced concrete structural members shall not exceed that permitted by ACI 318.

1604.3.3 Steel. The deflection of steel structural members shall not exceed that permitted by AISC 360, AISI S100, ASCE 8, SJI 100 or SJI 200, as applicable.

1604.3.4 Masonry. The deflection of masonry structural members shall not exceed that permitted by TMS 402.

1604.3.5 Aluminum. The deflection of aluminum structural members shall not exceed that permitted by AA ADM.

1604.3.6 Limits. The deflection limits of Section 1604.3.1 shall be used unless more restrictive deflection limits are required by a referenced standard for the element or finish material.

1604.3.7 Framing supporting glass. The deflection of framing members supporting glass subjected to 0.6 times the "component and cladding" wind loads shall not exceed either of the following:

1. $^{1}/_{175}$ of the length of span of the framing member, for framing members having a length not more than 13 feet 6 inches (4115 mm).
2. $^{1}/_{240}$ of the length of span of the framing member + $^{1}/_{4}$ inch (6.4 mm), for framing members having a length greater than 13 feet 6 inches (4115 mm).

1604.4 Analysis. Load effects on structural members and their connections shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties.

Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the effects of added deformations expected to occur during their service life.

Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring loads from their point of origin to the load-resisting elements.

The total lateral force shall be distributed to the various vertical elements of the lateral force-resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements assumed not to be a part of the lateral force-resisting system are permitted to be incorporated into buildings provided that their effect on the action of the system is considered and provided for in the design. Where a diaphragm is not permitted to be idealized as either flexible or rigid in accordance with ASCE 7 or for wood diaphragms in accordance with AWC SDPWS, the structure shall be analyzed and designed utilizing one of the following procedures:

1. An envelope analysis of the structure using a flexible and rigid diaphragm analysis separately and designing each component for the more severe load condition.
2. A semirigid diaphragm analysis and design.

Where required by ASCE 7, provisions shall be made for the increased forces induced on resisting elements of the structural system resulting from torsion due to eccentricity between the center of application of the lateral forces and the center of rigidity of the lateral force-resisting system.

Every structure shall be designed to resist the effects caused by the forces specified in this chapter, including overturning, uplift and sliding. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force.

1604.5 Risk category. Each building and structure shall be assigned a risk category in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a risk category be in accordance with ASCE 7, Table 1.5-1, Table 1604.5 shall be used in lieu of ASCE 7, Table 1.5-1.

Exceptions:

1. The assignment of buildings and structures to Tsunami Risk Categories III and IV is permitted to be in accordance with Section 6.4 of ASCE 7.
2. Freestanding parking garages not used for the storage of emergency services vehicles or not providing means of egress for buildings or structures assigned to a higher risk category shall be assigned to Risk Category II.

TABLE 1604.5—RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	• ***[OSHPD 2]*** *Skilled nursing facilities, intermediate care facilities, Group I-2 occupancy with 50 or more care recipients.*
	• ***[OSHPD 5]*** *Acute psychiatric hospitals, Group I-2 occupancy with 50 or more care recipients.*
	• Group I-3, Condition 1 occupancies.
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *California Fire Code*; and
	  • Are sufficient to pose a threat to the public if released.[b]

IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to:
	• Group I-2 occupancies. ***[OSHPD 2 & 5]*** *Not adopted by OSHPD.*
	• Ambulatory care facilities having emergency surgery or emergency treatment facilities.
	• Group I-3 occupancies other than Condition 1.
	• Fire, rescue, ambulance and police stations and emergency vehicle garages
	• Designated earthquake, hurricane or other emergency shelters.
	• Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
	• Public utility facilities providing power generation, potable water treatment, or wastewater treatment.
	• Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.
	• Buildings and other structures containing quantities of highly toxic materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *California Fire Code*; and
	  • Are sufficient to pose a threat to the public if released.[b]
	• Aviation control towers, air traffic control centers and emergency aircraft hangars.
	• Buildings and other structures having critical national defense functions.
	• Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

1604.5.1 Multiple occupancies. Where a building or structure is occupied by two or more occupancies not included in the same risk category, it shall be assigned the classification of the highest risk category corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified.

Where a separated portion of a building or structure provides required access to, required egress from or shares life safety systems, designated seismic systems, emergency power systems, or emergency and egress lighting systems with another portion having a higher risk category, or provides required electrical, communications, mechanical, plumbing or conveying support to another portion assigned to Risk Category IV, both portions shall be assigned to the higher risk category.

Exception: Where a storm shelter designed and constructed in accordance with ICC 500 is provided in a building, structure or portion thereof normally occupied for other purposes, the risk category for the normal occupancy of the building shall apply unless the storm shelter is a designated emergency shelter in accordance with Table 1604.5.

1604.5.2 Photovoltaic (PV) panel systems. Photovoltaic (PV) panel systems and elevated PV support structures shall be assigned a risk category as follows:

1. Ground-mounted PV panel systems serving only Group R-3 buildings shall be assigned to Risk Category I.
2. Ground-mounted PV panel systems other than those described in Items 1 and 5 shall be assigned to Risk Category II.
3. Elevated PV support structures other than those described in Items 4, 5 and 6 shall be assigned to Risk Category II.
4. Rooftop-mounted PV panel systems and elevated PV support structures installed on top of buildings shall be assigned to the same risk category as the risk category of the building on which they are mounted.
5. PV panel systems and elevated PV support structures paired with energy storage systems (ESS) and serving as a dedicated, stand-alone source of backup power for Risk Category IV buildings shall be assigned to Risk Category IV.
6. Elevated PV support structures where the usable space underneath is used for parking of emergency vehicles shall be assigned to Risk Category IV.

1604.6 In-situ load tests. The building official is authorized to require an engineering analysis or a load test, or both, of any construction whenever there is reason to question the safety of the construction for the intended occupancy. Engineering analysis and load tests shall be conducted in accordance with Section 1708.

1604.7 Preconstruction load tests. Materials and methods of construction that are not capable of being designed by approved engineering analysis or that do not comply with the applicable referenced standards, or alternative test procedures in accordance with Section 1707, shall be load tested in accordance with Section 1709.

1604.8 Anchorage. Buildings and other structures, and portions thereof, shall be provided with anchorage in accordance with Sections 1604.8.1 through 1604.8.3, as applicable.

1604.8.1 General. Anchorage of the roof to walls and columns, and of walls and columns to foundations, shall be provided to resist the uplift and sliding forces that result from the application of the prescribed loads.

1604.8.2 Structural walls. Walls that provide vertical load-bearing resistance or lateral shear resistance for a portion of the structure shall be anchored to the roof and to all floors and members that provide lateral support for the wall or that are supported by the wall. The connections shall be capable of resisting the horizontal forces that result from the application of the prescribed loads. The required earthquake out-of-plane loads are specified in Section 1.4.4 of ASCE 7 for walls of structures assigned to Seismic Design Category A and to Section 12.11 of ASCE 7 for walls of structures assigned to all other seismic design categories. Required anchors in masonry walls of hollow units or cavity walls shall be embedded in a reinforced grouted structural element of the wall. See Sections 1609 for wind design requirements and 1613 for earthquake design requirements.

1604.8.3 Decks. Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. Connections of decks with cantilevered framing members to exterior walls or other framing members shall be designed for both of the following:

1. The reactions resulting from the dead load and live load specified in Table 1607.1, or the snow load specified in Section 1608, in accordance with Section 1605, acting on all portions of the deck.
2. The reactions resulting from the dead load and live load specified in Table 1607.1, or the snow load specified in Section 1608, in accordance with Section 1605, acting on the cantilevered portion of the deck, and no live load or snow load on the remaining portion of the deck.

1604.9 Wind and seismic detailing. Lateral force-resisting systems shall meet seismic detailing requirements and limitations prescribed in this code and ASCE 7 Chapters 11, 12, 13, 15, 17 and 18 as applicable, even where wind load effects are greater than seismic load effects.

Exception: References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.

1604.10 Loads on storm shelters. Loads and load combinations on storm shelters shall be determined in accordance with ICC 500.

SECTION 1605—LOAD COMBINATIONS

1605.1 General. Buildings and other structures and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3, the allowable stress design load combinations specified in ASCE 7, Section 2.4, or the alternative allowable stress design load combinations of Section 1605.2.

Exceptions:

1. The modifications to load combinations of ASCE 7, Section 2.3, ASCE 7, Section 2.4 and Section 1605.2 specified in ASCE 7 Chapters 18 and 19 shall apply.

Equation 16-7 $$L = L_o\left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}}\right)$$

For SI: $$L = L_o\left(0.25 + \frac{4.57}{\sqrt{K_{LL}A_T}}\right)$$

where:

L = Reduced design live load per square foot (m^2) of area supported by the member.

L_o = Unreduced design live load per square foot (m^2) of area supported by the member (see Table 1607.1).

K_{LL}= Live load element factor (see Table 1607.13.1).

A_T = Tributary area, in square feet (m^2).

L shall be not less than $0.50L_o$ for members supporting one floor and L shall be not less than $0.40L_o$ for members supporting two or more floors.

TABLE 1607.13.1—LIVE LOAD ELEMENT FACTOR, K_{LL}

ELEMENT	K_{LL}
Interior columns	4
Exterior columns without cantilever slabs	4
Edge columns with cantilever slabs	3
Corner columns with cantilever slabs	2
Edge beams without cantilever slabs	2
Interior beams	2
Members not previously identified including:	1
Edge beams with cantilever slabs	
Cantilever beams	
One-way slabs	
Two-way slabs	
Members without provisions for continuous shear transfer normal to their span	

1607.13.1.1 One-way slabs. The tributary area, A_T, for use in Equation 16-7 for one-way slabs shall not exceed an area defined by the slab span times a width normal to the span of 1.5 times the slab span.

1607.13.1.2 Heavy live loads. Live loads that exceed 100 psf (4.79 kN/m^2) shall not be reduced.

Exceptions:

1. The live loads for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced live load shall be not less than L as calculated in Section 1607.13.1.
2. For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the registered design professional that a rational approach has been used and that such reductions are warranted.

1607.13.1.3 Passenger vehicle garages. The live loads shall not be reduced in passenger vehicle garages.

Exception: The live loads for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced live load shall be not less than L as calculated in Section 1607.13.1.

1607.13.2 Alternative uniform live load reduction. As an alternative to Section 1607.13.1 and subject to the limitations of Table 1607.1, uniformly distributed live loads are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. For live loads not exceeding 100 pounds per square foot (4.79 kN/m^2), the design live load for structural members supporting 150 square feet (13.94 m^2) or more is permitted to be reduced in accordance with Equation 16-8.

Equation 16-8 $R = 0.08(A - 150)$

For SI: $R = 0.861(A - 13.94)$

where:

A = Area of floor supported by the member, square feet (m^2).

R = Reduction in percent. Such reduction shall not exceed the smallest of:

1.1. 40 percent for members supporting one floor.

1.2. 60 percent for members supporting two or more floors.

1.3. R as determined by the following equation:

Equation 16-9 $R = 23.1(1+ D/L_o)$

where:

D = *Dead load* per square foot (m²) of area supported.

L_o = Unreduced live load per square foot (m²) of area supported.

2. A reduction shall not be permitted where the live load exceeds 100 pounds per square foot (4.79 kN/m²) except that the design live load for members supporting two or more floors is permitted to be reduced by not greater than 20 percent.

   Exception: For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the registered design professional that a rational approach has been used and that such reductions are warranted.

3. A reduction shall not be permitted in passenger vehicle parking garages except that the live loads for members supporting two or more floors are permitted to be reduced by not greater than 20 percent.

4. For one-way slabs, the area, A, for use in Equation 16-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

1607.14 Reduction in uniform roof live loads. The minimum uniformly distributed live loads of roofs, marquees and canopies, L_o, in Table 1607.1 are permitted to be reduced in accordance with Section 1607.14.1.

1607.14.1 Ordinary roofs, awnings and canopies. Ordinary flat, pitched and curved roofs, and awnings and canopies other than of fabric construction supported by a skeleton structure, are permitted to be designed for a reduced uniformly distributed roof live load, L_r, as specified in the following equations or other controlling combinations of loads as specified in Section 1605, whichever produces the greater load effect.

In structures such as greenhouses, where special scaffolding is used as a work surface for workers and materials during maintenance and repair operations, a lower roof load than specified in the following equations shall not be used unless approved by the building official. Such structures shall be designed for a minimum roof live load of 12 psf (0.58 kN/m²).

Equation 16-10 $L_r = L_o R_1 R_2$

where: $12 \le L_r \le 20$

For SI: $L_r = L_o R_1 R_2$

where: $0.58 \le L_r \le 0.96$

L_o = Unreduced roof live load per square foot (m²) of horizontal projection supported by the member (see Table 1607.1).

L_r = Reduced roof live load per square foot (m²) of horizontal projection supported by the member.

The reduction factors R_1 and R_2 shall be determined as follows:

Equation 16-11 $R_1 = 1$ for $A_t \le 200$ square feet (18.58 m²)

Equation 16-12 $R_1 = 1.2 - 0.001A_t$ for 200 square feet $< A_t <$ 600 square feet

Equation 16-13 $R_1 = 0.6$ for $A_t \ge 600$ square feet (55.74 m²)

where:

A_t = Tributary area (span length multiplied by effective width) in square feet (m²) supported by the member, and

Equation 16-14 $R_2 = 1$ for $F \le 4$

Equation 16-15 $R_2 = 1.2 - 0.05F$ for $4 < F < 12$

Equation 16-16 $R_2 = 0.6$ for $F \ge 12$

where:

F = For a sloped roof, the number of inches of rise per foot (for SI: $F = 0.12 \times$ slope, with slope expressed as a percentage), or for an arch or dome, the rise-to-span ratio multiplied by 32.

1607.14.2 Occupiable roofs. Areas of roofs that are occupiable, such as vegetative roofs, landscaped roofs or for assembly or other similar purposes, and marquees are permitted to have their uniformly distributed live loads reduced in accordance with Section 1607.13.

*

1607.15 Crane loads. The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall be in accordance with Section 4.9 of ASCE 7.

1607.16 Interior walls and partitions. Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m²).

1607.16.1 Fabric partitions. Fabric partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the following load conditions:

1. The horizontal distributed load need only be applied to the partition framing. The total area used to determine the distributed load shall be the area of the fabric face between the framing members to which the fabric is attached. The total distributed load shall be uniformly applied to such framing members in proportion to the length of each member.

2. A concentrated load of 40 pounds (0.176 kN) applied to an 8-inch-diameter (203 mm) area [50.3 square inches (32 452 mm^2)] of the fabric face at a height of 54 inches (1372 mm) above the floor.

1607.16.2 Fire walls. In order to meet the structural stability requirements of Section 706.2 where the structure on either side of the wall has collapsed, fire walls and their supports shall be designed to withstand a minimum horizontal allowable stress load of 5 psf (0.240 kN/m^2).

1607.17 Library stack rooms. The live loading indicated in Table 1607.1 for library stack rooms applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:

1. The nominal book stack unit height shall not exceed 90 inches (2290 mm).
2. The nominal shelf depth shall not exceed 12 inches (305 mm) for each face.
3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches (914 mm) in width.

1607.18 Seating for assembly uses. Bleachers, folding and telescopic seating and grandstands shall be designed for the loads specified in ICC 300. Stadiums and arenas with fixed seats shall be designed for the horizontal sway loads in Section 1607.18.1.

1607.18.1 Horizontal sway loads. The design of stadiums and arenas with fixed seats shall include horizontal swaying forces applied to each row of seats as follows:

1. 24 pounds per linear foot (0.35 kN/m) of seat applied in a direction parallel to each row of seats.
2. 10 pounds per linear foot (0.15 kN/m) of seat applied in a direction perpendicular to each row of seats.

The parallel and perpendicular horizontal swaying forces are not required to be applied simultaneously.

1607.19 Sidewalks, vehicular driveways, and yards subject to trucking. The live loading indicated in Table 1607.1 for sidewalks, vehicular driveways, and yards subject to trucking shall comply with the requirements of this section.

1607.19.1 Uniform loads. In addition to the loads indicated in Table 1607.1, other uniform loads in accordance with an approved method that contains provisions for truck loading shall be considered where appropriate.

1607.19.2 Concentrated loads. The concentrated wheel *load* indicated in Table 1607.1 shall be applied on an area of $4^1/_2$ inches by $4^1/_2$ inches (114 mm by 114 mm).

1607.20 Stair treads. The concentrated load indicated in Table 1607.1 for stair treads shall be applied on an area of 2 inches by 2 inches (51 mm by 51 mm). This load need not be assumed to act concurrently with the uniform load.

1607.21 Residential attics. The live loads indicated in Table 1607.1 for attics in residential occupancies shall comply with the requirements of this section.

1607.21.1 Uninhabitable attics without storage. In residential occupancies, uninhabitable attic areas without storage are those where the maximum clear height between the joists and rafters is less than 42 inches (1067 mm), or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The live load in Table 1607.1 need not be assumed to act concurrently with any other live load requirement.

1607.21.2 Uninhabitable attics with storage. In residential occupancies, uninhabitable attic areas with storage are those where the maximum clear height between the joist and rafter is 42 inches (1067 mm) or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The live load in Table 1607.1 need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches (508 mm) in width by 30 inches (762 mm) in length that is located where the clear height in the attic is not less than 30 inches (762 mm).
2. The slope of the joists or truss bottom chords is not greater than 2 units vertical in 12 units horizontal.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot (0.48 kN/m^2).

1607.21.3 Attics served by stairs. Attic spaces served by stairways other than the pull-down type shall be designed to support the minimum live load specified for habitable attics and sleeping rooms.

1607.22 Photovoltaic panel systems. Roof structures that provide support for photovoltaic panel systems shall be designed in accordance with Sections 1607.22.1 through 1607.22.5, as applicable. **

1607.22.1 Roof live load. Roof structures that support photovoltaic panel systems shall be designed to resist each of the following conditions:

1. Applicable uniform and concentrated roof loads with the photovoltaic panel system dead loads.

   Exception: Roof live loads need not be applied to the area covered by photovoltaic panels where the clear space between the panels and the roof surface is 24 inches (610 mm) or less.
2. Applicable uniform and concentrated roof loads without the photovoltaic panel system present.

1607.22.2 Photovoltaic panels or modules. The structure of a roof that supports solar photovoltaic panels or modules shall be designed to accommodate the full solar photovoltaic panels or modules and ballast dead load, including concentrated loads from support frames in combination with the loads from Section 1607.22.1 and other applicable loads. Where applicable, snow drift loads created by the photovoltaic panels or modules shall be included.

1607.22.3 Elevated photovoltaic (PV) support structures with open grid framing. Elevated photovoltaic (PV) support structures with open grid framing and without a roof deck or sheathing shall be designed to support the uniform and concentrated roof live loads specified in Section 1607.22.1, except that the uniform roof live load shall be permitted to be reduced to 12 psf (0.57 kN/m^2).

1607.22.4 Ground-mounted photovoltaic (PV) panel systems. Ground-mounted photovoltaic (PV) panel systems are not required to accommodate a roof live load. Other loads and combinations in accordance with Section 1605 shall be accommodated.

1607.22.5 Ballasted photovoltaic panel systems. Roof structures that provide support for ballasted photovoltaic panel systems shall be designed, or analyzed, in accordance with Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding. ***[OSHPD 1R, 2 & 5]*** *Ballasted photovoltaic panel systems shall be considered as an alternative system.*

SECTION 1608—SNOW LOADS

1608.1 General. Design snow loads shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof load shall be not less than that determined by Section 1607.

Exception: Temporary structures complying with Section 3103.6.1.1.

1608.2 Ground snow loads. The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with the reliability-targeted (strength based) ground snow load values in Chapter 7 of ASCE 7 or Figures 1608.2(1) through 1608.2(4) for the contiguous United States and Table 1608.2 for Alaska. Site-specific case studies shall be determined in accordance with Chapter 7 of ASCE 7 and shall be approved by the building official. Snow loads are zero for Hawaii, except in mountainous regions as approved by the building official.

TABLE 1608.2—GROUND SNOW LOADS, p_g, FOR ALASKAN LOCATIONS

CITY/TOWN	ELEVATION (ft)	GROUND SNOW LOAD, p_g[a, b, c] (lb/ft^2)			
		RISK CATEGORY			
		I	II	III	IV
Adek	100	32	40	46	50
Anchorage/Eagle River[c]	500	64	80	92	100
Arctic Village	2,100	38	48	55	60
Bethel	100	51	64	74	80
Bettles	700	102	128	147	160
Cantwell	2,100	109	136	156	170
Cold Bay	100	45	56	64	70
Cordova	100	128	160	184	200
Deadhorse	100	32	40	46	50
Delta Junction	400	51	64	74	80
Dillingham	100	141	176	202	220
Emmonak	100	128	160	184	200
Fairbanks	1,200	77	96	110	120
Fort Yukon	400	64	80	92	100
Galena	200	77	96	110	120
Girdwood	200	179	224	258	280
Glennallen	1,400	58	72	83	90
Haines	100	237	296	340	370
Holy Cross	100	154	192	221	240
Homer [c]	500	58	72	83	90
Iliamna	200	102	128	147	160
Juneau	100	90	112	129	140
Kaktovik	100	58	72	83	90
Kenai/Soldotna	200	83	104	120	130
Ketchikan	100	38	48	55	60
Kobuk	200	115	144	166	180
Kodiak	100	45	56	64	70
Kotzebue	100	77	96	110	120
McGrath	400	83	104	120	130
Nenana	400	96	120	138	150
Nikiski	200	102	128	147	160

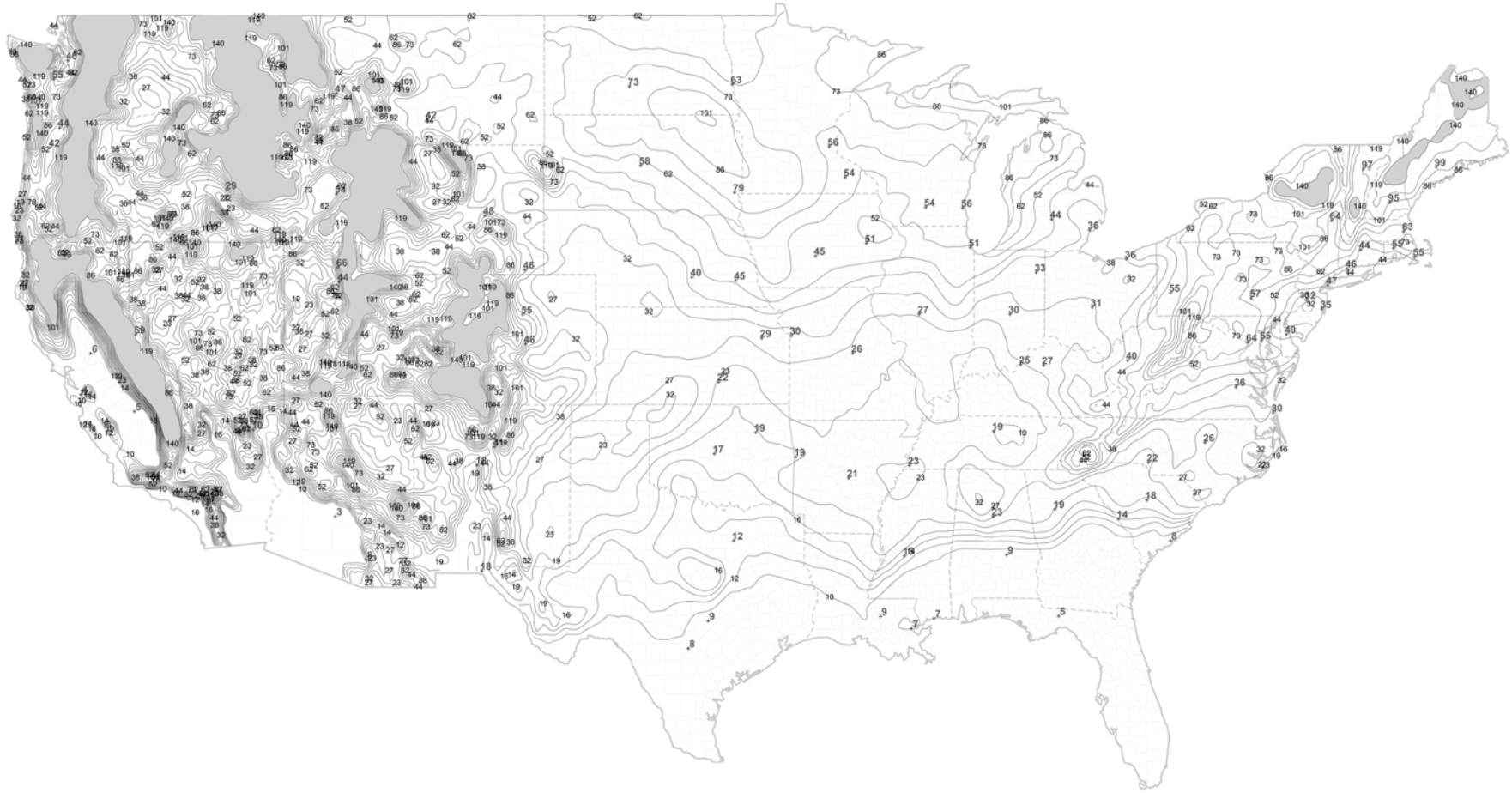


FIGURE 1608.2(2)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY II FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2.

Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or an approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a “+” symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

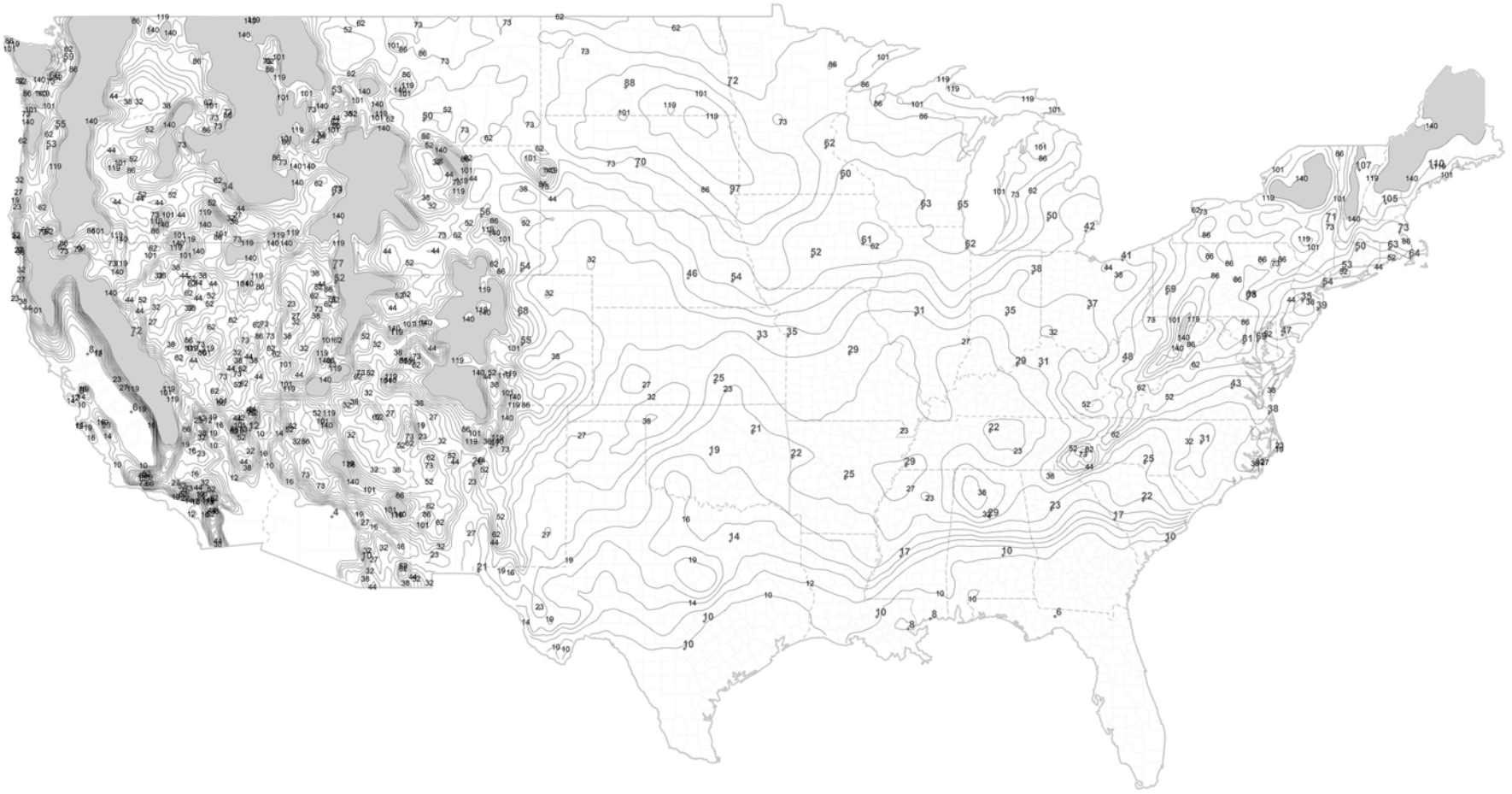


FIGURE 1608.2(3)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY III FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2.

Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or an approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a "+" symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

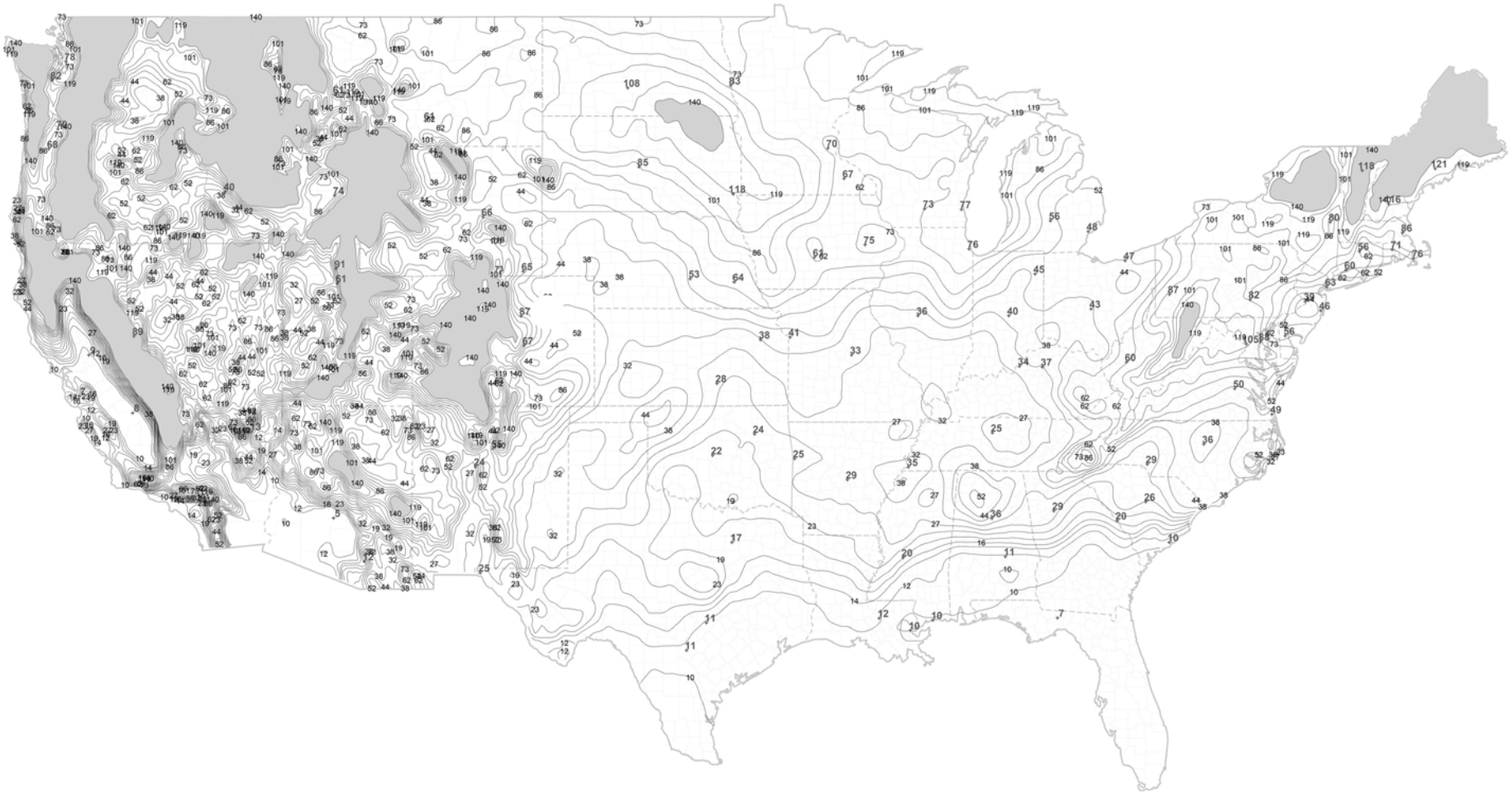


FIGURE 1608.2(4)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY IV FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2.

Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or an approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a "+" symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

SECTION 1609—WIND LOADS

1609.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic wind speed, *V*, and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.7 of ASCE 7.
7. Temporary structures complying with Section 3103.6.1.2.

The wind speeds in Figures 1609.3(1) through 1609.3(4) are basic wind speeds, *V*, and shall be converted in accordance with Section 1609.3.1 to allowable stress design wind speeds, V_{asd}, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1609.1.1.1 Applicability. The provisions of ICC 600 are applicable only to buildings located within Exposure B or C as defined in Section 1609.4. The provisions of ICC 600, AWC WFCM and AISI S230 shall not apply to buildings sited on the upper half of an isolated hill, ridge or escarpment meeting all of the following conditions:

1. The hill, ridge or escarpment is 60 feet (18 288 mm) or higher if located in Exposure B or 30 feet (9144 mm) or higher if located in Exposure C.
2. The maximum average slope of the hill exceeds 10 percent.
3. The hill, ridge or escarpment is unobstructed upwind by other such topographic features for a distance from the high point of 50 times the height of the hill or 2 miles (3.22 km), whichever is greater.

1609.2 Protection of openings. In windborne debris regions, glazing in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of an approved impact-resistant standard or ASTM E1996 referenced herein as follows:

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the large missile test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.

Exceptions:

1. Wood structural panels with a minimum thickness of $^{7}/_{16}$ inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in buildings with a mean roof height of 33 feet (10 058 mm) or less that are classified as a Group R-3 or R-4 occupancy. Panels shall be precut so that they shall be attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the components and cladding loads determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table 1609.2 with corrosion-resistant attachment hardware provided and anchors permanently installed on the building is permitted for buildings with a mean roof height of 45 feet (13 716 mm) or less where V_{asd} determined in accordance with Section 1609.3.1 does not exceed 140 mph (63 m/s).
2. Glazing in Risk Category I buildings, including greenhouses that are occupied for growing plants on a production or research basis, without public access shall be permitted to be unprotected.
3. Glazing in Risk Category II, III or IV buildings located over 60 feet (18 288 mm) above the ground and over 30 feet (9144 mm) above aggregate surface roofs located within 1,500 feet (457 m) of the building shall be permitted to be unprotected.

TABLE 1609.2—WINDBORNE DEBRIS PROTECTION FASTENING SCHEDULE FOR WOOD STRUCTURAL PANELS[a, b, c, d]

FASTENER TYPE	FASTENER SPACING (inches)		
	Panel Span ≤ 4 feet	4 feet < Panel Span ≤ 6 feet	6 feet < Panel Span ≤ 8 feet
No. 8 wood-screw-based anchor with 2-inch embedment length	16	10	8
No. 10 wood-screw-based anchor with 2-inch embedment length	16	12	9
$^1/_4$-inch diameter lag-screw-based anchor with 2-inch embedment length	16	16	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N, 1 mile per hour = 0.447 m/s.

a. This table is based a on 140 mph basic wind speed, *V*, and a 45-foot mean roof height.

b. Fasteners shall be installed at opposing ends of the wood structural panel. Fasteners shall be located not less than 1 inch from the edge of the panel.

c. Anchors shall penetrate through the exterior wall covering with an embedment length of 2 inches minimum into the building frame. Fasteners shall be located not less than $2^1/_2$ inches from the edge of concrete block or concrete.

d. Where panels are attached to masonry or masonry/stucco, they shall be attached using vibration-resistant anchors having a minimum ultimate withdrawal capacity of 1,500 pounds.

1609.2.1 Louvers. Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540.

1609.2.2 Garage doors. Garage door glazed opening protection for windborne debris shall meet the requirements of an approved impact-resisting standard or ANSI/DASMA 115.

1609.3 Basic wind speed. The basic wind speed, *V*, in mph, for the determination of the wind loads shall be determined by Figures 1609.3(1) through 1609.3(4). ⬅

The basic wind speed, *V*, for use in the design of Risk Category I buildings and structures shall be obtained from Figure 1609.3(1).

The basic wind speed, *V*, for use in the design of Risk Category II buildings and structures shall be obtained from Figure 1609.3(2).

The basic wind speed, *V*, for use in the design of Risk Category III buildings and structures shall be obtained from Figure 1609.3(3).

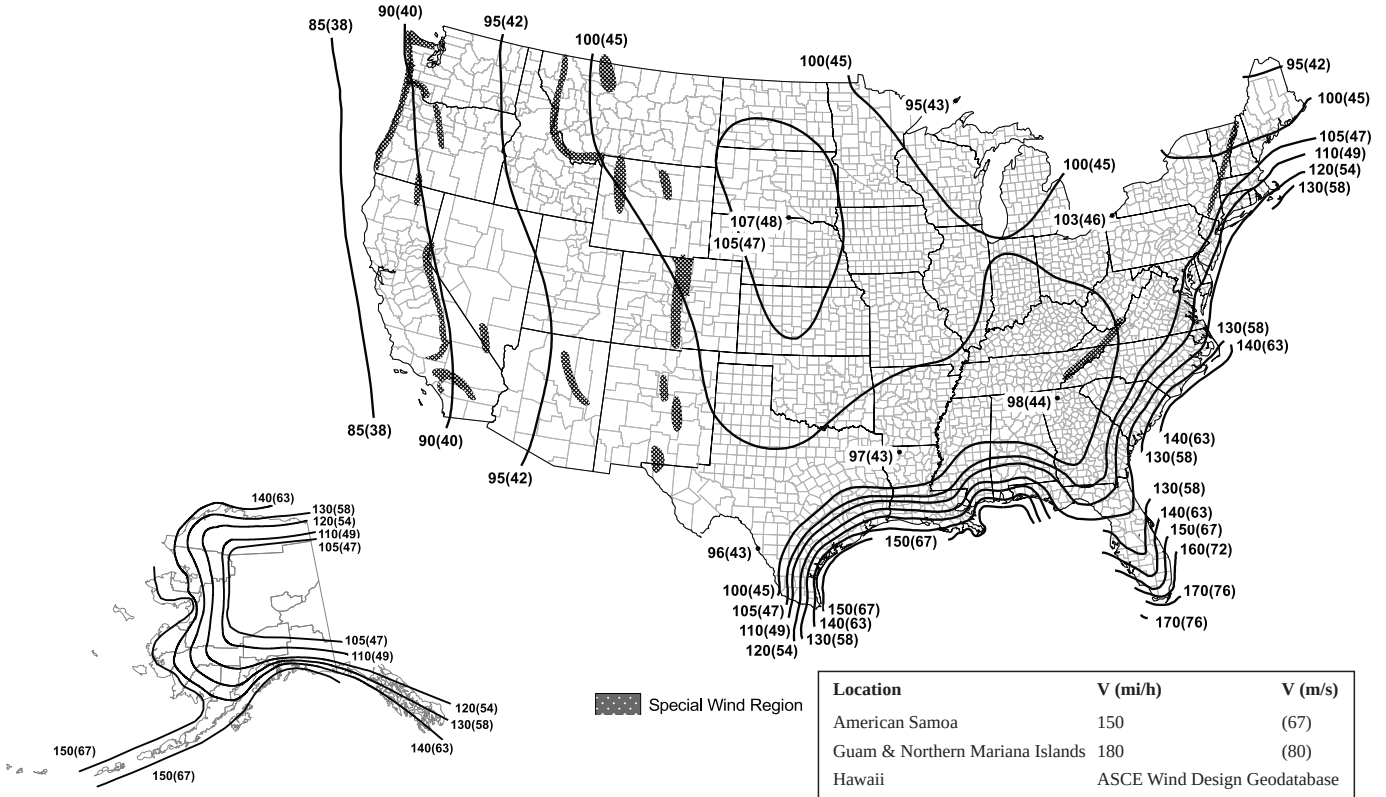
The basic wind speed, *V*, for use in the design of Risk Category IV buildings and structures shall be obtained from Figure 1609.3(4).

Basic wind speeds for Hawaii, the US Virgin Islands and Puerto Rico shall be determined by using the ASCE Wind Design Geodatabase. The ASCE Wind Design Geodatabase is available at https://asce7hazardtool.online, or an approved equivalent.

The basic wind speed, *V*, for the special wind regions indicated near mountainous terrain and near gorges shall be in accordance with local jurisdiction requirements. The basic wind speeds, *V*, determined by the local jurisdiction shall be in accordance with Chapter 26 of ASCE 7.

In nonhurricane-prone regions, when the basic wind speed, *V*, is estimated from regional climatic data, the basic wind speed, *V*, shall be determined in accordance with Chapter 26 of ASCE 7.

FIGURE 1609.3(1)—BASIC WIND SPEEDS, *V*, FOR RISK CATEGORY I BUILDINGS AND OTHER STRUCTURES



Location	V (mi/h)	V (m/s)
American Samoa	150	(67)
Guam & Northern Mariana Islands	180	(80)
Hawaii	ASCE Wind Design Geodatabase	
Puerto Rico	ASCE Wind Design Geodatabase	
U.S. Virgin Islands	ASCE Wind Design Geodatabase	

Notes:

1. Values are 3-second gust wind speeds in miles per hour (m/s) at 33 feet (10 m) above ground for Exposure Category C.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas and land boundaries outside the last contour shall use the last wind speed contour.
4. Location-specific basic wind speeds shall be determined using the ASCE Wind Design Geodatabase.
5. Wind speeds for Hawaii, the US Virgin Islands and Puerto Rico shall be determined from the ASCE Wind Design Geodatabase.
6. Mountainous terrain, gorges, ocean promontories and special wind regions shall be examined for unusual wind conditions. Site-specific values for selected special wind regions shall be determined using the ASCE Wind Design Geodatabase.
7. Wind speeds correspond to approximately a 15-percent probability of exceedance in 50 years (annual exceedance probability = 0.00333, MRI = 300 years).
8. The ASCE Wind Design Geodatabase can be accessed at the ASCE 7 Hazard Tool (https://asce7hazardtool.online) or approved equivalent.

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 16A – STRUCTURAL DESIGN

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter								**X**		**X**				**X**										
Adopt entire chapter as amended (amended sections listed below)																								
Adopt only those sections that are listed below						**X**	**X**					**X**			**X**									
Chapter / Section																								
1607A.9.2						X	X																	
1617A.1.18												X			X									
1617A.1.41											X	X		†	X									

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

CHAPTER

16A

STRUCTURAL DESIGN

User notes:

About this chapter: *Chapter 16A prescribes minimum structural loading requirements for use in the design and construction of structures regulated by the Division of the State Architect-Structural Safety—including public elementary and secondary schools, community colleges, and state-owned or state-leased essential services buildings (applications listed in Section 1.9.2.1 [DSA-SS])—and by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development—including hospitals and correctional treatment centers (applications listed in Sections 1.10.1 [OSHPD 1] and 1.10.4 [OSHPD 4]).*

SECTION 1601*A*—GENERAL

1601*A*.1 Scope. The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof.

1601A.1.1 Application. *The scope of application of Chapter 16A is as follows:*

1. *Structures regulated by the Division of the State Architect-Structural Safety (DSA-SS), which include those applications listed in Section 1.9.2.1. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*
2. *Applications listed in Sections 1.10.1 and 1.10.4, regulated by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development (OSHPD). These applications include hospitals and correctional treatment centers.*

1601A.1.2 Amendments in this chapter. *DSA-SS and OSHPD adopt this chapter and all amendments.*

Exception: *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

1. *Division of the State Architect-Structural Safety:*

   [DSA-SS] – *For applications listed in Section 1.9.2.1.*
2. *Office of Statewide Hospital Planning and Development:*

   [OSHPD 1] – *For applications listed in Section 1.10.1.*

   [OSHPD 4] – *For applications listed in Section 1.10.4.*

1601A.2 Enforcement agency approval. *In addition to the requirements of the California Administrative Code and the California Building Code, any aspect of project design, construction, quality assurance or quality control programs for which this code requires approval by the Registered Design Professional (RDP), are also subject to approval by the enforcement agency.*

SECTION 1602*A*—NOTATIONS

1602*A*.1 Notations. The following notations are used in this chapter:

D = Dead load.

D_i = Weight of ice in accordance with Chapter 10 of ASCE 7.

E = Combined effect of horizontal and vertical earthquake induced forces as defined in Section 12.4 of ASCE 7.

F = Load due to fluids with well-defined pressures and maximum heights.

F_a = Flood load in accordance with Chapter 5 of ASCE 7.

H = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.

L = Live load.

L_r = Roof live load.

$p_{g(asd)}$ = Allowable stress design ground snow load.

p_g = Ground snow load determined from Figures 1608.2(1) through 1608.2(4) and Table 1608.2.

R = Rain load.

S = Snow load.

T = Cumulative effects of self-straining load forces and effects.

V_{asd} = Allowable stress design wind speed, mph (m/s) where applicable.

V = Basic wind speed, *V*, mph (m/s) determined from Figures 1609*A*.3(1) through 1609*A*.3(4) or ASCE 7.

V_T = Tornado speed, mph (m/s) determined from Chapter 32 of ASCE 7.

W = Load due to wind pressure.

W_i = Wind-on-ice in accordance with Chapter 10 of ASCE 7.

SECTION 1603*A*—CONSTRUCTION DOCUMENTS

1603*A*.1 General. Construction documents shall show the material, size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603*A*.1.1 through *1603A.1.10* shall be indicated on the construction documents.

Exception: Construction documents for buildings constructed in accordance with the conventional light-frame construction provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof dead and live loads.
2. Ground snow load, p_g, and allowable stress design ground snow load, $p_{g(asd)}$.
3. Basic wind speed, *V*, mph (m/s), and allowable stress design wind speed, V_{asd}, as determined in accordance with Section 1609*A*.3.1 and wind exposure.
4. Seismic design category and site class.
5. Flood design data, if located in flood hazard areas established in Section 1612*A*.3.
6. Design load-bearing values of soils.
7. Rain load data.

[DSA-SS] *Additional requirements are included in Section 4-210 and 4-317 of the California Administrative Code (Part 1, Title 24, C.C.R).*

[OSHPD 1] *Additional requirements are included in Section 7-115 and 7-125 of the California Administrative Code.*

1603*A*.1.1 Floor live load. The uniformly distributed, concentrated and impact floor live load used in the design shall be indicated for floor areas. Use of live load reduction in accordance with Section 1607*A*.13 shall be indicated for each type of live load used in the design.

1603*A*.1.2 Roof live load. The roof live load used in the design shall be indicated for roof areas.

1603*A*.1.3 Roof snow load data. The ground snow load, p_g, shall be indicated. In areas where the ground snow load, p_g, exceeds 15 pounds per square foot (psf) (0.72 kN/m^2), the following additional information shall also be provided, regardless of whether snow loads govern the design of the roof:

1. Flat-roof snow load, p_f.
2. Snow exposure factor, C_e.
3. Risk category.
4. Thermal factor, C_t.
5. Slope factor(s), C_s.
6. Drift surcharge load(s), p_d, where the sum of p_d and p_f exceeds 30 psf (1.44 kN/m^2).
7. Width of snow drift(s), *w*.
8. Winter wind parameter for snow drift, W_2.

1603*A*.1.4 Wind and tornado design data. The following information related to wind loads and, where required by Section 1609*A*.5, tornado loads shall be shown, regardless of whether wind or tornado loads govern the design of the lateral force-resisting system of the structure:

1. Basic wind speed, *V*, mph (m/s), tornado speed, V_T, mph (m/s), and allowable stress design wind speed, V_{asd}, mph (m/s), as determined in accordance with Section 1609*A*.3.1.
2. Risk category.
3. Effective plan area, A_e, for tornado design in accordance with Chapter 32 of ASCE 7.
4. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
5. Applicable internal pressure coefficients, and applicable tornado internal pressure coefficients.
6. Design wind pressures and their applicable zones with dimensions to be used for exterior component and cladding materials not specifically designed by the registered design professional responsible for the design of the structure, pounds per square foot (kN/m^2). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

1603*A*.1.5 Earthquake design data. The following information related to seismic loads shall be shown, regardless of whether seismic loads govern the design of the lateral force-resisting system of the structure:

1. Risk category.
2. Seismic importance factor, I_e.
3. Spectral response acceleration parameters, S_S and S_1.
4. Site class.
5. Design spectral response acceleration parameters, S_{DS} and S_{D1}.
6. Seismic design category.
7. Basic seismic force-resisting system(s).
8. Design base shear(s).
9. Seismic response coefficient(s), C_s.
10. Response modification coefficient(s), *R*.

1604*A*.3.7 Framing supporting glass. The deflection of framing members supporting glass subjected to 0.6 times the "component and cladding" wind loads shall not exceed either of the following:

1. $^1/_{175}$ of the length of span of the framing member, for framing members having a length not more than 13 feet 6 inches (4115 mm).
2. $^1/_{240}$ of the length of span of the framing member + $^1/_4$ inch (6.4 mm), for framing members having a length greater than 13 feet 6 inches (4115 mm).

1604A.3.8 Horizontal diaphragms. *The maximum span-depth ratio for any roof or floor diaphragm consisting of steel and composite steel slab decking shall not exceed those given in Table 1604A.4, unless test data and design calculations acceptable to the enforcement agency are submitted and approved for the use of other span-depth ratios. Concrete diaphragms shall not exceed the span depth ratios for the equivalent composite steel-slab diaphragm in Table 1604A.4.*

TABLE 1604A.4-MAXIMUM HORIZONTAL DIAPHRAGM SPAN AND SPAN-DEPTH RATIOS [1, 3, 4]

FLEXIBILITY FACTOR(F)[2]	MAXIMUM DIAPHRAGM SPAN FOR MASONRY OR CONCRETE WALLS (feet)	DIAPHRAGM SPAN-DEPTH LIMITATION			
		Rotation (torsion) Not Considered in Diaphragm		Rotation (torsion) Considered in Diaphragm	
		Masonry or Concrete Walls	Flexible Walls	Masonry or Concrete Walls	Flexible Walls
More than 150	Not to be used	Not to be used	2:1	Not to be used	$1^1/_2$:1
70–150	200	2:1 or as required for deflection	3:1	Not to be used	2:1
10–70	400	$2^1/_2$:1 or as required for deflection	4:1	As required for deflection	$2^1/_2$:1
1–10	No limitation	3:1 or as required for deflection	5:1	As required for deflection	3:1
Less than 1	No limitation	As required for deflection	No limitation	As required for deflection	$3^1/_2$:1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 plf = 14.594 N/m, 1 psi = 6894 Pa

1. *Diaphragms shall satisfy span-depth limitations based on flexibility.*
2. *Flexibility factor (F) is the average deflection in micro inches (10^{-6}) or μm of the diaphragm web per foot (m) of span stressed with a shear of 1 pound per foot (N/m).*
3. *The total deflection Δ of the diaphragm may be computed from the equation: $\Delta = \Delta_f + \Delta_w$.*

Where:

Δ_f = Flexural deflection of the diaphragm determined in the same manner as the deflection of beams. The flexural stiffness of the web of diaphragms consisting of bare steel decking shall be neglected.

Δ_w = Web deflection of the diaphragm may be determined solving the following equation:

$$F = \frac{\Delta_w x 10^6}{q_{ave} L}$$

Where:

L = Distance in feet (m) between the vertical resisting element (such as a shear wall) and the point to which the deflection is to be determined.

q_{ave} = Average shear in the diaphragm in pounds per foot (N/m) over length L.

4. *When applying these limitations to cantilevered diaphragms, the allowable span-depth ratio will be half of that shown.*

1604A.3.9 Deflections. *Deflection criteria for materials not specified shall be developed by the project architect or structural engineer in a manner consistent with the provisions of this section and approved by the enforcement agency.*

1604*A*.4 Analysis. Load effects on structural members and their connections shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties.

Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the effects of added deformations expected to occur during their service life.

Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring loads from their point of origin to the load-resisting elements.

The total lateral force shall be distributed to the various vertical elements of the lateral force-resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements assumed not to be a part of the lateral force-resisting system are permitted to be incorporated into buildings provided that their effect on the action of the system is considered and provided for in the design. Where a diaphragm is not permitted to be idealized as either flexible or rigid in accordance with ASCE 7 or for wood diaphragms in accordance with AWC SDPWS, the structure shall be analyzed and designed utilizing one of the following procedures:

1. An envelope analysis of the structure using a flexible and rigid diaphragm analysis separately and designing each component for the more severe load condition.
2. A semirigid diaphragm analysis and design.

Where required by ASCE 7, provisions shall be made for the increased forces induced on resisting elements of the structural system resulting from torsion due to eccentricity between the center of application of the lateral forces and the center of rigidity of the lateral force-resisting system.

Every structure shall be designed to resist the effects caused by the forces specified in this chapter, including overturning, uplift and sliding. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force.

1604*A*.5 Risk category. Each building and structure shall be assigned a risk category in accordance with Table 1604*A*.5. Where a referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a risk category be in accordance with ASCE 7, Table 1.5-1, Table 1604*A*.5 shall be used in lieu of ASCE 7, Table 1.5-1.

Exceptions:

1. The assignment of buildings and structures to Tsunami Risk Categories III and IV is permitted to be in accordance with Section 6.4 of ASCE 7.
2. Freestanding parking garages not used for the storage of emergency services vehicles or not providing means of egress for buildings or structures assigned to a higher risk category shall be assigned to Risk Category II.

TABLE 1604*A*.5—RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. • Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-3, Condition 1 occupancies. • Any other occupancy with an occupant load greater than 5,000.[a] • Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *California Fire Code*; and • Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to: • ***[OSHPD 1 & 4]*** *General Acute-care Hospital Buildings, General Acute-care Hospital Buildings providing only acute medical rehabilitation center services, and Correctional Treatment Center Buildings and all structures required for their continuous operation or access/egress.* • Group I-2 occupancies. • Ambulatory care facilities having emergency surgery or emergency treatment facilities. • Group I-3 occupancies other than Condition 1. • Fire, rescue, ambulance and police stations and emergency vehicle garages • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response ***[DSA-SS]*** *as defined in the California Administrative Code (Title 24, Part 1, CCR) Section 4-207 and all structures required for their continuous operation or access/egress.* • Public utility facilities providing power generation, potable water treatment, or wastewater treatment. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *California Fire Code*; and • Are sufficient to pose a threat to the public if released.[b] • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

1606*A*.2 Weights of materials of construction. For purposes of design, the actual weights of materials of construction shall be used. In the absence of definite information, values used shall be subject to the approval of the building official.

1606*A*.3 Weight of fixed service equipment. In determining dead loads for purposes of design, the weight of fixed service equipment, including the maximum weight of the contents of fixed service equipment, shall be included. The components of fixed service equipment that are variable, such as liquid contents and movable trays, shall not be used to counteract forces causing overturning, sliding, and uplift conditions in accordance with Section 1.3.6 of ASCE 7.

Exceptions:

1. Where force effects are the result of the presence of the variable components, the components are permitted to be used to counter those load effects. In such cases, the structure shall be designed for force effects with the variable components present and with them absent.
2. For the calculation of seismic force effects, the components of fixed service equipment that are variable, such as liquid contents and movable trays, need not exceed those expected during normal operation.

1606*A*.4 Photovoltaic panel systems. The weight of photovoltaic panel systems, their support system, and ballast shall be considered as dead load.

1606*A*.5 Vegetative and landscaped roofs. The weight of all landscaping and hardscaping materials for vegetative and landscaped roofs shall be considered as dead load. The weight shall be computed considering both fully saturated soil and drainage layer materials and fully dry soil and drainage layer materials to determine the most severe load effects on the structure.

1606A.6 Roof dead loads. *The design dead load shall provide for the weight of at least one additional roof covering in addition to other applicable loadings if the new roof covering is permitted to be applied over the original roofing without its removal, in accordance with Section 1512.*

SECTION 1607*A*—LIVE LOADS

1607*A*.1 General. Buildings, structures, and parts thereof shall be designed to resist the effects of live loads.

TABLE 1607*A*.1—MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS

	OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1.	Apartments (see residential)		—	—	—
2.	Access floor systems	Office use	50	2,000	—
		Computer use	100	2,000	—
3.	Armories and drill rooms		150[a]	—	—
4.	Assembly areas[c, e]	Fixed seats (fastened to floor)	60[a]	—	—
		Lobbies	100[a]		
		Movable seats	100[a]		
		Stage floors	150[a]		
		Platforms (assembly)	100[a]		
		Bleachers, folding and telescopic seating and grandstands[g]	100[a] (See Section 1607*A*.18)		
		Stadiums and arenas with fixed seats (fastened to the floor)	60[a] (See Section 1607*A*.18)		
		Other assembly areas	100[a]		
5.	Balconies and decks		1.5 times the live load for the area served, not required to exceed 100	—	—
6.	Catwalks for maintenance and service access		40	300	—
7.	Cornices		60	—	—
8.	Corridors	First floor	100	—	—
		Other floors	Same as occupancy served except as indicated		
9.	Dining rooms and restaurants		100[a]	—	—
10.	Dwellings (see residential)		—	—	—
11.	Elevator machine room and control room grating (on area of 2 inches by 2 inches)		—	300	—
12.	Finish light floor plate construction (on area of 1 inch by 1 inch)		—	200	—

TABLE 1607*A*.1—MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS—continued

	OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
13.	Fire escapes		100	—	—
		On single-family dwellings only	40		
14.	Fixed ladders		See Section 1607*A*.10		—
15.	Garages and vehicle floors	Passenger vehicle garages	40[c]	See Section 1607*A*.7	—
		Trucks and buses	See Section 1607*A*.8		
		Fire trucks and emergency vehicles	See Section 1607*A*.8		
		Forklifts and movable equipment	See Section 1607*A*.8		
16.	Handrails, guards and grab bars		See Section 1607*A*.9		—
17.	Helipads	Helicopter takeoff weight 3,000 pounds or less	40[a]	See Section 1607*A*.6.1	Section 1607*A*.6
		Helicopter takeoff weight more than 3,000 pounds	60[a]	See Section 1607*A*.6.1	Section 1607*A*.6
18.	Hospitals	Corridors above first floor	80	1,000	—
		Operating rooms, laboratories	60	1,000	
		Patient rooms	40	1,000	
19.	Hotels (see residential)		—	—	—
20.	Libraries[d]	Corridors above first floor	80	1,000	—
		Reading rooms	60	1,000	—
		Stack rooms	150[b]	1,000	Section 1607*A*.17
21.	Manufacturing	Heavy	250[b]	3,000	—
		Light	125[b]	2,000	
22.	Marquees, except one- and two-family dwellings		75	—	—
23.	Office buildings[b]	Corridors above first floor	80	2,000	—
		File and computer rooms shall be designed for heavier loads based on anticipated occupancy	—	—	
		Lobbies and first-floor corridors	100	2,000	
		Offices	50	2,000	
24.	Penal institutions	Cell blocks	40	—	—
		Corridors	100		
25.	Public restrooms		Same as live load for area served but not required to exceed 60 psf	—	—
26.	Recreational uses	Bowling alleys, poolrooms and similar uses	75[a]	—	—
		Dance halls and ballrooms	100[a]		
		Gymnasiums	100[a]		
		Theater projection, control, and follow spot rooms	50		
		Ice skating rinks	250[b]		
		Roller skating rinks	100[a]		

TABLE 1607*A*.13.1—LIVE LOAD ELEMENT FACTOR, K_{LL}	
ELEMENT	K_{LL}
Interior columns	4
Exterior columns without cantilever slabs	4
Edge columns with cantilever slabs	3
Corner columns with cantilever slabs	2
Edge beams without cantilever slabs	2
Interior beams	2
Members not previously identified including:	1
Edge beams with cantilever slabs	
Cantilever beams	
One-way slabs	
Two-way slabs	
Members without provisions for continuous shear transfer normal to their span	

1607*A*.13.1.1 One-way slabs. The tributary area, A_T, for use in Equation 16-7 for one-way slabs shall not exceed an area defined by the slab span times a width normal to the span of 1.5 times the slab span.

1607*A*.13.1.2 Heavy live loads. Live loads that exceed 100 psf (4.79 kN/m^2) shall not be reduced.

Exceptions:

1. The live loads for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced live load shall be not less than L as calculated in Section 1607*A*.13.1.
2. For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the registered design professional that a rational approach has been used and that such reductions are warranted.

1607*A*.13.1.3 Passenger vehicle garages. The live loads shall not be reduced in passenger vehicle garages.

Exception: The live loads for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced live load shall be not less than L as calculated in Section 1607*A*.13.1.

1607*A*.13.2 Alternative uniform live load reduction. As an alternative to Section 1607*A*.13.1 and subject to the limitations of Table 1607.1, uniformly distributed live loads are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. For live loads not exceeding 100 pounds per square foot (4.79 kN/m^2), the design live load for structural members supporting 150 square feet (13.94 m^2) or more is permitted to be reduced in accordance with Equation 16*A*-8.

   Equation 16*A*-8 $R = 0.08(A - 150)$

   For SI: $R = 0.861(A - 13.94)$

   where:

   A = Area of floor supported by the member, square feet (m^2).

   R = Reduction in percent. Such reduction shall not exceed the smallest of:

   1.1. 40 percent for members supporting one floor.

   1.2. 60 percent for members supporting two or more floors.

   1.3. R as determined by the following equation:

   Equation 16*A*-9 $R = 23.1(1+ D/L_o)$

   where:

   D = Dead load per square foot (m^2) of area supported.

   L_o = Unreduced live load per square foot (m^2) of area supported.

2. A reduction shall not be permitted where the live load exceeds 100 pounds per square foot (4.79 kN/m^2) except that the design live load for members supporting two or more floors is permitted to be reduced by not greater than 20 percent.

   Exception: For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the registered design professional that a rational approach has been used and that such reductions are warranted.

3. A reduction shall not be permitted in passenger vehicle parking garages except that the live loads for members supporting two or more floors are permitted to be reduced by not greater than 20 percent.
4. For one-way slabs, the area, A, for use in Equation 16*A*-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

1607*A*.14 Reduction in uniform roof live loads. The minimum uniformly distributed live loads of roofs, marquees and canopies, L_o, in Table 1607*A*.1 are permitted to be reduced in accordance with Section 1607*A*.14.1.

1607*A*.14.1 Ordinary roofs, awnings and canopies. Ordinary flat, pitched and curved roofs, and awnings and canopies other than of fabric construction supported by a skeleton structure, are permitted to be designed for a reduced uniformly distributed roof live load, L_r, as specified in the following equations or other controlling combinations of loads as specified in Section 1605*A*, whichever produces the greater load effect.

In structures such as greenhouses, where special scaffolding is used as a work surface for workers and materials during maintenance and repair operations, a lower roof load than specified in the following equations shall not be used unless approved by the building official. Such structures shall be designed for a minimum roof live load of 12 psf (0.58 kN/m^2).

Equation 16*A*-10 $L_r = L_o R_1 R_2$

where: $12 \le L_r \le 20$

For SI: $L_r = L_o R_1 R_2$

where: $0.58 \le L_r \le 0.96$

L_o = Unreduced roof live load per square foot (m^2) of horizontal projection supported by the member (see Table 1607*A*.1).

L_r = Reduced roof live load per square foot (m^2) of horizontal projection supported by the member.

The reduction factors R_1 and R_2 shall be determined as follows:

Equation 16*A*-11 $R_1 = 1$ for $A_t \le 200$ square feet (18.58 m^2)

Equation 16*A*-12 $R_1 = 1.2 - 0.001A_t$ for 200 square feet $< A_t <$ 600 square feet

Equation 16*A*-13 $R_1 = 0.6$ for $A_t \ge 600$ square feet (55.74 m^2)

where:

A_t = Tributary area (span length multiplied by effective width) in square feet (m^2) supported by the member, and

Equation 16*A*-14 $R_2 = 1$ for $F \le 4$

Equation 16*A*-15 $R_2 = 1.2 - 0.05F$ for $4 < F < 12$

Equation 16*A*-16 $R_2 = 0.6$ for $F \ge 12$

where:

F = For a sloped roof, the number of inches of rise per foot (for SI: $F = 0.12 \times$ slope, with slope expressed as a percentage), or for an arch or dome, the rise-to-span ratio multiplied by 32.

1607*A*.14.2 Occupiable roofs. Areas of roofs that are occupiable, such as vegetative roofs, landscaped roofs or for assembly or other similar purposes, and marquees are permitted to have their uniformly distributed live loads reduced in accordance with Section 1607*A*.13.

*

1607*A*.15 Crane loads. The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall be in accordance with Section 4.9 of ASCE 7.

1607*A*.16 Interior walls and partitions. Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m^2). *The 5 psf (0.24 kN/m^2) allowable stress design load need not be applied simultaneously with wind or seismic loads. The deflection of such walls under a load of 5 psf (0.24 kN/m^2) shall not exceed the limits in Table 1604A.3.*

1607*A*.16.1 Fabric partitions. Fabric partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the following load conditions:

1. The horizontal distributed load need only be applied to the partition framing. The total area used to determine the distributed load shall be the area of the fabric face between the framing members to which the fabric is attached. The total distributed load shall be uniformly applied to such framing members in proportion to the length of each member.
2. A concentrated load of 40 pounds (0.176 kN) applied to an 8-inch-diameter (203 mm) area [50.3 square inches (32 452 mm^2)] of the fabric face at a height of 54 inches (1372 mm) above the floor.

1607*A*.16.2 Fire walls. In order to meet the structural stability requirements of Section 706.2 where the structure on either side of the wall has collapsed, fire walls and their supports shall be designed to withstand a minimum horizontal allowable stress load of 5 psf (0.240 kN/m^2).

1607*A*.17 Library stack rooms. The live loading indicated in Table 1607*A*.1 for library stack rooms applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:

1. The nominal book stack unit height shall not exceed 90 inches (2290 mm).
2. The nominal shelf depth shall not exceed 12 inches (305 mm) for each face.
3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches (914 mm) in width.

1607*A*.18 Seating for assembly uses. Bleachers, folding and telescopic seating and grandstands shall be designed for the loads specified in ICC 300 *as modified by Section 1605A.3 load combinations*. Stadiums and arenas with fixed seats shall be designed for the horizontal sway loads in Section 1607*A*.18.1.

1607*A*.18.1 Horizontal sway loads. The design of stadiums and arenas with fixed seats shall include horizontal swaying forces applied to each row of seats as follows:

1. 24 pounds per linear foot (0.35 kN/m) of seat applied in a direction parallel to each row of seats.
2. 10 pounds per linear foot (0.15 kN/m) of seat applied in a direction perpendicular to each row of seats.

The parallel and perpendicular horizontal swaying forces are not required to be applied simultaneously.

1607*A*.19 Sidewalks, vehicular driveways, and yards subject to trucking. The live loading indicated in Table 1607*A*.1 for sidewalks, vehicular driveways, and yards subject to trucking shall comply with the requirements of this section.

1607*A*.19.1 Uniform loads. In addition to the loads indicated in Table 1607*A*.1, other uniform loads in accordance with an approved method that contains provisions for truck loading shall be considered where appropriate.

1607*A*.19.2 Concentrated loads. The concentrated wheel load indicated in Table 1607*A*.1 shall be applied on an area of $4^1/_2$ inches by $4^1/_2$ inches (114 mm by 114 mm).

1607*A*.20 Stair treads. The concentrated load indicated in Table 1607*A*.1 for stair treads shall be applied on an area of 2 inches by 2 inches (51 mm by 51 mm). This load need not be assumed to act concurrently with the uniform load.

1607*A*.21 Residential attics. The live loads indicated in Table 1607*A*.1 for attics in residential occupancies shall comply with the requirements of this section.

1607*A*.21.1 Uninhabitable attics without storage. In residential occupancies, uninhabitable attic areas without storage are those where the maximum clear height between the joists and rafters is less than 42 inches (1067 mm), or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The live load in Table 1607*A*.1 need not be assumed to act concurrently with any other live load requirement.

1607*A*.21.2 Uninhabitable attics with storage. In residential occupancies, uninhabitable attic areas with storage are those where the maximum clear height between the joist and rafter is 42 inches (1067 mm) or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches (1067 mm) in height by 24 inches (610 mm) in width, or greater, within the plane of the trusses. The live load in Table 1607*A*.1 need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches (508 mm) in width by 30 inches (762 mm) in length that is located where the clear height in the attic is not less than 30 inches (762 mm).
2. The slope of the joists or truss bottom chords is not greater than 2 units vertical in 12 units horizontal.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot (0.48 kN/m^2).

1607*A*.21.3 Attics served by stairs. Attic spaces served by stairways other than the pull-down type shall be designed to support the minimum live load specified for habitable attics and sleeping rooms.

1607*A*.22 Photovoltaic panel systems. Roof structures that provide support for photovoltaic panel systems shall be designed in accordance with Sections 1607*A*.22.1 through 1607*A*.22.5, as applicable. **

1607*A*.22.1 Roof live load. Roof structures that support photovoltaic panel systems shall be designed to resist each of the following conditions:

1. Applicable uniform and concentrated roof loads with the photovoltaic panel system dead loads.

   Exception: Roof live loads need not be applied to the area covered by photovoltaic panels where the clear space between the panels and the roof surface is 24 inches (610 mm) or less.
2. Applicable uniform and concentrated roof loads without the photovoltaic panel system present.

1607*A*.22.2 Photovoltaic panels or modules. The structure of a roof that supports solar photovoltaic panels or modules shall be designed to accommodate the full solar photovoltaic panels or modules and ballast dead load, including concentrated loads from support frames in combination with the loads from Section 1607*A*.22.1 and other applicable loads. Where applicable, snow drift loads created by the photovoltaic panels or modules shall be included.

1607*A*.22.3 Elevated photovoltaic (PV) support structures with open grid framing. Elevated photovoltaic (PV) support structures with open grid framing and without a roof deck or sheathing shall be designed to support the uniform and concentrated roof live loads specified in Section 1607*A*.22.1, except that the uniform roof live load shall be permitted to be reduced to 12 psf (0.57 kN/m^2).

1607*A*.22.4 Ground-mounted photovoltaic (PV) panel systems. Ground-mounted photovoltaic (PV) panel systems are not required to accommodate a roof live load. Other loads and combinations in accordance with Section 1605*A* shall be accommodated.

1607*A*.22.5 Ballasted photovoltaic panel systems. Roof structures that provide support for ballasted photovoltaic panel systems shall be designed, or analyzed, in accordance with Section 1604*A*.4; checked in accordance with Section 1604*A*.3.6 for deflections; and checked in accordance with Section 1611*A* for ponding. ***[OSHPD 1 & 4]*** *Ballasted photovoltaic panel systems shall be considered as an alternative system.*

1607A.23 Uncovered open-frame roof structures. *Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.*

SECTION 1608*A*—SNOW LOADS

1608*A*.1 General. Design snow loads shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof load shall be not less than that determined by Section 1607*A*.

Exception: Temporary structures complying with Section 3103.6.1.1.

1608*A*.2 Ground snow loads. The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with the reliability-targeted (strength based) ground snow load values in Chapter 7 of ASCE 7 or Figures 1608*A*.2(1) through 1608*A*.2(4) for the contiguous United States. Site-specific case studies shall be determined in accordance with Chapter 7 of ASCE 7 and shall be approved by the building official.

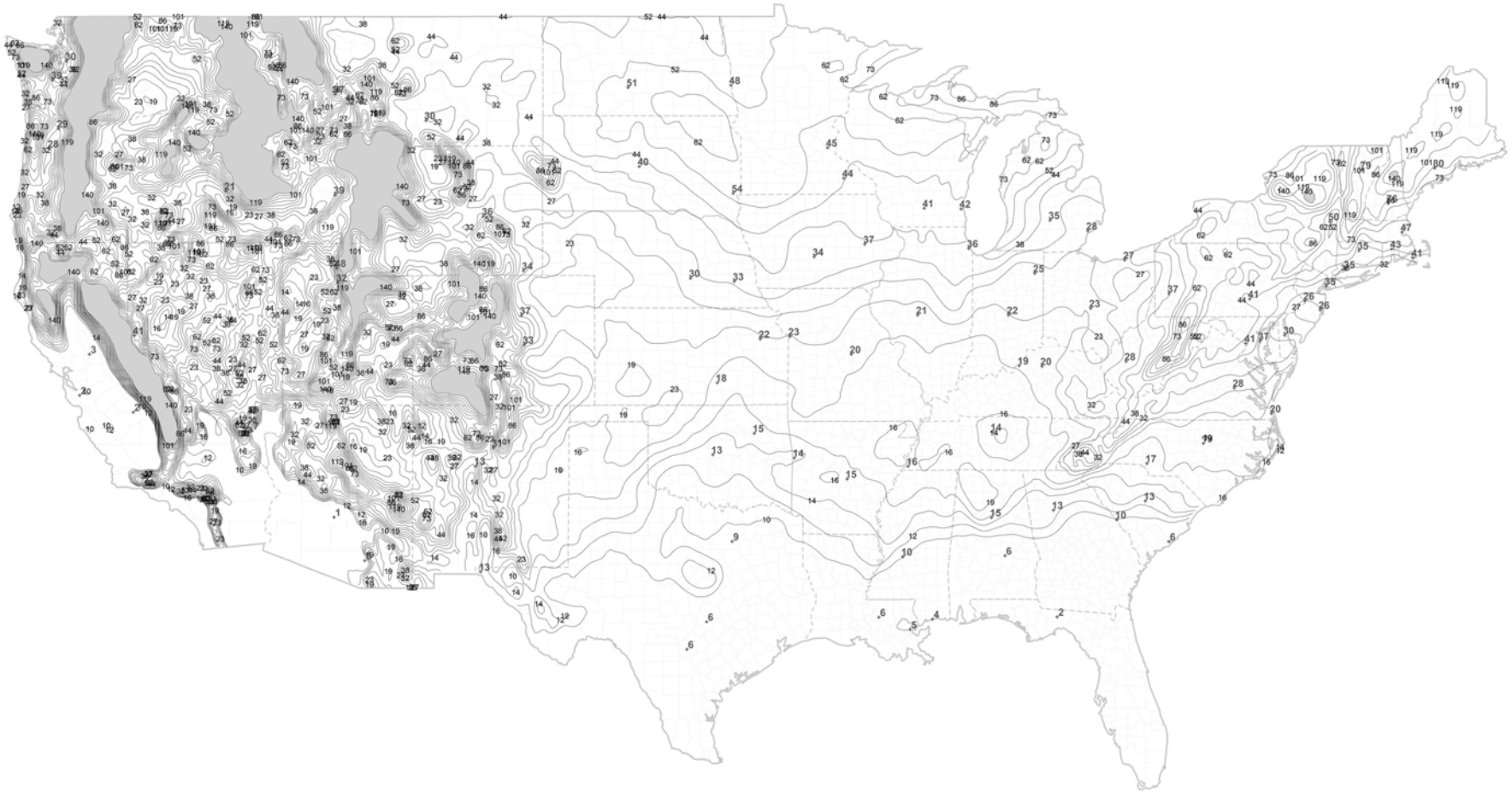


FIGURE 1608*A*.2(1)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY I FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2. Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a "+" symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

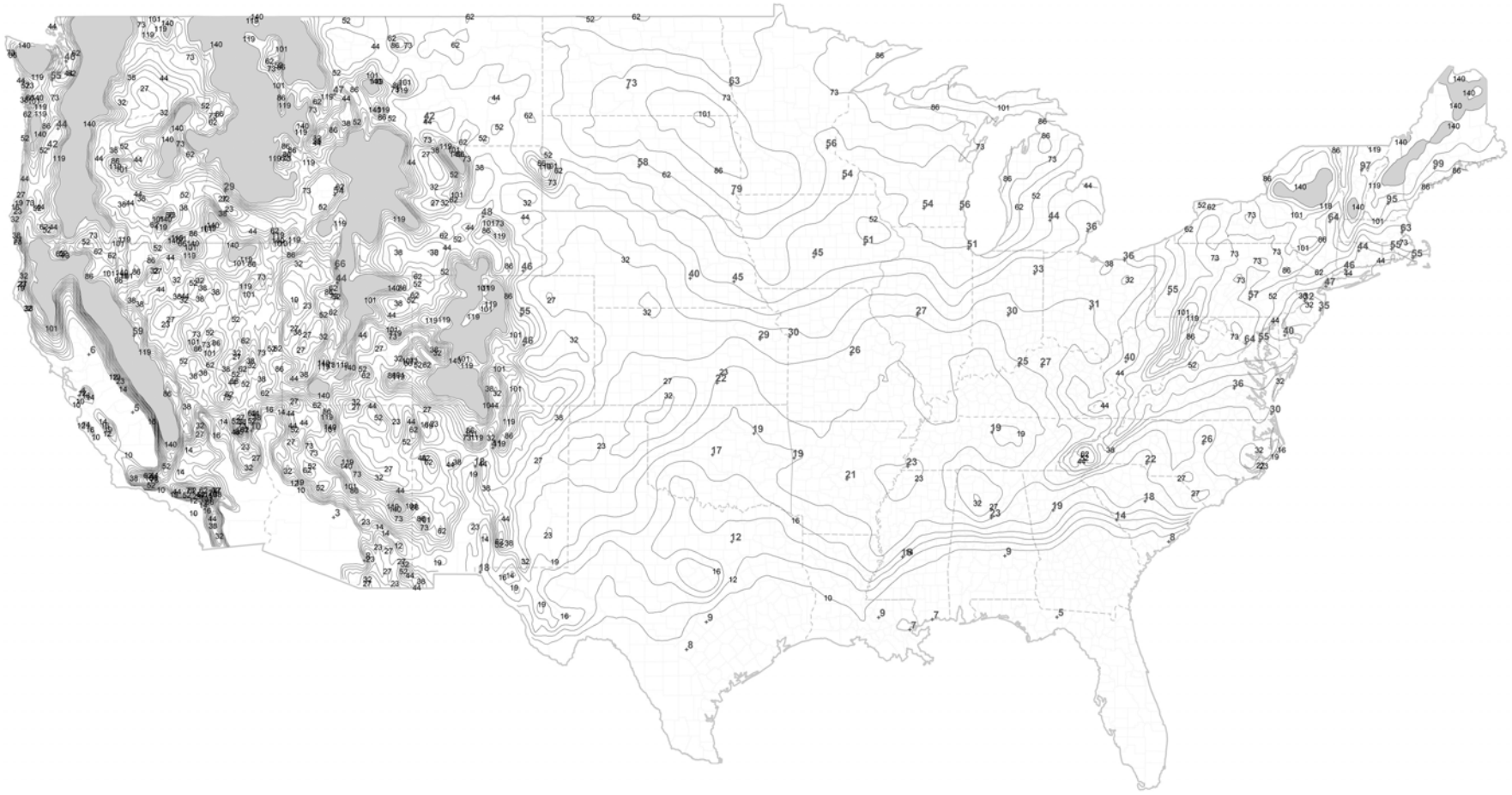


FIGURE 1608*A*.2(2)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY II FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2.

Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or an approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a "+" symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

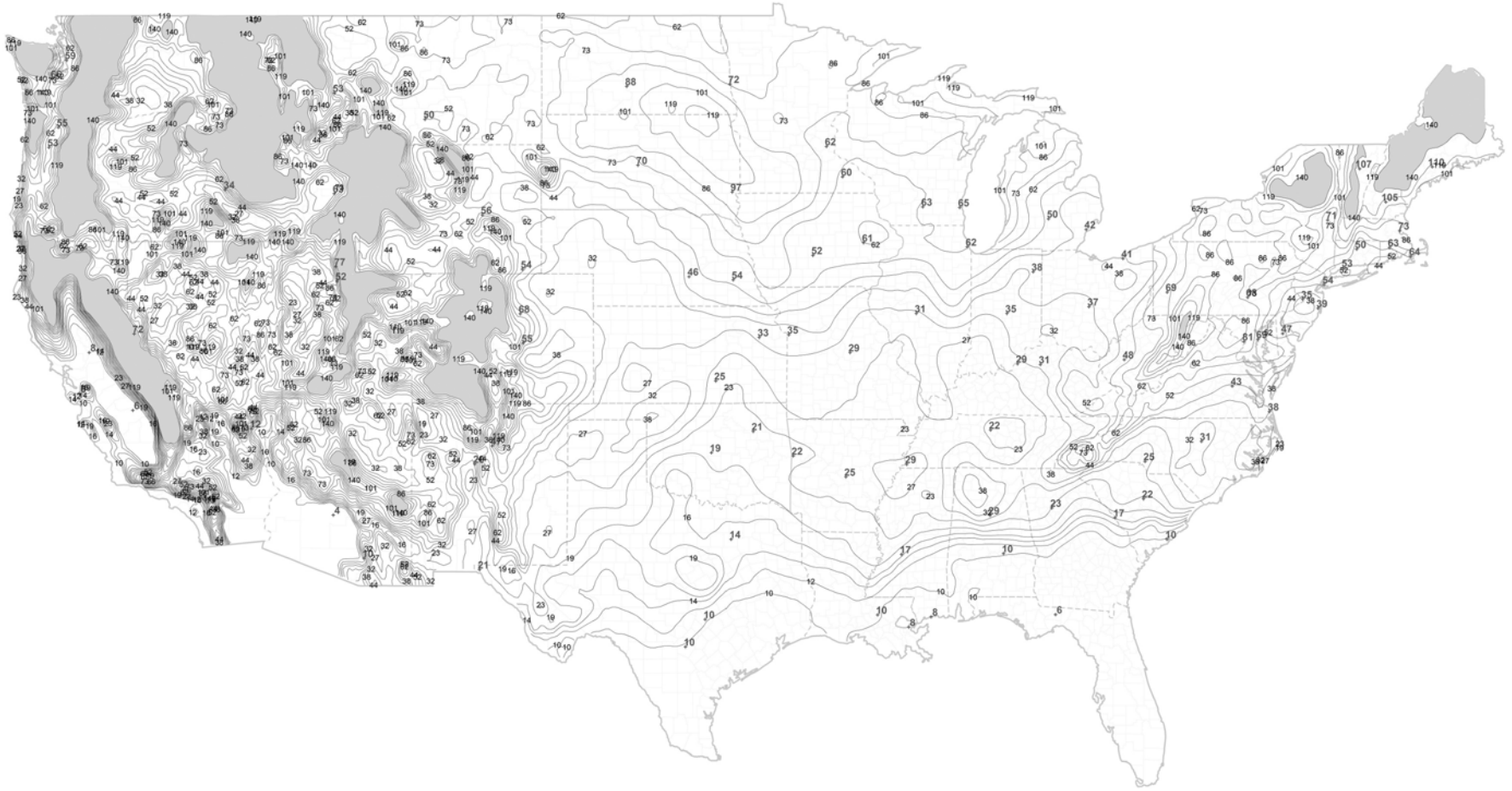


FIGURE 1608*A*.2(3)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY III FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2.

Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or an approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a "+" symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

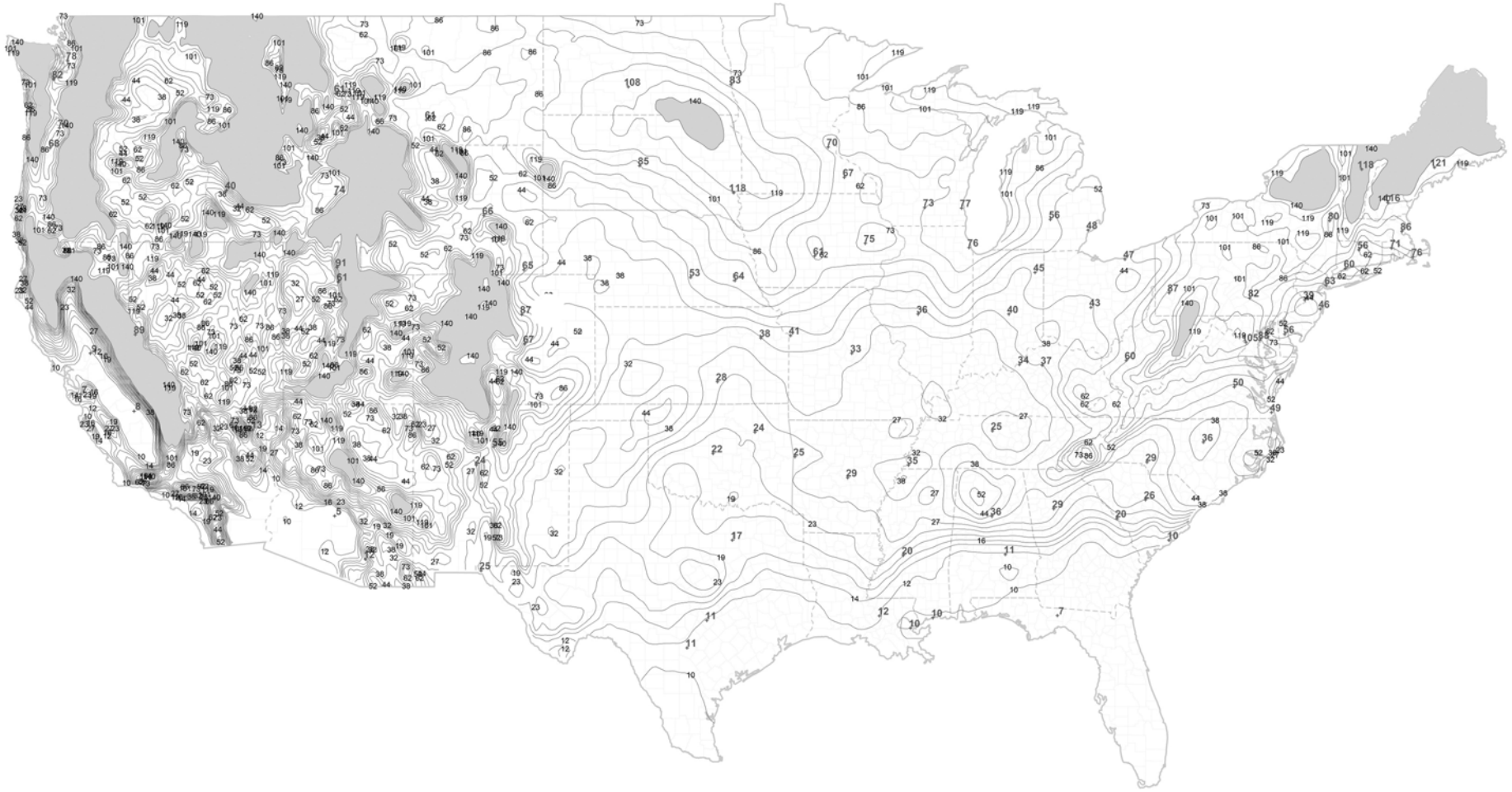


FIGURE 1608*A*.2(4)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY IV FOR THE CONTERMINOUS UNITED STATES (lb/ft^2)

For SI: 1 pound per square foot = 0.0479 kN/m^2.

Notes:

1. Location-specific ground snow load values are provided in the Ground Snow Load Geodatabase of geocoded design ground snow load values, which can be accessed at the ASCE 7 Hazard Tool at https://asce7hazardtool.online/ or an approved equivalent.
2. Lines shown on the figure are contours separated by a constant ratio 1.18 with values of 10, 12, 14, 16, 19, 23, 27, 32, 38, 44, 52, 62, 73, 86, 101, 119 and 140 psf.
3. Values denoted with a "+" symbol indicate design ground snow loads at state capitals or other high-population locations.
4. Areas shown in gray represent areas with ground snow loads exceeding 140 psf. Ground snow load values for these locations can be determined from the Geodatabase.

1608*A*.2.1 Ground snow conversion. Where required, the ground snow loads, p_g, of Figures 1608*A*.2(1) through 1608*A*.2(4) and Table 1608*A*.2 shall be converted to allowable stress design ground snow loads, $p_{g(asd)}$, using Equation 16*A*-17.

Equation 16*A*-17 $p_{g(asd)} = 0.7p_g$

where:

$p_{g(asd)}$ = Allowable stress design ground snow load.

p_g = Ground snow load determined from Figures 1608*A*.2(1) through 1608*A*.2(4) and Table 1608*A*.2.

1608*A*.3 Ponding instability. Ponding instability on roofs shall be evaluated in accordance with ASCE 7.

1608A.4 Determination of snow loads. [DSA-SS] *The ground snow load or the design snow load for roofs shall conform with the adopted ordinance of the city, county, or city and county in which the project site is located, and shall be approved by DSA. See Section 106.1.2 for snow load posting requirements.*

SECTION 1609*A*—WIND LOADS

1609*A*.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

1609*A*.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic wind speed, *V*, and the exposure category for a site is permitted to be determined in accordance with Section 1609*A* or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609*A*.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609*A*.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609*A*.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.7 of ASCE 7.
7. Temporary structures complying with Section 3103.6.1.2.

The wind speeds in Figures 1609*A*.3(1) through 1609*A*.3(4) are basic wind speeds, *V*, and shall be converted in accordance with Section 1609.3.1 to allowable stress design wind speeds, V_{asd}, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1609*A*.1.1.1 Applicability. The provisions of ICC 600 are applicable only to buildings located within Exposure B or C as defined in Section 1609*A*.4. The provisions of ICC 600, AWC WFCM and AISI S230 shall not apply to buildings sited on the upper half of an isolated hill, ridge or escarpment meeting all of the following conditions:

1. The hill, ridge or escarpment is 60 feet (18 288 mm) or higher if located in Exposure B or 30 feet (9144 mm) or higher if located in Exposure C.
2. The maximum average slope of the hill exceeds 10 percent.
3. The hill, ridge or escarpment is unobstructed upwind by other such topographic features for a distance from the high point of 50 times the height of the hill or 2 miles (3.22 km), whichever is greater.

1609A.1.2 Story drift for wind loads. *The calculated story drift due to wind pressures with ultimate design wind speed, V_{ult}, shall not exceed 0.008 times the story height for buildings less than 65 feet (19812 mm) in height or 0.007 times the story height for buildings 65 feet (19812 mm) or greater in height.*

Exception: [DSA-SS] *This story drift limit need not be applied for single-story open structures in Risk Categories I and II.*

Exception: [OSHPD 1 & 4] *This story drift limit need not be applied for single-story open structures.*

1609*A*.2 Protection of openings. In windborne debris regions, glazing in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of an approved impact-resistant standard or ASTM E1996 referenced herein as follows:

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the large missile test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.

Exceptions:

1. Wood structural panels with a minimum thickness of $^7/_{16}$ inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in buildings with a mean roof height of 33 feet (10 058 mm) or less that are classified as a Group R-3 or R-4 occupancy. Panels shall be precut so that they shall be attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage

method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the components and cladding loads determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table 1609*A*.2 with corrosion-resistant attachment hardware provided and anchors permanently installed on the building is permitted for buildings with a mean roof height of 45 feet (13 716 mm) or less where V_{asd} determined in accordance with Section 1609*A*.3.1 does not exceed 140 mph (63 m/s).

2. Glazing in Risk Category I buildings, including greenhouses that are occupied for growing plants on a production or research basis, without public access shall be permitted to be unprotected.
3. Glazing in Risk Category II, III or IV buildings located over 60 feet (18 288 mm) above the ground and over 30 feet (9144 mm) above aggregate surface roofs located within 1,500 feet (457 m) of the building shall be permitted to be unprotected.

TABLE 1609*A*.2—WINDBORNE DEBRIS PROTECTION FASTENING SCHEDULE FOR WOOD STRUCTURAL PANELS[a, b, c, d]

FASTENER TYPE	FASTENER SPACING (inches)		
	Panel Span ≤ 4 feet	4 feet < Panel Span ≤ 6 feet	6 feet < Panel Span ≤ 8 feet
No. 8 wood-screw-based anchor with 2-inch embedment length	16	10	8
No. 10 wood-screw-based anchor with 2-inch embedment length	16	12	9
$^1/_4$-inch diameter lag-screw-based anchor with 2-inch embedment length	16	16	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N, 1 mile per hour = 0.447 m/s.

a. This table is based a on 140 mph basic wind speed, *V*, and a 45-foot mean roof height.

b. Fasteners shall be installed at opposing ends of the wood structural panel. Fasteners shall be located not less than 1 inch from the edge of the panel.

c. Anchors shall penetrate through the exterior wall covering with an embedment length of 2 inches minimum into the building frame. Fasteners shall be located not less than $2^1/_2$ inches from the edge of concrete block or concrete.

d. Where panels are attached to masonry or masonry/stucco, they shall be attached using vibration-resistant anchors having a minimum ultimate withdrawal capacity of 1,500 pounds.

1609*A*.2.1 Louvers. Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540.

1609*A*.2.2 Garage doors. Garage door glazed opening protection for windborne debris shall meet the requirements of an approved impact-resisting standard or ANSI/DASMA 115.

1609*A*.3 Basic wind speed. The basic wind speed, *V*, in mph, for the determination of the wind loads shall be determined by Figures 1609*A*.3(1) through 1609*A*.3(4). ⬅

The basic wind speed, *V*, for use in the design of Risk Category I buildings and structures shall be obtained from Figure 1609*A*.3(1).

The basic wind speed, *V*, for use in the design of Risk Category II buildings and structures shall be obtained from Figure 1609*A*.3(2).

The basic wind speed, *V*, for use in the design of Risk Category III buildings and structures shall be obtained from Figure 1609*A*.3(3).

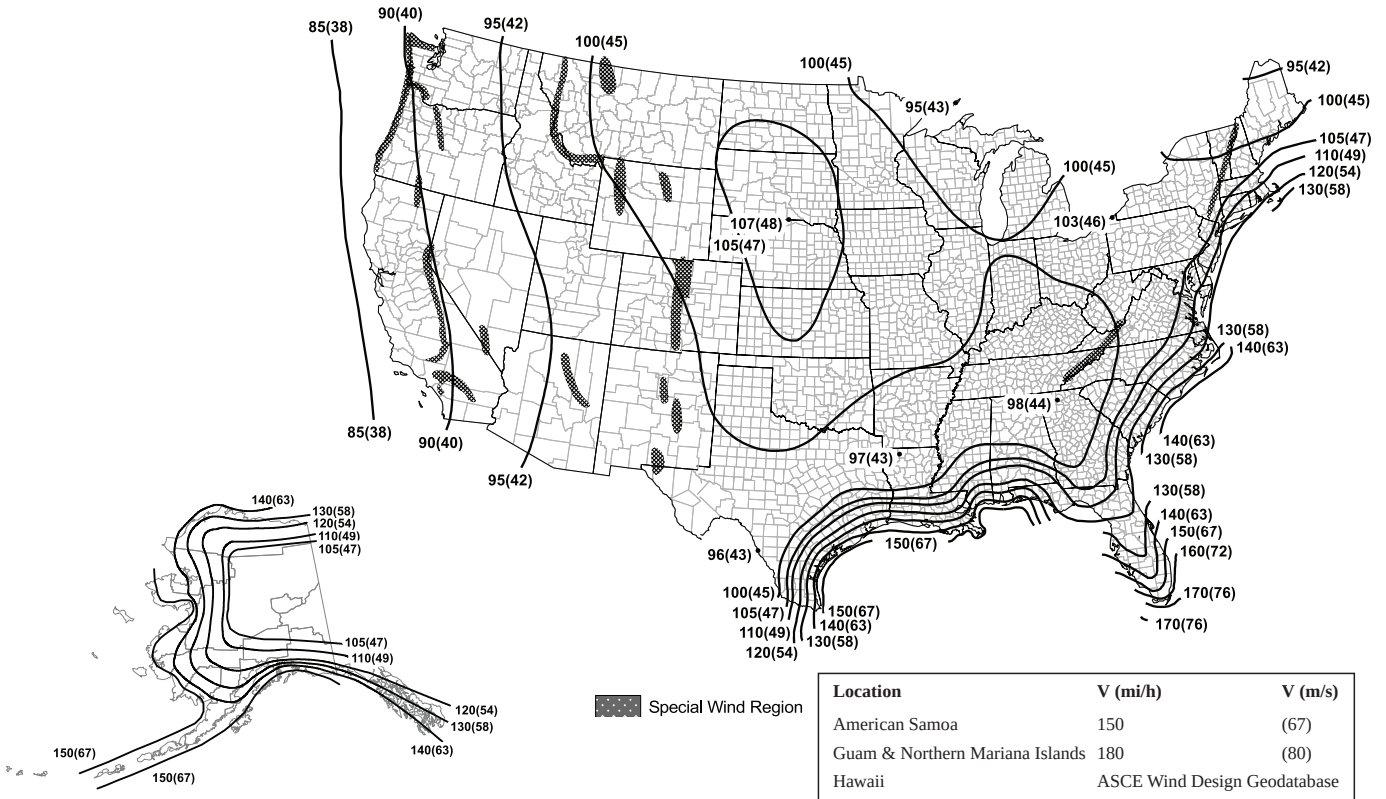
The basic wind speed, *V*, for use in the design of Risk Category IV buildings and structures shall be obtained from Figure 1609*A*.3(4).

Basic wind speeds for Hawaii, the US Virgin Islands and Puerto Rico shall be determined by using the ASCE Wind Design Geodatabase. The ASCE Wind Design Geodatabase is available at https://asce7hazardtool.online, or an approved equivalent.

The basic wind speed, *V*, for the special wind regions indicated near mountainous terrain and near gorges shall be in accordance with local jurisdiction requirements. The basic wind speeds, *V*, determined by the local jurisdiction shall be in accordance with Chapter 26 of ASCE 7.

In nonhurricane-prone regions, when the basic wind speed, *V*, is estimated from regional climatic data, the basic wind speed, *V*, shall be determined in accordance with Chapter 26 of ASCE 7.

FIGURE 1609*A*.3(1)—BASIC WIND SPEEDS, *V*, FOR RISK CATEGORY I BUILDINGS AND OTHER STRUCTURES



Location	V (mi/h)	V (m/s)
American Samoa	150	(67)
Guam & Northern Mariana Islands	180	(80)
Hawaii	ASCE Wind Design Geodatabase	
Puerto Rico	ASCE Wind Design Geodatabase	
U.S. Virgin Islands	ASCE Wind Design Geodatabase	

Notes:

1. Values are 3-second gust wind speeds in miles per hour (m/s) at 33 feet (10 m) above ground for Exposure Category C.
2. Linear interpolation is permitted between contours. Point values are provided to aid with interpolation.
3. Islands, coastal areas and land boundaries outside the last contour shall use the last wind speed contour.
4. Location-specific basic wind speeds shall be determined using the ASCE Wind Design Geodatabase.
5. Wind speeds for Hawaii, the US Virgin Islands and Puerto Rico shall be determined from the ASCE Wind Design Geodatabase.
6. Mountainous terrain, gorges, ocean promontories and special wind regions shall be examined for unusual wind conditions. Site-specific values for selected special wind regions shall be determined using the ASCE Wind Design Geodatabase.
7. Wind speeds correspond to approximately a 15-percent probability of exceedance in 50 years (annual exceedance probability = 0.00333, MRI = 300 years).
8. The ASCE Wind Design Geodatabase can be accessed at the ASCE 7 Hazard Tool (https://asce7hazardtool.online) or approved equivalent.

required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

Exception: Where concrete slabs with continuous reinforcement having an area not less than 0.0015 times the concrete area in each of two orthogonal directions are present and are either monolithic with or equivalently bonded to beams, girders or columns, the longitudinal reinforcing or prestressing steel passing through the column reinforcement shall have a nominal tensile strength of one-third of the required one-way vertical strength of the connection of the floor or roof system to the column in each direction of beam or slab reinforcement passing through the column.

1616*A*.2.2 Structural steel, open web steel joist or joist girder, or composite steel and concrete frame structures. Frame structures constructed with a structural steel frame or a frame composed of open web steel joists, joist girders with or without other structural steel elements or a frame composed of composite steel or composite steel joists and reinforced concrete elements shall conform to the requirements of this section.

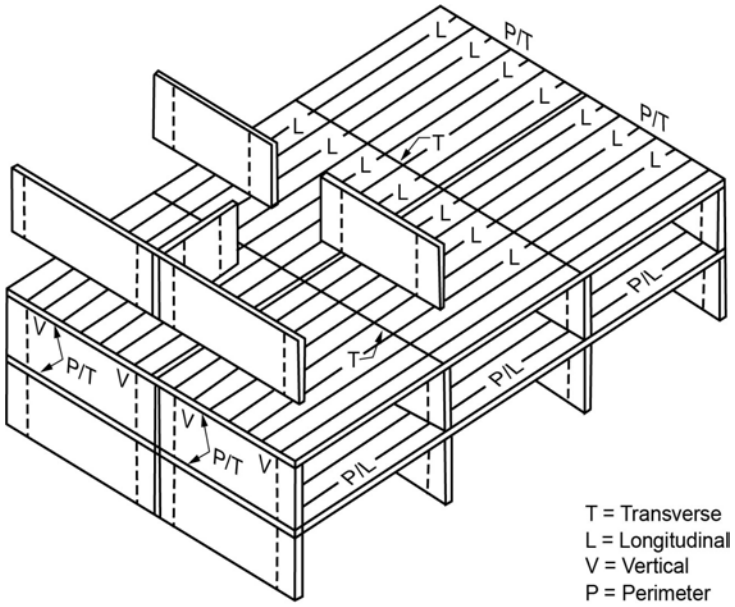
1616*A*.2.2.1 Columns. Each column splice shall have the minimum design strength in tension to transfer the design dead and live load tributary to the column between the splice and the splice or base immediately below.

1616*A*.2.2.2 Beams. End connections of all beams and girders shall have a minimum nominal axial tensile strength equal to the required vertical shear strength for allowable stress design (ASD) or two-thirds of the required shear strength for load and resistance factor design (LRFD) but not less than 10 kips (45 kN). For the purpose of this section, the shear force and the axial tensile force need not be considered to act simultaneously.

Exception: Where beams, girders, open web joist and joist girders support a concrete slab or concrete slab on metal deck that is attached to the beam or girder with not less than $^{3}/_{8}$-inch-diameter (9.5 mm) headed shear studs, at a spacing of not more than 12 inches (305 mm) on center, averaged over the length of the member, or other attachment having equivalent shear strength, and the slab contains continuous distributed reinforcement in each of two orthogonal directions with an area not less than 0.0015 times the concrete area, the nominal axial tension strength of the end connection shall be permitted to be taken as half the required vertical shear strength for ASD or one-third of the required shear strength for LRFD, but not less than 10 kips (45 kN).

1616*A*.3 Bearing wall structures. Bearing wall structures shall have vertical ties in all load-bearing walls and longitudinal ties, transverse ties and perimeter ties at each floor level in accordance with this section and as shown in Figure 1616*A*.3.

FIGURE 1616*A*.3—LONGITUDINAL, PERIMETER, TRANSVERSE AND VERTICAL TIES



1616*A*.3.1 Concrete wall structures. Precast bearing wall structures constructed solely of reinforced or prestressed concrete, or combinations of these shall conform to the requirements of Sections 16.2.4 and 16.2.5 of ACI 318.

1616*A*.3.2 Other bearing wall structures. Ties in bearing wall structures other than those covered in Section 1616*A*.3.1 shall conform to this section.

1616*A*.3.2.1 Longitudinal ties. Longitudinal ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Longitudinal ties shall extend across interior load-bearing walls and shall connect to exterior load-bearing walls and shall be spaced at not greater than 10 feet (3038 mm) on center. Ties shall have a minimum nominal tensile strength, T_T, given by Equation 16*A*-21. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

Equation 16*A*-21 $T_T = w\,LS \le \alpha_T S$

where:

L = The span of the horizontal element in the direction of the tie, between bearing walls, feet (m).

w = The weight per unit area of the floor or roof in the span being tied to or across the wall, psf (N/m^2).

S = The spacing between ties, feet (m).

α_T = A coefficient with a value of 1,500 pounds per foot (2.25 kN/m) for masonry bearing wall structures and a value of 375 pounds per foot (0.6 kN/m) for structures with bearing walls of cold-formed steel light-frame construction.

1616*A*.3.2.2 Transverse ties. Transverse ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Transverse ties shall be placed not farther apart than the spacing of load-bearing walls. Transverse ties shall have minimum nominal tensile strength T_T, given by Equation 16*A*-21. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

1616*A*.3.2.3 Perimeter ties. Perimeter ties shall consist of continuous reinforcement in slabs; continuous or spliced decks or sheathing; continuous or spliced members framing to, within or across walls; or connections of continuous framing members to walls. Ties around the perimeter of each floor and roof shall be located within 4 feet (1219 mm) of the edge and shall provide a nominal strength in tension not less than T_p, given by Equation 16*A*-22. For ASD the minimum nominal tensile strength shall be permitted to be taken as 1.5 times the allowable tensile stress times the area of the tie.

Equation 16*A*-22 $T_p = 200w \le \beta_T$

For SI: $T_p = 90.7w \le \beta_T$

where:

w = As defined in Section 1616*A*.3.2.1.

β_T = A coefficient with a value of 16,000 pounds (7200 kN) for structures with masonry bearing walls and a value of 4,000 pounds (1300 kN) for structures with bearing walls of cold-formed steel light-frame construction.

1616*A*.3.2.4 Vertical ties. Vertical ties shall consist of continuous or spliced reinforcing, continuous or spliced members, wall sheathing or other engineered systems. Vertical tension ties shall be provided in bearing walls and shall be continuous over the height of the building. The minimum nominal tensile strength for vertical ties within a bearing wall shall be equal to the weight of the wall within that story plus the weight of the diaphragm tributary to the wall in the story below. Not fewer than two ties shall be provided for each wall. The strength of each tie need not exceed 3,000 pounds per foot (450 kN/m) of wall tributary to the tie for walls of masonry construction or 750 pounds per foot (140 kN/m) of wall tributary to the tie for walls of cold-formed steel light-frame construction.

SECTION 1617A—MODIFICATIONS TO ASCE 7

1617A.1 General. *The text of ASCE 7 shall be modified as indicated in Sections 1617A.1.1 through 1617A.1.41.*

1617A.1.1 ASCE 7, Section 1.3. *Modify ASCE 7, Section 1.3 by adding Section 1.3.8 as follows:*

1.3.8 Structural design criteria. *Where design is based on ASCE 7, Chapters 16, 17, 18 or 31, the seismic ground motion, wind tunnel test-based design recommendations, analysis and design methods, material assumptions, testing requirements and acceptance criteria shall be submitted to the enforcement agency as an alternative system.*

[DSA-SS] *Peer review requirements in Section 322 of the California Existing Building Code shall apply to design reviews required by ASCE 7, Chapters 17, 18, 31 and ASCE 49.*

[OSHPD 1 & 4] *Peer review requirements in Section 1617A.1.41 of this code shall apply to design reviews required by ASCE 7, Chapters 17, 18, 31 and ASCE 49.*

1617A.1.2 ASCE 7, Section 11.1.3. *Replace last paragraph of ASCE 7, Section 11.1.3, by the following:*

Non-building structures similar to buildings shall be designed and detailed in accordance with Chapter 12.

1617A.1.3 Reserved.

1617A.1.4 ASCE 7, Table 12.2-1. *Modify ASCE 7, Table 12.2-1 as follows:*

A. BEARING WALL SYSTEMS

6. Intermediate Precast Shear Walls—*Not permitted by OSHPD.*

18. Light-framed walls with shear panels of all other materials—*Not permitted by OSHPD and DSA-SS.*

B. BUILDING FRAME SYSTEMS

3. Steel ordinary concentrically braced frames— *Not permitted by OSHPD.*

9. Intermediate Precast Shear Walls—*Not permitted by OSHPD.*

25. Light-framed walls with shear panels of all other materials—*Not permitted by OSHPD and DSA-SS.*

27. Special steel plate shear wall—*Not permitted by OSHPD.*

C. MOMENT-RESISTING FRAME SYSTEMS

2. Steel special truss moment frames—*Not permitted by OSHPD.*

3. Steel intermediate moment frames—*Not permitted by OSHPD except for single-story canopies and independent covered walkways where R, C_d and Ω_0 = 1.5 and the roof dead load is less than 20 psf.*

4. Steel ordinary moment frames—*Not permitted by OSHPD except for single-story canopies and independent covered walkways where R, C_d and Ω_0 = 1.5 and the roof dead load is less than 20 psf.*

12. Cold-formed steel–special bolted moment frame—*Not permitted by DSA-SS and OSHPD.*

G. CANTILEVER COLUMN SYSTEMS DETAILED TO CONFORM WITH THE REQUIREMENTS FOR:

1. Steel special cantilever column systems—*Not permitted by OSHPD except for single-story canopies and independent covered walkways where R, C_d and Ω_0 = 1.5 and roof dead load is less than 20 psf.*

3. Special reinforced concrete moment frames—Not permitted by OSHPD.

Exceptions:

1. *Systems listed in this section can be used as an alternative system when preapproved by the enforcement agency.*
2. *Rooftop or other supported structures not exceeding two stories in height and 10 percent of the total structure weight can use the systems in this section when designed as components per ASCE 7, Chapter 13.*
3. *Systems listed in this section can be used for seismically isolated buildings, when permitted by ASCE 7, Section 17.2.5.4.*

1617A.1.5 Reserved.

1617A.1.6 Reserved.

1617A.1.7 ASCE 7, Section 12.2.5.6.1 [DSA-SS] *The exception after the first paragraph is not permitted by DSA-SS.*

1617A.1.8 ASCE 7, Section 12.2.5.7.1 [DSA-SS] *The exception after the first paragraph is not permitted by DSA-SS.*

1617A.1.9 ASCE 7, Section 12.2.5.7.2 [DSA-SS] *The exception after the first paragraph is not permitted by DSA-SS.*

1617A.1.10 ASCE 7, Section 12.3.3.1. *Replace ASCE 7, Section 12.3.3.1 by the following:*

12.3.3.1 Prohibited vertical irregularities for Seismic Design Categories *D through* F. Structures assigned to Seismic Design Category *D*, E or F that have vertical irregularities Type 1b, 4a or 4b of Table 12.3-2 shall not be permitted. <

Exception: Structures assigned to Seismic Design Category *D*, E or F that have vertical irregularity Type 4a shall be permitted where the story lateral strength is not less than 80% of that in the story above.

1617A.1.11 ASCE 7, Section 12.7.2. *Modify ASCE 7, Section 12.7.2, by adding Item 7 to read as follows:*

7. *Where buildings provide lateral support for walls retaining earth, and the exterior grades on opposite sides of the building differ by more than 6 feet (1829 mm), the load combination of the seismic increment of earth pressure due to earthquake acting on the higher side, as determined by a geotechnical engineer qualified in soils engineering plus the difference in earth pressures shall be added to the lateral forces provided in this section.*

1617A.1.12 ASCE 7, Section 12.10.2.1. *Replace Exception to ASCE 7, Section 12.10.2.1 by the following:*

Exception: In *light-frame* structures or portions thereof braced entirely by wood light-frame shear walls, collector elements and their connections, including connections to vertical elements, need only be designed to resist forces using the load combinations of Section 2.3.6 with seismic forces determined in accordance with Section 12.10.1.1.

1617A.1.13 ASCE 7, Section 12.13.5.2. *Modify ASCE 7, Section 12.13.5.2 by the following:*

Replace last sentence by the following: When vertical nominal strength (upward or downward) is determined by approved in-situ prototype testing program, resistance factor (ϕ) shall be permitted to be 0.75 (ϕ = 0.75).

1617A.1.14 Reserved.

1617A.1.15 ASCE 7, Section 12.13.1. *Modify ASCE 7, Section 12.13.1 by adding Section 12.13.1.1 as follows:*

12.13.1.1 Foundations and superstructure-to-foundation connections. *The foundation shall be capable of transmitting the design base shear and the overturning forces from the structure into the supporting soil. Stability against overturning and sliding shall be in accordance with Section 1605A.1.1.*

In addition, the foundation and the connection of the superstructure elements to the foundation shall have the strength to resist, in addition to gravity loads, the lesser of the following seismic loads:

1. *The strength of the superstructure elements.*
2. *The maximum forces that can be delivered to the foundation in a fully yielded structural system.*
3. *Forces from the load combinations with overstrength factor in accordance with ASCE 7, Section 12.4.3.1.*

Exceptions:

1. *Where referenced standards specify the use of higher design loads.*
2. *When it can be demonstrated that inelastic deformation of the foundation and superstructure-to-foundation connection will not result in a weak story or cause collapse of the structure.*
3. *Where seismic force-resisting system consists of light framed walls with shear panels, unless the reference standard specifies the use of higher design loads.*

Where the computation of the seismic overturning moment is by the equivalent lateral-force method or the modal analysis method, reduction in overturning moment permitted by section 12.13.4 of ASCE 7 may be used.

Where moment resistance is assumed at the base of the superstructure elements, the rotation and flexural deformation of the foundation as well as deformation of the superstructure-to-foundation connection shall be considered in the drift and deformation compatibility analyses.

1617A.1.16 ASCE 7, Section 12.13.9.2. *Modify ASCE 7, Section 12.13.9.2 by adding the following sentence at the end of the exception:*

Seismic load effects determined in accordance with Section 12.4 need not be considered in this check.

1617A.1.17 ASCE 7, Section 13.1.3. [OSHPD 1 & 4] *Modify ASCE 7, Section 13.1.3 by the following:*

All nonstructural components shall have a component importance factor, I_p, equal to 1.5.

Exception: *Hospital buildings rated SPC-1 and SPC-2 not providing services/systems, utilities or access/egress to general acute care buildings designated as SPC 3 or higher in accordance with Chapter 6 of the California Administrative Code, shall be permitted to use component importance factor, I_p, as given in ASCE 7, Section 13.1.3.*

1617A.1.18 ASCE 7, Section 13.1.4. *Replace ASCE 7, Section 13.1.4, with the following:*

13.1.4. Nonstructural component and equipment support and attachment requirements: *The following nonstructural components and equipment shall be anchored in accordance with this section. Design and detailing shall be in accordance with Chapter 13 except as modified by this section.*

1. ***Fixed Equipment:*** *Equipment shall be anchored if it is directly attached to the building utility services such as electricity, gas or water. For the purposes of this requirement, "directly attached" shall include all electrical connections except plugs for 110/220-volt receptacles having a flexible cable/cord. Equipment that is connected to the building plumbing system with a shut-off valve in proximity to the equipment shall not be considered as directly attached provided the inside diameter of the pipe/tubing is less than $^1/_2$ inch (12.7 mm).*
2. ***Movable Equipment:*** *Equipment is subject to the same requirement as fixed equipment, but is permitted to be anchored by re-attachable anchors or restraints in a manner approved by the enforcement agency. Utilities and services at the equipment shall have flexible connections to allow for necessary movement.*
3. ***[OSHPD 1, 2, 4 & 5] Mobile Equipment:*** *Equipment heavier than 400 pounds (181.4 kg) that has a center of mass located 4 feet (1219 mm) or more above the adjacent floor or roof level that directly support the equipment shall be restrained in a manner approved by the enforcement agency when stored and not in use, unless the equipment is stored in an equipment storage room.*

   [DSA-SS] Mobile Equipment: *Equipment heavier than 400 pounds (181.4 kg) or has a center of mass located 4 feet (1219 mm) or more above the adjacent floor or roof level that directly supports the equipment shall be restrained in a manner approved by the enforcement agency. Mobile equipment shall be restrained when not in use and is stored, unless the equipment is stored in a storage room that does not house hazardous materials or any facility systems or fixed equipment that can be affected by mobile equipment lacking restraint.*
4. ***[OSHPD 1, 2, 4 & 5] Countertop Equipment:*** *Countertop equipment shall be subject to the same anchorage or restraint requirements for fixed, movable, mobile or other equipment, as applicable.*

   [DSA-SS] Countertop Equipment: *Countertop equipment shall be subject to the same anchorage or restraint requirements for fixed or movable equipment, as applicable. Countertop equipment shall also be subject to the same requirements as mobile or other equipment if weight of equipment is greater than 100 pounds (45 kg) and has a center of mass located 4 feet (1219 mm) or more above the adjacent floor level or if equipment could fall and block a required means of egress.*
5. ***[OSHPD 1, 2, 4 & 5] Temporary Equipment:*** *Equipment for uses greater than 30 days but less than or equal to 180 days and where this section requires supports and attachments, the following shall apply:*
   a. *Seismic design for supports and attachments for temporary equipment shall meet the requirements of Chapter 13; however, the calculated F_p may be reduced by 50 percent. It is acceptable to use ballasts for seismic bracing supports and attachments and to limit the design criteria to overturning unless directly or indirectly supported by the building structure.*
   b. *Wind design speeds may be reduced as prescribed in ASCE 37 or other standard approved by OSHPD.*
   c. *Temporary piping, conductors and ductwork shall be supported. Seismic design for supports and attachments of temporary piping, conductors and ductwork is not required.*
6. ***[OSHPD 1, 2, 4 & 5] Interim Equipment:***
   a. *Seismic design for supports and attachments for interim equipment shall meet the requirements of Chapter 13 with the following modifications; 1) The calculated F_p used in the design may be reduced by 50 percent. 2) It is acceptable to use ballasts for seismic or wind bracing supports and attachments and limit the design to overturning only without the consideration of sliding, unless directly or indirectly supported by the building structure. 3) Anticipated duration of use must be specified.*
   b. *Wind design speeds may be reduced as prescribed in ASCE 37-14 or other standard approved by OSHPD.*
   c. *Piping, conductors and ductwork shall be supported. Seismic design for supports and attachments of piping, conductors and ductwork is not required.*

7. ***Other Equipment:*** *Equipment shall be anchored where any of the following apply:*
   a. ***[OSHPD 1, 2, 4 & 5]*** *Essential to hospital operations and weight of equipment is greater than 100 pounds (45 kg).*

      [DSA-SS] *Weight of equipment is greater than 100 pounds (45 kg) and essential to operations for emergency preparedness, communications and operations centers, and other facilities required for emergency response of state-owned essential services buildings as defined in the California Administrative Code (Title 24, Part 1, CCR) Section 4-207 and all structures required for their continuous operation or access/egress.*
   b. ***[OSHPD 1, 2, 4 & 5]*** *Could fall within the patient care vicinity as defined in Article 517.2 of the California Electrical Code.*
   c. *Could fall and block a required means of egress.*
   d. ***[OSHPD 1, 2, 4 & 5]*** *Weight of equipment is greater than 400 pounds (181.4 kg).*
   e. ***[DSA-SS]*** *Weight of equipment is greater than 400 pounds (181.4 kg) or center of mass is located greater than 4 feet (1219 mm) above the finished floor or roof level that directly supports the component.*

      [OSHPD 1, 2, 4 & 5] *Weight of equipment is greater than 200 pounds (90 kg) and center of mass located greater than 4 feet (1219 mm) measured from the finished floor.*
8. *Equipment with hazardous contents.*
9. *Other architectural, mechanical and electrical components stated in Chapter 13.* ***[DSA-SS]*** *Cabinets shall be restrained in a manner approved by the enforcement agency if they could fall and block a required means of egress.*
10. ***Wall-, Roof- or Floor-Hung Equipment:*** *Seismic design and seismic details shall be provided for wall-, roof- or floor-hung nonstructural components and equipment when the component weighs more than 20 pounds (9 kg) or, in the case of a distribution system, 5 pounds per foot (73 N/m).*

[OSHPD 1, 2, 4 & 5] Exemptions:

1. *Furniture except storage cabinets as noted in Table 13.5-1.*
2. *Nonstructural components and equipment, that are attached to the building, provided that the component weighs 20 pounds (9 kg) or less or, in the case of a distribution system, 5 pounds per foot (73 N/m) or less. Seismic design and details need not be provided.* <
3. *Seismic design need not be provided for discrete architectural, mechanical and electrical components and equipment that are attached to the building and anchorage is detailed on the construction documents, provided that the component weighs 400 pounds (181.4 kg) or less, and the center of mass is located 4 feet (1219 mm) or less above the adjacent floor or roof level that directly supports the component and flexible connections are provided between the component and associated ductwork, piping and conduit where required.* ||

[DSA-SS] Exemptions: *The following nonstructural components are exempt from the requirements of ASCE 7, Chapter 13:*

1. *Furniture except storage cabinets as noted in Table 13.5-1.*
2. *Nonstructural components and equipment that are positively attached to the structure, provided that the component weighs 20 pounds (9 kg) or less.*
3. *Discrete architectural, mechanical and electrical components and equipment that are positively attached to the structure, provided that the component weighs 400 pounds (181.4 kg) or less, and the center of mass is located 4 feet (1219 mm) or less above the adjacent floor or roof level that directly supports the component, flexible connections are provided between the component and associated ductwork, piping and conduit where required, and the component importance factor, I_p, is equal to 1.0.*

1617A.1.19 ASCE 7, Section 13.4 *Replace ASCE 7, Sections 13.4.2.3, with the following:*

13.4.2.3 Prequalified post-installed anchors and specialty inserts in concrete and masonry.

Post-installed anchors, post-installed reinforcing bars and specialty inserts in concrete that are pre-qualified for seismic applications in accordance with ACI 355.2, ACI 355.4, ICC-ES AC193, ICC-ES AC232, ICC-ES AC308 or ICC-ES AC446 shall be permitted. Post-installed anchors in masonry shall be pre-qualified for seismic applications in accordance with ICC-ES AC01 or AC58. ||<

Note: *The removal and resetting of post-installed mechanical anchors are prohibited by ACI 318 Section 17.1.3.*

1617A.1.20 ASCE 7, Section 13.4.5 *Modify ASCE 7, Section 13.4.5 by adding Section 13.4.5.1 as follows:*

13.4.5.1 Power actuated fasteners. *Power actuated fasteners qualified in accordance with ICC ES AC 70 shall be deemed to satisfy the requirements of Section 13.4.5.*

Power actuated fasteners shall be permitted in seismic shear for components exempt from permit requirements by Section 1617A.1.18 of this code and for interior non-bearing non-shear wall partitions only. Power actuated fastener shall not be used to anchor seismic bracing, exterior cladding or curtain wall systems.

Exception: *Power actuated fasteners in steel to steel connections prequalified for seismic application by cyclic tests in accordance with ICC ES AC 70 shall be permitted for seismic design.*

1617A.1.21 ASCE 7, Section 13.5.6.2. *Modify ASCE 7, Section 13.5.6.2 by the following exception added to the end of Section 13.5.6.2.2 and by adding Section 13.5.6.2.3 as follows:*

Exception to Section 13.5.8.1 shall not be used in accordance with ASTM E580 Section 5.5.

13.5.6.2.3 Modification to ASTM E580. *Modify ASTM E580 by the following:*

1. ***Exitways.*** *Lay-in ceiling assemblies in exitways shall be installed with a main runner or cross runner surrounding all sides of each piece of tile, board or panel and each light fixture or grille. A cross runner that supports another cross runner shall be considered as a main runner for the purpose of structural classification. Splices or intersections of such runners shall be attached with through connectors such as pop rivets, screws, pins, plates with end tabs or other approved connectors. Lateral force diagonal bracing may be omitted in the short or transverse direction of exitways, not exceeding 8 feet wide, when perimeter support in accordance with ASTM E580 Sections 5.2.2 and 5.2.3 is provided and the perimeter wall laterally supporting the ceiling in the short or transverse direction is designed to carry the ceiling lateral forces. The connections between the ceiling grid, wall angle and the wall shall be designed to resist the ceiling lateral forces.*
2. ***Corridors and lobbies.*** *Expansion joints shall be provided in the ceiling at intersections of corridors and at junctions of corridors and lobbies or other similar areas.*
3. ***Lay-in panels.*** *Metal panels and panels weighing more than $^1/_2$ pounds per square foot (24 N/m^2) other than acoustical tiles shall be positively attached to the ceiling suspension runners.*
4. ***Lateral force bracing.*** *Lateral force bracing is required for all ceiling areas except that they shall be permitted to be omitted in rooms with floor areas up to 144 square feet when perimeter support in accordance with ASTM E580, Sections 5.2.2 and 5.2.3, are provided and perimeter walls are designed to carry the ceiling lateral forces. The connections between the ceiling grid, wall angle and the wall shall be designed to resist the ceiling lateral forces. Horizontal restraint point spacing shall be justified by analysis or test and shall not exceed a spacing of 12 feet by 12 feet. Bracing wires shall be secured with four tight twists in $1^1/_2$ inches, or an approved alternate connection.*
5. *Ceiling support and bracing wires shall be spaced a minimum of 6 inches from all pipes, ducts, conduits and equipment that are not braced for horizontal forces, unless approved otherwise by the building official.*
6. ***[OSHPD 1 & 4]*** *Acoustical tile or lay-in panel ceiling grids constructed of aluminum shall have the hanger spacing at 2 feet on center each way and total ceiling weight of such systems, W_p, shall not exceed 2 psf.*

1617A.1.22 ASCE 7, Section 13.5.7. [OSHPD 1 & 4] *Modify ASCE 7, Section 13.5.7, by the following:*

All access floors shall be special access floors in accordance with Section 13.5.7.2, except for raised roof or exterior floor paver systems.

1617A.1.23 ASCE 7, Section 13.6.2.1. [OSHPD 1 & 4] *Modify ASCE 7 Section 13.6.2.1 by adding the following to the end of the section:*

Use of this section shall be considered as an alternative system. Alternatively, HVACR systems shall require special seismic certification in accordance with Section 1705A.14.3 of this code.

1617A.1.24 ASCE 7, Section 13.6.5. *Replace ASCE 7, Section 13.6.5 as follows:*

13.6.5 Distribution Systems: Conduit, Cable Tray and Raceways. Cable trays and raceways shall be designed for seismic forces and seismic relative displacements as required in Section 13.3. Conduit *equal to or* greater than 2.5 inches (64 mm) trade size and attached to panels, cabinets or other equipment subject to seismic relative displacement, D_{pl}, shall be provided with flexible connections or designed for seismic forces and seismic relative displacements as required in Section 13.3.

Exceptions:

1. Design for the seismic forces and relative displacements of Section 13.3 shall not be required for raceways where flexible connections or other assemblies are provided between the cable tray or raceway and associated components to accommodate the relative displacement, where the cable tray or raceway is positively attached to the structure, and one of the following apply:
   a. Trapeze assemblies with $^3/_8$ inch (10 mm) or $^1/_2$ inch (13-mm) in diameter rod hangers not exceeding 12 inches (305 mm) in length from the conduit, cable tray or raceway support point to the connection at the supporting structure are used to support the cable tray or raceway, and the total weight supported by any single trapeze is 100 pounds (445 N) or less; or
   b. The conduit, cable tray or raceway is supported by individual rod hangers $^3/_8$ inch (10 mm) or $^1/_2$ inch (13 mm) in diameter, and each hanger in the raceway run is 12 inches (305 mm) or less in length from the conduit, cable tray or raceway support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds (220 N) or less.
2. Design for the seismic forces and relative displacements of Section 13.3 shall not be required for conduit, regardless of the value of I_p, where the conduit is less than 2.5 inches (64 mm) trade size.

Design for the displacements across seismic joints shall be required for conduit, cable trays and raceways with $I_p = 1.5$ without consideration of conduit size.

1617A.1.25 ASCE 7, Section 13.6.6. *Replace ASCE 7, Section 13.6.6 with the following:*

13.6.6 Distribution Systems: Duct Systems. HVACR and other duct systems shall be designed for seismic forces and seismic relative displacements as required in Section 13.3.

Exceptions: The following exceptions pertain to *ductwork* not designed to carry toxic, highly toxic or flammable gases or not used for smoke control:

1. Design for the seismic forces and relative displacements of Section 13.3 shall not be required for duct systems where flexible connections or other assemblies are provided to accommodate the relative displacement between

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 17 – SPECIAL INSPECTIONS AND TESTS

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter													**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)	**X**			**X**	**X**						**X**	**X**			**X**									
Adopt only those sections that are listed below			**X**																					
Chapter / Section																								
1701			X																					
1701.1.1											X	X			X									
1701.1.2											X	X			X									
1701.1.3											X	X			X									
1702			X																					
1703			X																					
1703.4											X	X			X									
1704.2				X	X						X	X			X									
1704.2.3											X	X			X									
1704.2.4											X	X			X									
1704.2.5.1											X	X			X									
1704.3.2											X	X			X									
1705.1			X																					
1705.2.1											X	X			X									
1705.2.2											X	X			X									
1705.2.3											X	X			X									
1705.2.4.1											X	X			X									
1705.2.5.1											X	X			X									
1705.2.7											X	X			X									
1705.2.8											X	X			X									
1705.3			X								X	X			X									
Table 1705.3			X								X	X			X									
1705.3.3											X	X			X									
1705.3.3.1											X	X			X									
1705.3.4											X	X			X									
1705.3.5											X	X			X									
1705.3.6											X	X			X									
1705.3.7											X	X			X									
1705.3.8											X	X			X									
1705.3.9											X	X			X									
1705.3.9.1											X	X			X									
1705.3.9.2											X	X			X									
1705.4											X	X			X									
1705.4.1											X	X			X									
1705.4.1.1											X	X			X									
1705.5.3			X																					
Table 1705.5.3			X																					
1705.5.4											X	X			X									
1705.5.5											X	X			X									
1705.5.6											X	X			X									
1705.5.7											X	X			X									
1705.6.1											X	X			X									

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 17 – SPECIAL INSPECTIONS AND TESTS—continued

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter													**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)	**X**			**X**	**X**						**X**	**X**			**X**									
Adopt only those sections that are listed below			**X**																					
Chapter / Section																								
1705.7.1											X	X			X									
1705.12.1			X																					
1705.12.2			X																					
1705.13.1.1											X	X			X									
1705.13.1.2											X	X			X									
1705.13.2			X																					
1705.13.3			X																					
1705.14.1.1											X	X			X									
1705.14.1.2											X	X			X									
1705.14.2											X	X			X									
1705.14.3.1											X	X			X									
1705.15			X																					
1705.16			X																					
1705.18			X								X	X			X									
1705.19 – 1705.20			X																					
1707.1	X			X	X																			
1710											X	X			X									

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

1705.14.2 Nonstructural components. For structures assigned to Seismic Design Category B, C, D, E or F, where the requirements of Section 13.2.1 of ASCE 7 for nonstructural components, supports or attachments are met by seismic qualification as specified in Item 2 therein, the registered design professional shall specify on the approved construction documents the requirements for seismic qualification by analysis, testing or experience data. Certificates of compliance for the seismic qualification shall be submitted to the building official as specified in Section 1704.5.

[OSHPD 1R, 2 & 5] *Seismic sway bracing components satisfying requirements of ANSI/FM 1950, ANSI/ASHRAE 171, or using an alternative testing protocol approved by the building official shall be deemed to satisfy the requirements of this section.*

Note: *Deemed to comply provisions provide acceptable options to comply with the code but do not mandate their use. Alternative systems in accordance with Section 104.2.3 and the California Administrative Code Section 7-104 are always acceptable when approved by the building official.*

1705.14.3 Designated seismic systems. For structures assigned to Seismic Design Category C, D, E or F and with designated seismic systems that are subject to the requirements of Section 13.2.3 of ASCE 7 for certification, the registered design professional shall specify on the approved construction documents the requirements to be met by analysis, testing or experience data as specified therein. Certificates of compliance documenting that the requirements are met shall be submitted to the building official as specified in Section 1704.5.

1705.14.3.1 Special seismic certification. [OSHPD 1R, 2 & 5] *Special seismic certification shall be required in accordance with Section 1705A.14.3. for all of the following:*

1. *Life-safety components, such as emergency and standby power systems, mechanical smoke removal systems and fire sprinkler/fire protection systems.*
2. *Medical, mechanical and electrical equipment and components required for life support for patients.*
3. *On-site power resources (PVs, batteries, fuel cells, etc.) provided to replace, in whole or in part, the public or private electric utility service.*
4. ***[OSHPD 2]*** *Alternate power systems including:*
    a. *Generators.*
    b. *UPS and batteries.*
    c. *Renewable electrical generation and control equipment.*
    d. *Panelboards as defined in the California Electrical Code (CEC) Article 100.*
    e. *Manual and automatic transfer switches.*
    f. *Switchgear and switchboards.*

1705.14.4 Seismic isolation systems. Seismic isolation systems in seismically isolated structures assigned to Seismic Design Category B, C, D, E or F shall be tested in accordance with Section 17.8 of ASCE 7.

[BF] 1705.15 Sprayed fire-resistive materials (SFRM). Special inspections and tests of sprayed fire-resistive materials (SFRM) applied to floor, roof and wall assemblies and structural members shall be performed in accordance with Sections 1705.15.1 through 1705.15.6. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents. The tests set forth in this section shall be based on samplings from specific floor, roof and wall assemblies and structural members. Special inspections and tests shall be performed during construction with an additional visual inspection after the rough installation of electrical, automatic sprinkler systems, mechanical and plumbing systems and suspension systems for ceilings, and before concealment where applicable. The required sample size shall not exceed 110 percent of that specified by the referenced standards in Sections 1705.15.4.1 through 1705.15.4.9.

[BF] 1705.15.1 Physical and visual tests. The special inspections and tests shall include the following to demonstrate compliance with the listing and the fire-resistance rating:

1. Condition of substrates.
2. Thickness of application.
3. Density in pounds per cubic foot (kg/m^3).
4. Bond strength adhesion/cohesion.
5. Condition of finished application.

[BF] 1705.15.2 Structural member surface conditions. The surfaces shall be prepared in accordance with the approved fire-resistance design and the written instructions of approved manufacturers. The prepared surface of structural members to be sprayed shall be inspected by the special inspector before the application of the SFRM.

[BF] 1705.15.3 Application. The substrate shall have a minimum ambient temperature before and after application as specified in the written instructions of approved manufacturers. The area for application shall be ventilated during and after application as required by the written instructions of approved manufacturers.

[BF] 1705.15.4 Thickness. Not more than 10 percent of the thickness measurements of the SFRM applied to floor, roof and wall assemblies and structural members shall be less than the thickness required by the approved fire-resistance design, and none shall be less than the minimum allowable thickness required by Section 1705.15.4.1.

[BF] 1705.15.4.1 Minimum allowable thickness. For design thicknesses 1 inch (25 mm) or greater, the minimum allowable individual thickness shall be the design thickness minus $^1/_4$ inch (6.4 mm). For design thicknesses less than 1 inch (25 mm), the

minimum allowable individual thickness shall be the design thickness minus 25 percent. Thickness shall be determined in accordance with ASTM E605. Samples of the SFRM shall be selected in accordance with Sections 1705.15.4.2 *through 1705.15.4.9.*

[BF] 1705.15.4.2 Floor, roof and wall assemblies. The thickness of the SFRM applied to floor, roof and wall assemblies shall be determined in accordance with ASTM E605, making not less than four measurements for each 1,000 square feet (93 m^2) of the sprayed area, or portion thereof, in each story.

[BF] 1705.15.4.3 Cellular decks. Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. Not fewer than four measurements shall be made, located symmetrically within the square area.

[BF] 1705.15.4.4 Fluted decks. Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. Not fewer than four measurements shall be made, located symmetrically within the square area, including one each of the following: valley, crest and sides. The average of the measurements shall be reported.

[BF] 1705.15.4.5 Structural members. The thickness of the SFRM applied to structural members shall be determined in accordance with ASTM E605. Thickness testing shall be performed on not less than 25 percent of the structural members on each floor.

[BF] 1705.15.4.6 Beams and girders. At beams and girders thickness measurements shall be made at nine locations around the beam or girder at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.7 Joists and trusses. At joists and trusses, thickness measurements shall be made at seven locations around the joist or truss at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.8 Wide-flanged columns. At wide-flanged columns, thickness measurements shall be made at 12 locations around the column at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.9 Hollow structural section and pipe columns. At hollow structural section and pipe columns, thickness measurements shall be made at not fewer than four locations around the column at each end of a 12-inch (305 mm) length.

[BF] 1705.15.5 Density. The density of the SFRM shall be not less than the density specified in the approved fire-resistance design. Density of the SFRM shall be determined in accordance with ASTM E605. The test samples for determining the density of the SFRM shall be selected as follows:

1. From each floor, roof and wall assembly at the rate of not less than one sample for every 2,500 square feet (232 m^2) or portion thereof of the sprayed area in each story.
2. From beams, girders, trusses and columns at the rate of not less than one sample for each type of structural member for each 2,500 square feet (232 m^2) of floor area or portion thereof in each story.

[BF] 1705.15.6 Bond strength. The cohesive/adhesive bond strength of the cured SFRM applied to floor, roof and wall assemblies and structural members shall be not less than 150 pounds per square foot (psf) (7.18 kN/m^2). The cohesive/adhesive bond strength shall be determined in accordance with the field test specified in ASTM E736 by testing in-place samples of the SFRM selected in accordance with Sections 1705.15.6.1 through 1705.15.6.3.

[BF] 1705.15.6.1 Floor, roof and wall assemblies. The test samples for determining the cohesive/adhesive bond strength of the SFRM shall be selected from each floor, roof and wall assembly at the rate of not less than one sample for every 2,500 square feet (232 m^2) of the sprayed area, or portion thereof, in each story.

[BF] 1705.15.6.2 Structural members. The test samples for determining the cohesive/adhesive bond strength of the SFRM shall be selected from beams, girders, trusses, columns and other structural members at the rate of not less than one sample for each type of structural member for each 2,500 square feet (232 m^2) of floor area or portion thereof in each story.

[BF] 1705.15.6.3 Primer, paint and encapsulant bond tests. Bond tests to qualify a primer, paint or encapsulant shall be conducted where the SFRM is applied to a primed, painted or encapsulated surface for which acceptable bond-strength performance between these coatings and the SFRM has not been determined. A bonding agent approved by the SFRM manufacturer shall be applied to a primed, painted or encapsulated surface where the bond strengths are found to be less than required values.

[BF] 1705.16 Intumescent fire-resistive materials. Special inspections and tests for intumescent fire-resistive materials applied to structural elements and decks shall be performed in accordance with AWCI 12-B. Special inspections and tests shall be based on the fire-resistance design as designated in the approved construction documents. Special inspections and tests shall be performed during construction. Additional visual inspection shall be performed after the rough installation and, where applicable, prior to the concealment of electrical, automatic sprinkler, mechanical and plumbing systems.

[BF] 1705.17 Exterior insulation and finish systems (EIFS). Special inspections shall be required for all EIFS applications.

Exceptions:

1. Special inspections shall not be required for EIFS applications installed over a water-resistive barrier with a means of draining moisture to the exterior.
2. Special inspections shall not be required for EIFS applications installed over masonry or concrete walls.

[BF] 1705.17.1 Water-resistive barrier coating. A water-resistive barrier coating complying with ASTM E2570 requires special inspection of the water-resistive barrier coating where installed over a sheathing substrate.

1709.5.2 Exterior windows and door assemblies not provided for in Section 1709.5.1. Exterior window and door assemblies shall be tested in accordance with ASTM E330. Exterior window and door assemblies containing glass shall comply with Section 2403. The design pressure for testing shall be calculated in accordance with Chapter 16. Each assembly shall be tested for 10 seconds at a load equal to 1.5 times the design pressure.

1709.5.2.1 Garage doors and rolling doors. Garage doors and rolling doors shall be tested in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the pass/fail criteria of ANSI/DASMA 108. Garage doors and rolling doors shall be labeled with a permanent label identifying the door manufacturer, the door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

1709.5.3 Windborne debris protection. Protection of exterior glazed openings in buildings located in windborne debris regions shall be in accordance with Section 1609.2.

1709.5.3.1 Impact protective systems testing and labeling. Impact protective systems shall be tested for impact resistance by an approved independent laboratory for compliance with ASTM E1886 and ASTM E1996 and for design wind pressure for compliance with ASTM E330. Required design wind pressures shall be determined in accordance with ASCE 7, and for the purposes of this section, multiplied by 0.6 to convert to allowable stress design.

Impact protective systems shall have a permanent label applied in accordance with Section 1703.5.4, identifying the manufacturer, product designation, performance characteristics, and approved inspection agency.

1709.6 Skylights and sloped glazing. Skylights and sloped glazing shall comply with the requirements of Chapter 24.

1709.7 Test specimens. Test specimens and construction shall be representative of the materials, workmanship and details normally used in practice. The properties of the materials used to construct the test assembly shall be determined on the basis of tests on samples taken from the load assembly or on representative samples of the materials used to construct the load test assembly. Required tests shall be conducted or witnessed by an approved agency.

SECTION 1710—OFF-SITE CONSTRUCTION [OSHPD 1R, 2 & 5]

1710.1 General. *This section applies to off-site construction and shall govern the requirements for planning, design, fabrication, assembly, inspection and regulatory compliance.*

1710.2 Construction. *In addition to other applicable requirements in this code, off-site construction shall be in accordance with ICC 1200, with the texts modified by Sections 1710.2.1 through 1710.2.2.*

1710.2.1 ICC 1200 Section 301.4. *Replace ICC 1200 Section 301.4 by the following:*

301.4 Use of shipping containers repurposed as buildings and building components. *Use of shipping containers repurposed as buildings and building components is not permitted by the California Building Code (CBC) Section 3114.*

1710.2.2 ICC 1200 Section 503.1. *Modify ICC 1200 Section 503.1 by adding the following:*

Quality Assurance/Quality Control (QA/QC) shall satisfy all the requirements for Testing, Inspection, and Observation (TIO) in the California Building Standards Code (CBSC).

1710.3 Regulatory compliance. *In addition to other applicable requirements in this code, off-site construction shall be inspected and regulated in accordance with ICC 1205, with texts modified by Sections 1710.3.1 through 1710.3.2.*

1710.3.1 ICC 1205 Section 302.1. *Modify ICC 1205 Section 302.1 by adding the following:*

Construction documents for plan approval shall satisfy all the requirements in the California Building Standards Code (CBSC).

1710.3.2 ICC 1205 Section 501.1. *Modify ICC 1205 Section 501.1 by adding the following:*

Testing, Inspection, and Observation (TIO) program shall satisfy all the requirements in the California Building Standards Code (CBSC).

2. *J7 (Welding Inspection and Nondestructive Testing).*
3. *J10 (Inspection of Composite Structures).*
4. *J11 (Inspection of H-Piles).*

Additionally, the applicable portions in Table 1705A.2.1 of the California Building Code shall apply.

1705*A*.13.1.2 Structural steel elements. Special inspections of structural steel elements in the seismic force-resisting systems of buildings and structures assigned to Seismic Design Category D, E or F other than those covered in Section 1705*A*.13.1.1, including struts, collectors, chords and foundation elements, shall be performed in accordance with the quality assurance requirements of AISC 341 *and this code*.

[DSA-SS, DSA-SS/CC] *Quality assurance application is not permitted for the following AISC 341, Chapter J Sections:*

1. *J6 (Inspection Tasks).*
2. *J7 (Welding Inspection and Nondestructive Testing).*
3. *J10 (Inspection of Composite Structures).*
4. *J11 (Inspection of H-Piles).*

Additionally, the applicable portions in Table 1705A.2.1 of the California Building Code shall apply.

1705*A*.13.2 Structural wood. For the seismic force-resisting systems of structures assigned to Seismic Design Category D, E or F:

1. Continuous special inspection shall be required during field gluing operations of elements of the seismic force-resisting system.
2. Periodic special inspection shall be required for nailing, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

1705*A*.13.3 Cold-formed steel light-frame construction. For the seismic force-resisting systems of structures assigned to Seismic Design Category D, E or F, periodic special inspection shall be required for both:

1. Welding operations of elements of the seismic force-resisting system.
2. Screw attachment, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.

[DSA-SS, DSA-SS/CC] *Requirements specified in Section 1705A.2.9 shall also apply.*

1705*A*.13.4 *Special inspection for special seismic certification*. For structures assigned to Seismic Design Category D, E or F, the special inspector shall examine *equipment and components* requiring *special* seismic *certification* in accordance with Section *1705A.14.3 or* ASCE 7*, Section 13.2.3* and verify that the label, anchorage and mounting conform to the certificate of compliance.

1705*A*.13.5 Architectural components. Periodic special inspection is required for the erection and fastening of exterior cladding, interior and exterior nonbearing walls, *ceilings* and interior and exterior veneer in structures assigned to Seismic Design Category D, E or F.

***[OSHPD 1]* Exception:** *Periodic special inspection is not required where continuous inspection of the work is performed in accordance with Section 7-145 of the CAC*.

1705*A*.13.5.1 Access floors. Periodic special inspection is required for the anchorage of access floors in structures assigned to Seismic Design Category D, E or F.

1705A.13.5.2 Structural sealant glazing. *Special inspection shall be in accordance with Section 2410.1.2 Item 9.*

1705*A*.13.6 Plumbing, mechanical and electrical components. Periodic special inspection of plumbing, mechanical and electrical components shall be required for the following:

1. Anchorage of electrical equipment for emergency and standby power systems in structures assigned to Seismic Design Category D, E or F.
2. Anchorage of other electrical equipment in structures assigned to Seismic Design Category *D,* E or F.
3. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units in structures assigned to Seismic Design Category D, E or F.
4. Installation and anchorage of ductwork designed to carry hazardous materials in structures assigned to Seismic Design Category D, E or F.
5. Installation and anchorage of vibration isolation systems in structures assigned to Seismic Design Category D, E or F where the approved construction documents require a nominal clearance of $^{1}/_{4}$ inch (6.4 mm) or less between the equipment support frame and restraint.
6. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic sprinkler systems are installed in structures assigned to Seismic Design Category D, E or F to verify one of the following:
    6.1. Minimum clearances have been provided as required by Section 13.2.4 ASCE/SEI 7.
    6.2. A nominal clearance of not less than 3 inches (76 mm) has been be provided between automatic sprinkler system drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.

Where flexible sprinkler hose fittings are used, special inspection of minimum clearances is not required.

1705*A*.13.7 Storage racks. Steel storage racks and steel cantilevered storage racks that are 8 feet (2438 mm) in height or greater and assigned to Seismic Design Category D, E or F shall be provided with periodic special inspection as required by Table 1705*A*.13.7.

TABLE 1705*A*.13.7—REQUIRED INSPECTIONS OF STORAGE RACK SYSTEMS

TYPE	CONTINUOUS INSPECTION	PERIODIC INSPECTION	REFERENCED STANDARD	IBC REFERENCE
1. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents.	—	X	—	—
2. Fabricated storage rack elements.	—	X	—	Section 1704*A*.2.5
3. Storage rack anchorage installation.	—	X	ANSI/MH16.1 Section 7.3.2	—
4. Completed storage rack system, to indicate compliance with the approved construction documents.	—	X	—	—

1705*A*.13.8 Seismic isolation *and damping* systems. Periodic special inspection shall be provided for seismic isolation *and damping* systems in structures assigned to Seismic Design Category D, E or F during the fabrication and installation of isolator units and energy dissipation devices. *Continuous special inspection is required for prototype and production testing of isolator units and damping devices.*

1705*A*.14 Testing for seismic resistance. Testing for seismic resistance shall be required as specified in Sections 1705*A*.14.1 through 1705*A*.14.4, unless exempted from special inspections by the exception of Section 1704*A*.2.

1705*A*.14.1 Structural steel. Nondestructive testing for seismic resistance shall be in accordance with Section 1705*A*.14.1.1 or 1705*A*.14.1.2, as applicable.

1705*A*.14.1.1 Seismic force-resisting systems. Nondestructive testing of structural steel in the seismic force-resisting systems in buildings and structures assigned to Seismic Design Category D, E or F shall be performed in accordance with the quality assurance requirements of AISC 341 *and this code.*

[DSA-SS, DSA-SS/CC] *Quality assurance application is not permitted for the following AISC 341, Chapter J Section:*

1. *J7 (Welding Inspection and Nondestructive Testing).*

Additionally, the applicable portions in Table 1705A.2.1 of the California Building Code shall apply.

1705*A*.14.1.2 Structural steel elements. Nondestructive testing of structural steel elements in the seismic force-resisting systems of buildings and structures assigned to Seismic Design Category D, E or F other than those covered in Section 1705*A*.14.1.1, including struts, collectors, chords and foundation elements, shall be performed in accordance with the quality assurance requirements of AISC 341 *and this code.*

[DSA-SS, DSA-SS/CC] *Quality assurance application is not permitted for the following AISC 341, Chapter J Section:*

1. *J7 (Welding Inspection and Nondestructive Testing).*

Additionally, the applicable portions in Table 1705A.2.1 of the California Building Code shall apply.

1705*A*.14.2 Nonstructural components. For structures assigned to Seismic Design Category D, E or F, where the requirements of Section 13.2.1 of ASCE 7 for nonstructural components, supports or attachments are met by *manufacturer's certification* as specified in Item 2 therein, the registered design professional shall specify on the approved construction documents the requirements for seismic *certification* by analysis *or* testing.

Seismic sway bracing components satisfying requirements of ANSI/FM 1950, ANSI/ASHRAE 171, or using an alternative testing protocol approved by the building official shall be deemed to satisfy the requirements of this section.

[OSHPD 1 & 4] Note: *Deemed to comply provisions provide acceptable options to comply with the code but do not mandate their use. Alternative systems in accordance with Section 104.2.3 and the California Administrative Code Section 7-104 are always acceptable when approved by the building official.*

1705A.14.2.1 Structural sealant glazing testing. *Testing and the manufacturer's certification shall be in accordance with Section 2410.1.2.*

1705*A*.14.3 *Special seismic certification*. For structures assigned to Seismic Design Category D, E or F *equipment and components* that are subject to the requirements of Section 13.2.3 of ASCE 7 for *special seismic* certification, the registered design professional shall specify on the approved construction documents the requirements to be met by analysis *or* testing as specified therein. Certificates of compliance documenting that the requirements are met shall be submitted to the building official as specified in Section 1704*A*.5.

Active or energized equipment and components shall be certified exclusively on the basis of approved shake table testing in accordance with ICC-ES AC 156 or equivalent shake table testing criteria approved by the building official. Minimum of two equipment/components shall be tested for a product line with similar structural configuration. Where a range of products are tested,

the two equipment/components shall be either the largest and a small unit, or approved alternative representative equipment/components.

Exception: *When a single product (and not a product line with more than one product with variations) is certified and manufacturing process is ISO 9001 certified, one test shall be permitted.*

For a multi-component system, where active or energized components are certified by tests, connecting elements, attachments and supports can be justified by supporting analysis.

1705A.14.3.1 Special seismic certification. [OSHPD 1 & 4] *Special seismic certification shall be required for the following systems, equipment and components:*

1. *Emergency and standby power systems.*
2. *Elevator equipment (excluding elevator cabs).*
3. *Components with hazardous contents.*
4. *Exhaust and smoke control fans.*
5. *Switchgear and switchboards.*
6. *Motor control centers.*
7. *Imaging equipment needed for diagnostic services of emergency/trauma patients, a minimum of one such equipment.*
8. *Air conditioning units excluding Variable/Constant Air Volume (VAV/CAV) boxes up to 75 lbs.*
9. *Air handling units.*
10. *Chillers, including associated evaporators, and condensers.*
11. *Cooling towers.*
12. *Transformers.*
13. *Electrical substations.*
14. *UPS and batteries.*
15. *Panelboards as defined in the California Electrical Code (CEC) Article 100.*
16. *Industrial control panels as defined in the California Electrical Code (CEC) Article 100.*
17. *Power isolation and correction systems.*
18. *Motorized surgical lighting systems.*
19. *Motorized operating table systems.*
20. *Internal communication servers, routers and switches failure of which could impair the continued operation of the facility.*
21. *Medical gas and vacuum systems.*
22. *Electrical busways as defined in UL 857.*
23. *Electrical control panels powered by the life safety branch in accordance with the California Electrical Code (CEC) Article 517.33 or the critical branch in accordance with the California Electrical Code (CEC) Article 517.34.*

Exceptions:

1. *Equipment and components weighing not more than 75 lbs. rigidly attached to structures or surface mounted on equipment or components that are not required to have special seismic certification by this section.*
2. *Mobile equipment/components.*
3. *Pipes, ducts, conduits and cable trays, excluding in-line equipment and components.*
4. *Underground tanks.*
5. *Electric motors, base-mounted horizontal pumps and compressors.*
6. *Based-mounted vertical pumps up to 20 hp.*
7. *Substitution of certified active subcomponents up to operating weight of 10 lbs.*
8. *Components where importance factor, I_p, is permitted to be 1.0 by this code.*
9. *Emergency generators up to 25 kilowatts.*
10. *Equipment and components used for clinical trials only.*
11. *Elevator machines and governors.*
12. *Temporary and Interim equipment.*

For Exceptions 5, 6 and 7:

Exempt subcomponents, which are an integral part of equipment that require special seismic certification, shall be tested attached to the equipment. Exempt subcomponents shall be permitted to be substituted without testing, provided that the substituted subcomponent relative to the certified subcomponent has:

1. *Similar configuration with equivalent function.*
2. *Supports and attachments of similar configuration with equivalent strength and stiffness.*
3. *Same attachment location.*

4. *Changes in dimensions, center of gravity and mass, of not more than 10 percent of the certified subcomponent and still meets Exception 5, 6 or 7.*
5. *Manufacturing process with ISO 9001 certification.*

1705*A*.14.4 Seismic isolation *and damping* systems. Seismic isolation *and damping* systems in structures assigned to Seismic Design Category D, E or F shall be tested in accordance with Section 17.8 *and 18.6* of ASCE 7.

Prototype and production testing and associated acceptance criteria for isolator units and damping devices shall be subject to preapproval by the building official. Testing exemption for similar units shall require approval by the building official.

[BF] 1705*A*.15 Sprayed fire-resistive materials (SFRM). Special inspections and tests of sprayed fire-resistive materials (SFRM) applied to floor, roof and wall assemblies and structural members shall be performed in accordance with Sections 1705*A*.15.1 through 1705*A*.15.6. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents. The tests set forth in this section shall be based on samplings from specific floor, roof and wall assemblies and structural members. Special inspections and tests shall be performed during construction with an additional visual inspection after the rough installation of electrical, automatic sprinkler systems, mechanical and plumbing systems and suspension systems for ceilings, and before concealment where applicable. The required sample size shall not exceed 110 percent of that specified by the referenced standards in Sections 1705*A*.15.4.1 through 1705*A*.15.4.9.

[BF] 1705*A*.15.1 Physical and visual tests. The special inspections and tests shall include the following to demonstrate compliance with the listing and the fire-resistance rating:

1. Condition of substrates.
2. Thickness of application.
3. Density in pounds per cubic foot (kg/m^3).
4. Bond strength adhesion/cohesion.
5. Condition of finished application.

[BF] 1705*A*.15.2 Structural member surface conditions. The surfaces shall be prepared in accordance with the approved fire-resistance design and the written instructions of approved manufacturers. The prepared surface of structural members to be sprayed shall be inspected by the special inspector before the application of the SFRM.

[BF] 1705*A*.15.3 Application. The substrate shall have a minimum ambient temperature before and after application as specified in the written instructions of approved manufacturers. The area for application shall be ventilated during and after application as required by the written instructions of approved manufacturers.

[BF] 1705*A*.15.4 Thickness. Not more than 10 percent of the thickness measurements of the SFRM applied to floor, roof and wall assemblies and structural members shall be less than the thickness required by the approved fire-resistance design, and none shall be less than the minimum allowable thickness required by Section 1705*A*.15.4.1.

[BF] 1705*A*.15.4.1 Minimum allowable thickness. For design thicknesses 1 inch (25 mm) or greater, the minimum allowable individual thickness shall be the design thickness minus $^1/_4$ inch (6.4 mm). For design thicknesses less than 1 inch (25 mm), the minimum allowable individual thickness shall be the design thickness minus 25 percent. Thickness shall be determined in accordance with ASTM E605. Samples of the SFRM shall be selected in accordance with Sections 1705*A*.15.4.2 *through 1705A.15.4.9*.

[BF] 1705*A*.15.4.2 Floor, roof and wall assemblies. The thickness of the SFRM applied to floor, roof and wall assemblies shall be determined in accordance with ASTM E605, making not less than four measurements for each 1,000 square feet (93 m^2) of the sprayed area, or portion thereof, in each story.

[BF] 1705*A*.15.4.3 Cellular decks. Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. Not fewer than four measurements shall be made, located symmetrically within the square area.

[BF] 1705*A*.15.4.4 Fluted decks. Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. Not fewer than four measurements shall be made, located symmetrically within the square area, including one each of the following: valley, crest and sides. The average of the measurements shall be reported.

[BF] 1705*A*.15.4.5 Structural members. The thickness of the SFRM applied to structural members shall be determined in accordance with ASTM E605. Thickness testing shall be performed on not less than 25 percent of the structural members on each floor.

[BF] 1705*A*.15.4.6 Beams and girders. At beams and girders thickness measurements shall be made at nine locations around the beam or girder at each end of a 12-inch (305 mm) length.

[BF] 1705.15.4.7 Joists and trusses. At joists and trusses, thickness measurements shall be made at seven locations around the joist or truss at each end of a 12-inch (305 mm) length.

[BF] 1705*A*.15.4.8 Wide-flanged columns. At wide-flanged columns, thickness measurements shall be made at 12 locations around the column at each end of a 12-inch (305 mm) length.

[BF] 1705*A*.15.4.9 Hollow structural section and pipe columns. At hollow structural section and pipe columns, thickness measurements shall be made at not fewer than four locations around the column at each end of a 12-inch (305 mm) length.

considered to have successfully met the test requirements if the assembly recovers not less than 75 percent of the maximum deflection within 24 hours after the removal of the test load. The test assembly shall then be reloaded and subjected to an increasing superimposed load until either structural failure occurs or the superimposed load is equal to two and one-half times the load at which the deflection limitations specified in Section 1709*A*.3.2 were reached, or the load is equal to two and one-half times the superimposed design load. In the case of structural components and assemblies for which deflection limitations are not specified in Section 1709*A*.3.2, the test specimen shall be subjected to an increasing superimposed load until structural failure occurs or the load is equal to two and one-half times the desired superimposed design load. The allowable superimposed design load shall be taken as the least of:

1. The load at the deflection limitation given in Section 1709*A*.3.2.
2. The failure load divided by 2.5.
3. The maximum load applied divided by 2.5.

1709*A*.3.2 Deflection. The deflection of structural members under the design load shall not exceed the limitations in Section 1604*A*.3.

1709*A*.4 Wall and partition assemblies. Load-bearing wall and partition assemblies shall sustain the test load both with and without window framing. The test load shall include all design load components. Wall and partition assemblies shall be tested both with and without door and window framing.

1709*A*.5 Exterior window and door assemblies. The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1709*A*.5.1 or 1709*A*.5.2. For exterior windows and doors tested in accordance with Section 1709*A*.5.1 or 1709*A*.5.2, required design wind pressures determined from ASCE 7 shall be permitted to be converted to allowable stress design by multiplying by 0.6.

Exception: Structural wind load design pressures for window or door assemblies other than the size tested in accordance with Section 1709*A*.5.1 or 1709*A*.5.2 shall be permitted to be different than the design value of the tested assembly, provided that such pressures are determined by accepted engineering analysis or validated by an additional test of the window or door assembly to the alternative allowable design pressure in accordance with Section 1709*A*.5.2. Components of the alternate size assembly shall be the same as the tested or labeled assembly. Where engineering analysis is used, it shall be performed in accordance with the analysis procedures of AAMA 2502 or WDMA I.S. 11.

1709*A*.5.1 Exterior windows and doors. Exterior windows and sliding doors shall be tested and labeled as conforming to AAMA/WDMA/CSA101/I.S.2/A440. The label shall state the name of the manufacturer, the approved labeling agency and the product designation as specified in AAMA/WDMA/CSA101/I.S.2/A440. Exterior side-hinged doors shall be tested and labeled as conforming to AAMA/WDMA/CSA101/I.S.2/A440 or comply with Section 1709*A*.5.2. Products tested and labeled as conforming to AAMA/WDMA/CSA 101/I.S.2/A440 shall not be subject to the requirements of Sections 2403.2 and 2403.3.

1709*A*.5.2 Exterior windows and door assemblies not provided for in Section 1709*A*.5.1. Exterior window and door assemblies shall be tested in accordance with ASTM E330. Exterior window and door assemblies containing glass shall comply with Section 2403. The design pressure for testing shall be calculated in accordance with Chapter 16. Each assembly shall be tested for 10 seconds at a load equal to 1.5 times the design pressure.

1709*A*.5.2.1 Garage doors and rolling doors. Garage doors and rolling doors shall be tested in accordance with either ASTM E330 or ANSI/DASMA 108, and shall meet the pass/fail criteria of ANSI/DASMA 108. Garage doors and rolling doors shall be labeled with a permanent label identifying the door manufacturer, the door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.

1709*A*.5.3 Windborne debris protection. Protection of exterior glazed openings in buildings located in windborne debris regions shall be in accordance with Section 1609*A*.2.

1709*A*.5.3.1 Impact protective systems testing and labeling. Impact protective systems shall be tested for impact resistance by an approved independent laboratory for compliance with ASTM E1886 and ASTM E1996 and for design wind pressure for compliance with ASTM E330. Required design wind pressures shall be determined in accordance with ASCE 7, and for the purposes of this section, multiplied by 0.6 to convert to allowable stress design.

Impact protective systems shall have a permanent label applied in accordance with Section 1703*A*.5.4, identifying the manufacturer, product designation, performance characteristics, and approved inspection agency.

1709*A*.6 Skylights and sloped glazing. Skylights and sloped glazing shall comply with the requirements of Chapter 24.

1709*A*.7 Test specimens. Test specimens and construction shall be representative of the materials, workmanship and details normally used in practice. The properties of the materials used to construct the test assembly shall be determined on the basis of tests on samples taken from the load assembly or on representative samples of the materials used to construct the load test assembly. Required tests shall be conducted or witnessed by an approved agency.

SECTION 1710A—OFF-SITE CONSTRUCTION [OSHPD 1 & 4]

1710A.1 General. *This section applies to off-site construction and shall govern the requirements for planning, design, fabrication, assembly, inspection and regulatory compliance.*

1710A.2 Construction. *In addition to other applicable requirements in this code, off-site construction shall be in accordance with ICC 1200, with the texts modified by Sections 1710A.2.1 through 1710A.2.2.*

1710A.2.1 ICC 1200 Section 301.4. *Replace ICC 1200 Section 301.4 by the following:*

301.4 Use of shipping containers repurposed as buildings and building components. *Use of shipping containers repurposed as buildings and building components is not permitted by the California Building Code (CBC) Section 3114.*

1710A.2.2 ICC 1200 Section 503.1. *Modify ICC 1200 Section 503.1 by adding the following:*

Quality Assurance/Quality Control (QA/QC) shall satisfy all the requirements for Testing, Inspection, and Observation (TIO) in the California Building Standards Code (CBSC).

1710A.3 Regulatory compliance. *In addition to other applicable requirements in this code, off-site construction shall be inspected and regulated in accordance with ICC 1205, with texts modified by Sections 1710A.3.1 through 1710A.3.2.*

1710A.3.1 ICC 1205 Section 302.1. *Modify ICC 1205 Section 302.1 by adding the following:*

Construction documents for plan approval shall satisfy all the requirements in the California Building Standards Code (CBSC).

1710A.3.2 ICC 1205 Section 501.1. *Modify ICC 1205 Section 501.1 by adding the following:*

Testing, Inspection, and Observation (TIO) program shall satisfy all the requirements in the California Building Standards Code (CBSC).

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 19 – CONCRETE

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	**X**				**X**								**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)				**X**					**X**		**X**	**X**			**X**									
Adopt only those sections that are listed below																								
Chapter / Section																								
1901.1.1									X		X	X			X									
1901.1.2									X		X	X			X									
1901.1.3									X		X	X			X									
1901.1.4									X															
1901.1.5									X															
1901.3.1 – 1901.3.4.5											X	X			X									
1903.1											X	X			X									
1903.3											X	X			X									
1903.4											X	X			X									
1903.5											X	X			X									
1905.5											X	X			X									
1905.6											X	X			X									
1906											X	X			X									
1907.4.1				X																				
1908.1											X	X			X									
1909									X															
1910											X	X			X									
1911											X	X			X									

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

CHAPTER

19 CONCRETE

About this chapter:	Chapter 19 provides minimum accepted practices for the design and construction of buildings and structural components using concrete—both plain and reinforced. Chapter 19 relies primarily on the reference to American Concrete Institute (ACI) 318, Building Code Requirements for Structural Concrete. Structural concrete must be designed and constructed to comply with this code and all listed standards. There are also specific provisions addressing slabs-on-ground and shotcrete. This chapter was extensively reorganized for the 2024 edition. For complete information, see the relocations table in the Preface information of this code.
ICC code development note:	Code change proposals to this chapter will be considered by the IBC—Structural Code Development Committee during the 2025 (Group B) Code Development Cycle.

SECTION 1901—GENERAL

1901.1 Scope. The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

1901.1.1 Application. [DSA-SS/CC, OSHPD] *The scope of application of Chapter 19 is as follows:*

1. *Structures regulated by the Division of the State Architect—Structural Safety/Community Colleges (DSA-SS/CC), which include those applications listed in Section 1.9.2.2.*
2. *Structures regulated by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development (OSHPD), which include hospital buildings removed from general acute care service, skilled nursing facility buildings, intermediate care facility buildings and acute psychiatric hospital buildings listed in Sections 1.10.1, 1.10.2 and 1.10.5.*

1901.1.2 Amendments in this chapter. [DSA-SS/CC, OSHPD] *DSA-SS/CC and OSHPD adopts this chapter as amended.*

1901.1.3 Identification of amendments. [DSA-SS/CC, OSHPD]

1. *Division of the State Architect - Structural Safety/Community Colleges amendments appear in this chapter preceded by the appropriate acronym, as follows:*

   [DSA-SS/CC] *– For applications listed in Section 1.9.2.2.*
2. ***[OSHPD 1R, 2 & 5]*** *Office of Statewide Hospital Planning and Development (OSHPD) amendments appear in this chapter preceded by the appropriate acronym, as follows:*

   [OSHPD 1R*] – For applications listed in Section 1.10.1.*

   [OSHPD 2] *– For applications listed in Section 1.10.2.*

   [OSHPD 5] *– For applications listed in Section 1.10.5.*

1901.1.4 Reference to other chapters. [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapters 17 and 18, the provisions in Chapters 17A and 18A respectively shall apply instead.*

1901.1.5 Additional amendments. [DSA-SS/CC] *See Section 1909 for additional requirements.*

1901.2 Plain and reinforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as supplemented in Section 1905 of this code.

1901.2.1 Structural concrete with GFRP reinforcement. Cast-in-place structural concrete internally reinforced with glass fiber reinforced polymer (GFRP) reinforcement conforming to ASTM D7957 and designed in accordance with ACI CODE 440.11 shall be permitted where fire-resistance ratings are not required and only for structures assigned to Seismic Design Category A.

1901.3 Anchoring to concrete. Anchoring to concrete shall be in accordance with ACI 318 as supplemented in Section 1905, and applies to cast-in (headed bolts, headed studs and hooked J- or L-bolts), post-installed expansion (torque-controlled and displacement-controlled), undercut, screw, and adhesive anchors.

1901.3.1 Power actuated fasteners. [OSHPD 1R, 2 & 5] *Power actuated fasteners qualified in accordance with ICC-ES AC 70 shall be deemed to satisfy the requirements of ASCE 7, Section 13.4.5.*

Power actuated fasteners shall be permitted in seismic shear for components exempt from construction documents review by ASCE 7, Section 13.1.4 and for interior non-bearing non-shear wall partitions only. Power actuated fastener shall not be used to anchor seismic bracing, exterior cladding or curtain wall systems.

Exception: *Power actuated fasteners in steel to steel connections prequalified for seismic application by cyclic tests in accordance with ICC-ES AC 70 shall be permitted for seismic design.*

1901.3.2 Mechanical anchors and specialty inserts. [OSHPD 1R, 2 & 5] *Mechanical anchors qualified in accordance with ICC-ES AC 193 shall be deemed to satisfy the requirements of this section. Specialty inserts, including cast-in-place specialty inserts, tested in accordance with ICC-ES AC 232 or AC 446 shall be deemed to satisfy the requirements of this section.*

Note: *The removal and resetting of post-installed mechanical anchors are prohibited by ACI 318 Section 17.1.3.*

1901.3.3 Post-installed adhesive anchors. [OSHPD 1R, 2 & 5] *Post-installed reinforcing bars, adhesive anchors, and torque-controlled adhesive anchors qualified in accordance with ICC-ES AC 308 shall be deemed to satisfy the requirements of this section.*

1901.3.4 Proof tests for post-installed anchors in concrete. [OSHPD 1R, 2 & 5] *When post-installed anchors are used in lieu of cast-in place bolts, the proof test loads, frequency and acceptance criteria shall be in accordance with this section.*

Exceptions. *Proof tests are not required for the following:*

1. *Undercut anchors that allow visual confirmation of full set.*
2. *Repetitively installed anchors (with three or more identical anchors) of diameter one-quarter ($^1/_4$) inch or less used for distributed systems or architectural components.*
3. *Power actuated fasteners used to attach tracks of interior nonstructural partition walls resisting only shear loads and with at least three fasteners per segment of track.*
4. *Shear dowels across cold joints in slabs on grade, where the slab is not structural in accordance with Section 1907.1.*

> ***1901.3.4.1 General.*** *Test loads or torques, test frequencies, and acceptance criteria shall be shown on the construction documents.*

If any anchor fails testing, all anchors of the same type shall be tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.

Anchors to be tested shall be selected at random by the special inspector or inspector of record (IOR) when 100 percent of the anchors are not tested.

The testing of the post-installed anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency.

> ***1901.3.4.2 Proof testing procedure.*** *Post-installed anchors shall be tension tested in accordance with ASTM E3121 with test frequency and test loads in accordance with Sections 1901.3.4.3 and 1901.3.4.4, respectively. Proof tests using ASTM E3121 tension test procedure do not require displacement measurement.*

Exception: *Torque-controlled post-installed and screw-type anchors shall be permitted to be tested using torque based on a valid evaluation report using criteria adopted in this code.*

> ***1901.3.4.3 Test frequency.***

1901.3.4.3.1 Structural applications. *One hundred percent of post-installed anchors used for sructural applications shall be proof tested.*

Exceptions:

1. ***Sill bolts.*** *When post-installed anchors are used for sill plate or bottom track bolting applications, 10 percent of the anchors shall be tested.*
2. ***Rebar dowels.*** *When adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, 25 percent of dowels shall be tested if all the following conditions are met:*
   - *2.1. The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*
   - *2.2. The number of dowels in any one member equals or exceeds twelve (12).*
   - *2.3. The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

1901.3.4.3.2 Nonstructural applications. *Fifty percent of post-installed anchors used in nonstructural applications shall be proof tested. The percentage of tested anchors applies to each set of anchors of a common type (e.g., adhesive, wedge, or shell and sleeve for expansion bolts), size, and embedment depth and to each group of anchors. Four or more anchors connected to a common element shall be defined as a group.*

Exceptions:

1. ***Repetitive anchors.*** *When anchors are used repetitively (with three or more identical anchors) in distribution systems (such as pipe, duct or conduit supports) or architectural systems (such as suspended ceilings, cladding, and partitions), 20 percent of anchors, including at least one anchor in each group, shall be tested.*
2. ***Anchors with low tension.*** *When the design tension on anchors is less than 100 pounds and those anchors are clearly noted on the approved construction documents, 10 percent of anchors shall be tested.*

> ***1901.3.4.4 Test loads.*** *Required test loads shall be determined by one of the following methods:*

1. *Twice the maximum allowable tension load or one and a quarter ($1^1/_4$) times the maximum design strength of anchors as provided in approved evaluation report using criteria adopted in this code or determined in accordance with Chapter 17 of ACI 318.*

   Tension test load need not exceed 80 percent of the nominal yield strength of the anchor element ($= 0.8\, A_{se}\, f_{ya}$).
2. *The manufacturer's recommended installation torque based on approved evaluation report using criteria adopted in this code.*

> ***1901.3.4.5 Test acceptance criteria.*** *Proof test shall satisfy the following minimum requirements.*

1. ***Tension test:*** *Anchors shall be tested in the unconfined condition in accordance with ASTM E3121 except that the minimum clearance to the test frame shall be 1.5 times the anchor's embedment depth. Test load shall be maintained for a*

minimum of 15 seconds and shall exhibit no discernable movement during the tension test, e.g., as evidenced by loosening of the washer under the nut or an abrupt decrease in the gauge pressure.

Exception: *Adhesive anchors shall be permitted to be tested in confined conditions in accordance with ASTM E3121 when the approved construction documents indicate that concrete breakout does not control the design tensile strength.*

2. ***Torque test:*** *Torque-controlled post-installed anchors tested with a calibrated torque wrench shall attain the specified torque within $^1/_2$ turn of the nut; or one-quarter ($^1/_4$) turn of the nut for a $^3/_8$-inch sleeve anchor only.*

   Screw-type anchors tested with a calibrated torque wrench shall attain the specified torque within one-quarter ($^1/_4$) turn of the screw after initial seating of the screw head.

1901.4 Composite structural steel and concrete structures. Systems of structural steel acting compositely with reinforced concrete shall be designed in accordance with Section 2202 of this code.

1901.5 Construction documents. The construction documents for structural concrete construction shall include:

1. The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. The specified strength or grade of reinforcement.
3. The size and location of structural elements, reinforcement and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.
5. The magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints specified for plain concrete.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for posttensioning tendons.
11. For structures assigned to Seismic Design Category D, E or F, a statement if slab on grade is designed as a structural diaphragm.

1901.6 Special inspections and tests. Special inspections and tests of concrete elements of buildings and structures and concreting operations shall be as required by Chapter 17.

1901.7 Tolerances for structural concrete. Where not indicated in construction documents, structural tolerances for concrete structural elements shall be in accordance with this section.

1901.7.1 Cast-in-place concrete tolerances. Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.

Exceptions:

1. Group R-3 detached one- or two-family dwellings are not required to comply with this section.
2. Shotcrete is not required to comply with this section.

1901.7.2 Precast concrete tolerances. Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.

Exception: Group R-3 detached one- or two-family dwellings are not required to comply with this section.

SECTION 1902—COORDINATION OF TERMINOLOGY

1902.1 General. Coordination of terminology used in ACI 318 and ASCE 7 shall be in accordance with Section 1902.1.1.

1902.1.1 Design displacement. Design displacement shall be the Design Earthquake Displacement, δ_{DE}, defined in ASCE 7 Section 12.8.6.3. For diaphragms that can be idealized as rigid in accordance with ASCE 7 Section 12.3.1.2, δ_{di}, displacement due to diaphragm deformation corresponding to the design earthquake, is permitted to be taken as zero.

SECTION 1903—SPECIFICATIONS FOR TESTS AND MATERIALS

1903.1 General. Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318.

Exception: *The following standards as referenced in Chapter 35 shall be permitted to be used.*

1. *ASTM C150*
2. *ASTM C595*
3. *ASTM C1157*

1903.2 Glass fiber-reinforced concrete. Glass fiber-reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI 128.

1903.3 Flat wall insulating concrete form (ICF) systems. *Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E2634.* ***[OSHPD 1R, 2 & 5]*** *Not Permitted by OSHPD.*

1903.4 Steel fiber reinforcement *-* ***[OSHPD 1R, 2 & 5]*** *Not permitted by OSHPD.*

***1903.5 Welding of reinforcing bars** - **[OSHPD 1R, 2 & 5]** Modify ACI 318 Section 26.6.4.1(b) by adding the following:*

Subject to prior approval of the enforcing agency, longitudinal holding wires conforming to ASTM A1064, of maximum wire size W5, that are machine resistance welded to stirrup/tie cage (or spiral assemblies) consisting of low alloy steel reinforcing conforming to ASTM A706 are permitted when performed under continuous competent control in a fabrication shop. Tack welding of primary reinforcing bars together or to stirrups/ties is not permitted. Holding wire weld locations shall not occur on any longitudinal or primary reinforcing nor on any portion of a reinforcing bar that is or will be bent in accordance with ACI 318 Section 25.3 for the extents specified in AWS D1.4 Section 4.2.6.

Quality control tests shall be performed on shop welded specimens by the fabricator. Reinforcing steel specimens containing the holding wire shall be tested for yield and tensile strength at the frequency required by Section 1910.2. Test reports shall be available on request to the approved agency, design professional and enforcement agency.

SECTION 1904—DURABILITY REQUIREMENTS

1904.1 Structural concrete. Structural concrete shall conform to the durability requirements of ACI 318.

Exception: For Group R-2 and R-3 occupancies not more than three stories above grade plane, the specified compressive strength, f'_c, for concrete in basement walls, foundation walls, exterior walls and other vertical surfaces exposed to the weather shall be not less than 3,000 psi (20.7 MPa).

1904.2 Nonstructural concrete. The registered design professional shall assign nonstructural concrete a freeze-thaw exposure class, as defined in ACI 318, based on the anticipated exposure of nonstructural concrete. Nonstructural concrete shall have a minimum specified compressive strength, f'_c, of 2,500 psi (17.2 MPa) for Class F0; 3,000 psi (20.7 MPa) for Class F1; and 3,500 psi (24.1 MPa) for Classes F2 and F3. Nonstructural concrete shall be air entrained in accordance with ACI 318.

SECTION 1905—SEISMIC REQUIREMENTS

1905.1 General. In addition to the provisions of ACI 318, structural concrete shall comply with the requirements of Section 1905.

1905.2 ACI 318 Section 2.3. Modify existing definitions and add the following definitions to ACI 318 Section 2.3:

CAST-IN-PLACE CONCRETE EQUIVALENT DIAPHRAGM. A cast-in-place noncomposite topping slab diaphragm, as defined in Section 18.12.5, or a diaphragm constructed with precast concrete components that uses closure strips between precast components with detailing that meets the requirements of ACI 318 for the Seismic Design Category of the structure.

DETAILED PLAIN CONCRETE STRUCTURAL WALL. A wall complying with the requirements of Chapter 14, and Section 1905.5 of the *California Building Code*.

ORDINARY PLAIN CONCRETE STRUCTURAL WALL. A wall complying with the requirements of Chapter 14, excluding 14.6.2.

ORDINARY PRECAST STRUCTURAL WALL. A precast wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.

ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. A cast-in-place wall complying with the requirements of Chapters 1 through 13, 15, 16 and 19 through 26.

PRECAST CONCRETE DIAPHRAGM. A diaphragm constructed with precast concrete components, with or without a cast-in-place topping, that includes the use of discrete connectors or joint reinforcement to transmit diaphragm forces.

1905.3 Intermediate precast structural walls. Intermediate precast structural walls shall comply with Section 18.5 of ACI 318 and this section.

1905.3.1 Connections designed to yield. Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.

1905.4 Foundations designed to resist earthquake forces. Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and the ground shall comply with the requirements of Section 18.13 of ACI 318 and other applicable provisions of ACI 318 unless modified by Chapter 18.

1905.5 Detailed plain concrete structural walls. Detailed plain concrete structural walls are walls conforming to the requirements of ordinary plain concrete structural walls and Section 1905.5.1. ***[OSHPD 1R, 2 & 5]** Plain concrete shall not be permitted.*

1905.5.1 Reinforcement. Reinforcement shall be provided as follows:

1. Vertical reinforcement of not less than 0.20 square inch (129 mm^2) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening, and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by Section 14.6.1 of ACI 318.
2. Horizontal reinforcement of not less than 0.20 square inch (129 mm^2) in cross-sectional area shall be provided:
    2.1. Continuously at structurally connected roof and floor levels and at the top of walls.
    2.2. At the bottom of load-bearing walls or in the top of foundations where doweled to the wall.
    2.3. At a maximum spacing of 120 inches (3048 mm).

Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 2.3, shall be continuous in the wall.

1905.6 Structural plain concrete. Structural plain concrete elements shall comply with this section in lieu of Section 14.1.4 of ACI 318. ***[OSHPD 1R, 2 & 5]*** *Plain concrete shall not be permitted.*

1905.6.1 Seismic Design Categories A and B. In structures assigned to Seismic Design Category A or B, detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement.

1905.6.2 Seismic Design Categories C, D, E and F. Structures assigned to Seismic Design Category C, D, E or F shall not have elements of structural plain concrete, except as follows:

1. Structural plain concrete basement, foundation or other walls below the base as defined in ASCE/SEI 7 are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D or E, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall be not less than $7^{1}/_{2}$ inches (190 mm), and the wall shall retain not more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with Section 14.6.1 of ACI 318.
2. Isolated footings of plain concrete supporting pedestals or columns are permitted, provided that the projection of the footing beyond the face of the supported member does not exceed the footing thickness.

   Exception: In detached one- and two-family dwellings three stories or less in height, the projection of the footing beyond the face of the supported member is permitted to exceed the footing thickness.
3. Plain concrete footings supporting walls are permitted, provided that the footings have not fewer than two continuous longitudinal reinforcing bars. Bars shall not be smaller than No. 4 and shall have a total area of not less than 0.002 times the gross cross-sectional area of the footing. For footings that exceed 8 inches (203 mm) in thickness, not fewer than one bar shall be provided at the top and bottom of the footing. Continuity of reinforcement shall be provided at corners and intersections.

   Exceptions:

   1. Where assigned to Seismic Design Category C, detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement.
   2. For foundation systems consisting of a plain concrete footing and a plain concrete stemwall, not fewer than one bar shall be provided at the top of the stemwall and at the bottom of the footing.
   3. Footings cast monolithically with a slab-on-ground shall have not fewer than one No. 4 bar at the top and bottom of the footing or one No. 5 bar or two No. 4 bars in the middle third of the footing depth.

1905.7 Design requirements for anchors. For the design requirements for anchors, Sections 1905.7.1 and 1905.7.2 provide exceptions that are permitted to ACI 318.

1905.7.1 Anchors in tension. The following exception is permitted to ACI 318 Section 17.10.5.2:

Exception: Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE/SEI 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy Section 17.10.5.3(d) of ACI 318.

1905.7.2 Anchors in shear. The following exceptions are permitted to ACI 318 Section 17.10.6.2:

Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stemwalls, the in-plane shear strength in accordance with Sections 17.7.2 and 17.7.3 of ACI 318 need not be computed and Section 17.10.6.3 of ACI 318 shall be deemed to be satisfied provided that all of the following are met:
   1.1. The allowable in-plane shear strength of the anchor is determined in accordance with ANSI/AWC NDS Table 12E for lateral design values parallel to grain.
   1.2. The maximum anchor nominal diameter is $^{5}/_{8}$ inch (16 mm).
   1.3. Anchor bolts are embedded into concrete not less than 7 inches (178 mm).
   1.4. Anchor bolts are located not less than 1¾ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.
   1.5. Anchor bolts are located not less than 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.
   1.6. The sill plate is 2-inch (51 mm) or 3-inch (76 mm) nominal thickness.
2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or nonbearing walls of light-frame construction to foundations or foundation stemwalls, the in-plane shear strength in accordance with Sections 17.7.2 and 17.7.3 of ACI 318 need not be computed and 17.10.6.3 shall be deemed to be satisfied provided that all of the following are met:

   Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete, shall be permitted to be determined in accordance with AISI S100 Section J3.3.1.
   2.1. The maximum anchor nominal diameter is $^{5}/_{8}$ inch (16 mm).
   2.2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).

2.3. Anchors are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the track.

2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.

2.5. The track is 33 to 68 mil (0.84 mm to 1.73 mm) designation thickness.

3. In light-frame construction bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch (25 mm) in diameter attaching sill plate or track to foundation or foundation stemwalls need not satisfy Sections 17.10.6.3(a) through (c) when the design strength of the anchors is determined in accordance with Section 17.7.2.1(c) of ACI 318.

SECTION 1906—FOOTINGS FOR LIGHT-FRAME CONSTRUCTION

[OSHPD 1R, 2 & 5] *Plain concrete footings not permitted by OSHPD.*

1906.1 Plain concrete footings. For Group R-3 occupancies and buildings of other occupancies less than two stories above grade plane of light-frame construction, the required thickness of plain concrete footings is permitted to be 6 inches (152 mm), provided that the footing does not extend more than 4 inches (102 mm) on either side of the supported wall.

SECTION 1907—SLABS-ON-GROUND

1907.1 Structural slabs-on-ground. Structural concrete slabs-on-ground shall comply with all applicable provisions of this chapter. Slabs-on-ground shall be considered structural concrete where required by ACI 318 or where designed to transmit either of the following:

1. Vertical loads or lateral forces from other parts of the structure to the soil.
2. Vertical loads or lateral forces from other parts of the structure to foundations.

1907.2 Nonstructural slabs-on-ground. Nonstructural slabs-on-ground shall be required to comply with Sections 1904.2, 1907.3 and 1907.4. Portions of the nonstructural slabs-on-ground used to resist uplift forces or overturning shall be designed in accordance with accepted engineering practice throughout the entire portion designated as dead load to resist uplift forces or overturning.

1907.3 Thickness. The thickness of concrete floor slabs supported directly on the ground shall be not less than $3^1/_2$ inches (89 mm).

1907.4 Vapor retarder. A 6-mil (0.006 inch; 0.15 mm) polyethylene vapor retarder with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other approved equivalent methods or materials shall be used to retard vapor transmission through the floor slab.

Exception: A vapor retarder is not required:

1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m^2) and carports attached to occupancies in Group R-3.
3. For buildings of other occupancies where migration of moisture through the slab from below will not be detrimental to the intended occupancy of the building.
4. For driveways, walks, patios and other flatwork that will not be enclosed at a later date.
5. Where approved based on local site conditions.

1907.4.1 [HCD 1] Capillary break. *When a vapor retarder is required, a capillary break shall be installed in accordance with the California Green Building Standards Code (CALGreen), Chapter 4, Division 4.5.*

SECTION 1908—SHOTCRETE

1908.1 General. Shotcrete shall be in accordance with the requirements of ACI 318. ***[OSHPD 1R, 2 & 5]*** *and the provisions of ACI 506R.*

Preconstruction tests of one or more shotcrete mockup panels prepared in accordance with Section 1705.3.9.2 are required. In addition to testing requirements in ACI 318, special inspection and testing shall be in accordance with Section 1705.3.9.

The evaluation of the shotcrete mockup panel to qualify bar clearance dimensions in accordance with ACI 318 Section 25.2.7 or contact lap splices in accordance with ACI 318 Section 25.5.1.7 shall be in accordance with the requirements of ACI 506.4R with a core quality category of Very Good given in ACI 506.6T.

Shotcrete construction shall be in accordance with the requirements of ACI 506.2.

SECTION 1909—ADDITIONAL REQUIREMENTS FOR COMMUNITY COLLEGES [DSA-SS/CC]

1909.1 General.

1909.1.1 Construction documents. *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings.*

1909.2 Tests and materials. *Where required, special inspections and tests shall be in accordance with Chapter 17A and this section.*

1909.2.1 Steel fiber reinforcement *- Not permitted.*

CHAPTER

19*A*

CONCRETE

User notes:

About this chapter: *Chapter 19A provides minimum accepted practices for the design and construction of buildings and structural components using reinforced concrete. Chapter 19A is applicable to structures regulated by the Division of the State Architect-Structural Safety—including public elementary and secondary schools, community colleges, and state-owned or state-leased essential services buildings (applications listed in Sections 1.9.2.1 [DSA-SS] and 1.9.2.2 [DSA-SS/CC])—and by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development—including hospitals and correctional treatment centers (applications listed in Sections 1.10.1 [OSHPD 1] and 1.10.4 [OSHPD 4]).*

SECTION 1901*A*—GENERAL

1901*A*.1 Scope. The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

1901A.1.1 Application. *The scope of application of Chapter 19A is as follows:*

1. *Structures regulated by the Division of the State Architect-Structural Safety (DSA-SS), which include those applications listed in Section 1.9.2.1. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*
2. *Applications listed in Sections 1.10.1 and 1.10.4, regulated by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development (OSHPD). These applications include hospitals and correctional treatment centers.*

1901A.1.2 Amendments in this chapter. *DSA-SS and OSHPD adopt this chapter and all amendments.*

Exception: *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

1. *Division of the State Architect-Structural Safety:*

   [DSA-SS] *For applications listed in Section 1.9.2.1.*
2. *Office of Statewide Hospital Planning and Development.*

   [OSHPD 1] *– For applications listed in Section 1.10.1.*

   [OSHPD 4] *– For applications listed in Section 1.10.4.*

1901*A*.2 *R*einforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as supplemented in Section 1905*A* of this code, *except that plain concrete is not permitted.*

1901*A*.3 Anchoring to concrete. Anchoring to concrete shall be in accordance with ACI 318 as supplemented in Section 1905*A*, and applies to cast-in (headed bolts, headed studs and hooked J- or L-bolts), post-installed expansion (torque-controlled and displacement-controlled), undercut, screw, and adhesive anchors.

1901*A*.4 Composite structural steel and concrete structures. Systems of structural steel acting compositely with reinforced concrete shall be designed in accordance with Section 2202*A* of this code.

1901*A*.5 Construction documents. The construction documents for structural concrete construction shall include:

1. The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. The specified strength or grade of reinforcement.
3. The size and location of structural elements, reinforcement and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.
5. The magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for posttensioning tendons.
11. For structures assigned to Seismic Design Category D, E or F, a statement if slab on grade is designed as a structural diaphragm.
12. *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings.*

1901*A*.6 Special inspections and tests. *S*pecial inspections and tests of concrete elements of buildings and structures and concreting operations shall be as required by Chapter *17A and Section 1910A.*

1901*A*.7 Tolerances for structural concrete. Where not indicated in construction documents, structural tolerances for concrete structural elements shall be in accordance with this section.

1901*A*.7.1 Cast-in-place concrete tolerances. Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.

Exceptions:

1. Group R-3 detached one- or two-family dwellings are not required to comply with this section.
2. Shotcrete is not required to comply with this section. ***[DSA-SS]*** *Tolerances for shotcrete construction shall be defined by the construction documents.*

1901*A*.7.2 Precast concrete tolerances. Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.

Exception: Group R-3 detached one- or two-family dwellings are not required to comply with this section.

SECTION 1902*A*—COORDINATION OF TERMINOLOGY

1902*A*.1 General. Coordination of terminology used in ACI 318 and ASCE 7 shall be in accordance with Section 1902*A*.1.1.

1902*A*.1.1 Design displacement. Design displacement shall be the Design Earthquake Displacement, δ_{DE}, defined in ASCE 7 Section 12.8.6.3. For diaphragms that can be idealized as rigid in accordance with ASCE 7 Section 12.3.1.2, δ_{di}, displacement due to diaphragm deformation corresponding to the design earthquake, is permitted to be taken as zero.

SECTION 1903*A*—SPECIFICATIONS FOR TESTS AND MATERIALS

1903*A*.1 General. Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318.

1903*A*.2 Glass fiber-reinforced concrete. Glass fiber-reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI 128.

1903*A*.3 Flat wall insulating concrete form (ICF) systems. Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E2634. ***[OSHPD 1 & 4]*** *Not permitted by OSHPD.* ***[DSA-SS]*** *ICF systems shall be considered alternative systems. Concrete constructed using ICF systems and attachments to ICF shall be designed for loads in accordance with this code and shall comply with manufacturer's instructions and industry standards determined applicable by the enforcement agency. Calculations and drawings shall be submitted to the enforcement agency for review and approval prior to construction.*

1903A.4 Steel fiber reinforcement *– Not permitted.*

1903A.5 Welding of reinforcing bars *- Modify ACI 318 Section 26.6.4.2(b) by adding the following:*

Subject to prior approval of the enforcing agency, longitudinal holding wires, conforming to ASTM A1064 of maximum wire size W5, that are machine resistance welded to stirrup/tie cage (or spiral assemblies) consisting of low alloy steel reinforcing conforming to ASTM A706 are permitted when performed under continuous competent control in a fabrication shop. Tack welding of primary reinforcing bars together or to stirrups/ties is not permitted. Holding wire weld locations shall not occur on any longitudinal or primary reinforcing nor on any portion of a reinforcing bar that is or will be bent in accordance with ACI 318 Section 25.3 for the extents specified in AWS D1.4 Section 4.2.6.

[DSA-SS] Exception: *Mat reinforcing for slabs or isolated footings shall be permitted to have holding wires located no more than six bar diameters from the free end of reinforcing. Such free ends shall not be associated with any welded splices, couplers or other free-end modifications involving reinforcement development.*

Quality control tests shall be performed on shop-welded specimens by the fabricator. Reinforcing steel specimens containing the holding wire shall be tested for yield and tensile strength at the frequency required by Section 1910A.2. Test reports shall be available on request to the approved agency, design professional and enforcement agency.

SECTION 1904*A*—DURABILITY REQUIREMENTS

1904*A*.1 Structural concrete. Structural concrete shall conform to the durability requirements of ACI 318.

1904*A*.2 Nonstructural concrete. The registered design professional shall assign nonstructural concrete a freeze-thaw exposure class, as defined in ACI 318, based on the anticipated exposure of nonstructural concrete. Nonstructural concrete shall have a minimum specified compressive strength, f'_c, of 2,500 psi (17.2 MPa) for Class F0; 3,000 psi (20.7 MPa) for Class F1; and 3,500 psi (24.1 MPa) for Classes F2 and F3. Nonstructural concrete shall be air entrained in accordance with ACI 318.

SECTION 1905*A*—SEISMIC REQUIREMENTS

1905*A*.1 General. In addition to the provisions of ACI 318, structural concrete shall comply with the requirements of Section 1905*A*.

1905*A*.2 ACI 318 Section 2.3. Modify existing definitions and add the following definitions to ACI 318 Section 2.3:

CAST-IN-PLACE CONCRETE EQUIVALENT DIAPHRAGM. A cast-in-place noncomposite topping slab diaphragm, as defined in Section 18.12.5, or a diaphragm constructed with precast concrete components that uses closure strips between precast components with detailing that meets the requirements of ACI 318 for the Seismic Design Category of the structure.

PRECAST CONCRETE DIAPHRAGM. A diaphragm constructed with precast concrete components, with or without a cast-in-place topping, that includes the use of discrete connectors or joint reinforcement to transmit diaphragm forces.

1905*A*.3 Intermediate precast structural walls. ***[DSA-SS]*** Intermediate precast structural walls shall comply with Section 18.5 of ACI 318 and this section.

1905*A*.3.1 Connections designed to yield. Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices. *Connections between wall panels and the foundation shall be designed per Section 1617A.1.15.*

1905*A*.4 Foundations designed to resist earthquake forces. Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and the ground shall comply with the requirements of Section 18.13 of ACI 318 and other applicable provisions of ACI 318 unless modified by Chapter 18*A*.

1905*A*.5 Detailed plain concrete structural walls. *Not permitted.*

1905*A*.6 Structural plain concrete. *Not permitted.*

1905*A*.7 Design requirements for anchors. For the design requirements for anchors, Sections 1905*A*.7.1 and 1905*A*.7.2 provide exceptions that are permitted to ACI 318.

1905*A*.7.1 Anchors in tension. The following exception is permitted to ACI 318 Section 17.10.5.2:

Exception: Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE/SEI 7 Equation 12.11-1 *and Section 1604A.8.2 of this code* shall be deemed to satisfy Section 17.10.5.3(d) of ACI 318.

1905*A*.7.2 Anchors in shear. The following exceptions are permitted to ACI 318 Section 17.10.6.2:

Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stemwalls, the in-plane shear strength in accordance with Sections 17.7.2 and 17.7.3 of ACI 318 need not be computed and Section 17.10.6.3 of ACI 318 shall be deemed to be satisfied provided that all of the following are met:
   1.1. The allowable in-plane shear strength of the anchor is determined in accordance with ANSI/AWC NDS Table 12E for lateral design values parallel to grain.
   1.2. The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).
   1.3. Anchor bolts are embedded into concrete not less than 7 inches (178 mm).
   1.4. Anchor bolts are located not less than 1¾ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.
   1.5. Anchor bolts are located not less than 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.
   1.6. The sill plate is 2-inch (51 mm) or 3-inch (76 mm) nominal thickness.
2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or nonbearing walls of light-frame construction to foundations or foundation stemwalls, the in-plane shear strength in accordance with Sections 17.7.2 and 17.7.3 of ACI 318 need not be computed and *Section* 17.10.6.3 shall be deemed to be satisfied provided that all of the following are met:

   Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete, shall be permitted to be determined in accordance with AISI S100 Section J3.3.1.
   2.1. The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).
   2.2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).
   2.3. Anchors are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the track.
   2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.
   2.5. The track is 33 to 68 mil (0.84 mm to 1.73 mm) designation thickness.
3. In light-frame construction bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch (25 mm) in diameter attaching sill plate or track to foundation or foundation stemwalls need not satisfy Sections 17.10.6.3(a) through (c) when the design strength of the anchors is determined in accordance with Section 17.7.2.1(c) of ACI 318.

SECTION 1906*A*—*RESERVED*

SECTION 1907*A*—SLABS-ON-GROUND

1907*A*.1 Structural slabs-on-ground. Structural concrete slabs-on-ground shall comply with all applicable provisions of this chapter. Slabs-on-ground shall be considered structural concrete where required by ACI 318 or where designed to transmit either of the following:

1. Vertical loads or lateral forces from other parts of the structure to the soil.
2. Vertical loads or lateral forces from other parts of the structure to foundations.

1907*A*.2 Nonstructural slabs-on-ground. Nonstructural slabs-on-ground shall be required to comply with Sections 1904*A*.2, 1907*A*.3 and 1907*A*.4. Portions of the nonstructural slabs-on-ground used to resist uplift forces or overturning shall be designed in accordance with accepted engineering practice throughout the entire portion designated as dead load to resist uplift forces or overturning.

1907*A*.3 Thickness. The thickness of concrete floor slabs supported directly on the ground shall be not less than $3^1/_2$ inches (89 mm).

1907*A*.4 Vapor retarder. A 6-mil (0.006 inch; 0.15 mm) polyethylene vapor retarder with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other approved equivalent methods or materials shall be used to retard vapor transmission through the floor slab.

Exception: A vapor retarder is not required:

1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.
2. For unheated storage rooms having an area of less than 70 square feet (6.5 m^2) and carports attached to occupancies in Group R-3.
3. For buildings of other occupancies where migration of moisture through the slab from below will not be detrimental to the intended occupancy of the building.
4. For driveways, walks, patios and other flatwork that will not be enclosed at a later date.
5. Where approved based on local site conditions.

SECTION 1908*A*—SHOTCRETE

1908*A*.1 General. Shotcrete shall be in accordance with the requirements of ACI 318 *and the provisions of ACI 506R. Preconstruction tests of one or more shotcrete mockup panels prepared in accordance with Section 1705A.3.9.2 are required. In addition to testing requirements in ACI 318, special inspection and testing shall be in accordance with Section 1705A.3.9. The evaluation of the shotcrete mockup panel to qualify bar clearance dimensions in accordance with ACI 318 Section 25.2.7 or contact lap splices in accordance with ACI 318 Section 25.5.1.7 shall be in accordance with the requirements of ACI 506.4R with a core quality category of Very Good given in ACI 506.6T.*

Shotcrete construction shall be in accordance with the requirements of ACI 506.2.

SECTION 1909A—MODIFICATIONS TO ACI 318

1909A.1 General. *The text of ACI 318 shall be modified as indicated in Sections 1909A.1.1 through 1909A.1.16.*

1909A.1.1 ACI 318, Section 4.12.2.2. *Modify ACI 318, Section 4.12.2.2 by adding the following:*

Where prestressed concrete elements are restrained from movement, an analysis of the stresses in the prestressed elements and loads in the adjoining structural system induced by the above-described effects shall be made in accordance with PCI Design Handbook.

1909A.1.2 ACI 318, Section 4.12.2.3. *Modify ACI 318, Section 4.12.2.3 by adding the following:*

For prestressed concrete members with recessed or dapped ends, an analysis of the connections shall be made in accordance with procedures given in PCI Design Handbook.

1909A.1.3 ACI 318, Section 9.6.1.3. *Modify ACI 318, Section 9.6.1.3 by adding the following:*

This section shall not be used for members that resist seismic loads, except for either of the following conditions:

1. *Foundation members for one-story wood-frame or one-story light steel buildings.*
2. *Foundation members designed for seismic load combinations including the overstrength factor.* ***[OSHPD 1 & 4]*** *The A_s provided shall not be less than that required by 1.2 times the cracking load based upon f_r defined in Section 19.2.3.*

1909A.1.4 ACI 318, Section 11.2.4.1. *Replace ACI 318, Section 11.2.4.1 as follows:*

11.2.4.1 – Walls shall be anchored to intersecting elements such as floors or roofs; or to columns, pilasters, buttresses, of intersecting walls and footings with reinforcement at least equivalent to No. 4 bars at 12 inches (305 mm) on center for each layer of reinforcement.

1909A.1.5 ACI 318, Section 11.7. *Add Section 11.7.6 to ACI 318.1 as follows:*

11.7.6 – ***Reinforcement.*** *Perimeters of precast walls shall be reinforced continuously with a minimum of one No. 5 bar extending the full height and width of the wall panel. Where wall panels do not connect to columns or other wall panels to develop at least 75 percent of the horizontal wall steel as noted below, vertical perimeter bars shall be retained by hooked wall bars.*

A continuous tie or bond beam shall be provided at the roof line either as a part of the roof structure or part of the wall panels as described in the next paragraph below. This tie may be designed as the edge member of the roof diaphragm but, in any case, shall not be less than equivalent to two No. 6 bars continuous. A continuous tie equivalent to two No. 5 bars minimum shall also be provided either in the footing or with an enlarged section of the floor slab.

Wall panels of shear wall buildings shall be connected to columns or to each other in such a manner as to develop at least 75 percent of the horizontal wall steel. No more than half of this continuous horizontal reinforcing shall be concentrated in bond or tie beams at the top and bottom of the walls and at points of intermediate lateral support. If possible, cast-in-place joints with reinforcing bars extending from the panels into the joint a sufficient distance to meet the splice requirements of Section 25.5.2, for Class A shall be used. The reinforcing bars or welded tie details shall not be spaced over eight times the wall thickness vertically

SECTION 1910A—CONCRETE, REINFORCEMENT AND ANCHOR TESTING

1910A.1 Cementitious material. *The concrete supplier shall furnish to the enforcement agency certification that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C150 for portland cement and ASTM C595 or ASTM C1157 for blended hydraulic cement, whichever is applicable. When a mineral admixture or ground granulated blast-furnace slag is proposed for use, the concrete supplier shall furnish to the enforcement agency certification that they have been manufactured and tested in compliance with ASTM C618 or ASTM C989, whichever is applicable. The concrete producer shall provide copies of the cementitious material supplier's Certificate of Compliance that represents the materials used by date of shipment for concrete. Cementitious materials without Certification of Compliance shall not be used.*

1910A.2 Tests of reinforcing bars. *Samples shall be taken from bundles as delivered from the mill, with the bundles identified as to heat number and the accompanying mill certificate. One tensile test and one bend test shall be made from a sample from each 10 tons (9080 kg) or fraction thereof of each size of reinforcing steel.*

Where positive identification of the heat number cannot be made or where random samples are to be taken, one series of tests shall be made from each 2 $^1/_2$ tons (2270 kg) or fraction thereof of each size of reinforcing steel.

Tests of reinforcing bars may be waived by the structural engineer with the approval of the Building Official for one-story buildings or non-building structures provided they are identified in the construction documents and certified mill test reports are provided to the inspector of record for each shipment of such reinforcement.

1910A.3 Tests for prestressing steel and anchorage*. All wires or bars of each size from each mill heat and all strands from each manufactured reel to be shipped to the site shall be assigned an individual lot number and shall be tagged in such a manner that each lot can be accurately identified at the jobsite. Each lot of tendon and anchorage assemblies and bar couplers to be installed shall be likewise identified.*

The following samples of materials and tendons selected by the engineer or the designated testing laboratory from the prestressing steel at the plant or jobsite shall be furnished by the contractor and tested by an approved independent testing agency:

1. *For wire, strand or bars, 7-foot-long (2134 mm) samples shall be taken of the coil of wire or strand reel or rods. A minimum of one random sample per 5,000 pounds (2270 kg) of each heat or lot used on the job shall be selected.*
2. *For prefabricated prestressing tendons other than bars, one completely fabricated tendon 10 feet (3048 mm) in length between grips with anchorage assembly at one end shall be furnished for each size and type of tendon and anchorage assembly.*

   Variations of the bearing plate size need not be considered.

   The anchorages of unbonded tendons shall develop at least 95 percent of the minimum specified ultimate strength of the prestressing steel. The total elongation of the tendon under ultimate load shall not be less than 2 percent measured in a minimum gage length of 10 feet (3048 mm).

   Anchorages of bonded tendons shall develop at least 90 percent of the minimum specified strength of the prestressing steel tested in an unbonded state. All couplings shall develop at least 95 percent of the minimum specified strength of the prestressing steel and shall not reduce the elongation at rupture below the requirements of the tendon itself.
3. *If the prestressing tendon is a bar, one 7-foot (2134 mm) length complete with one end anchorage shall be furnished and, in addition, if couplers are to be used with the bar, two 4-foot (1219 mm) lengths of bar fabricated to fit and equipped with one coupler shall be furnished.*
4. *Mill tests of materials used for end anchorages shall be furnished. In addition, at least one Brinnell hardness test shall be made of each thickness of bearing plate.*

1910A.4 Composite construction cores. *Cores of the completed composite concrete construction shall be taken to demonstrate the shear strength along the contact surfaces. The cores shall be tested when the cast-in-place concrete is approximately 28 days old and shall be tested by a shear loading parallel to the joint between the precast concrete and the cast-in-place concrete. The minimum unit shear strength of the contact surface area of the core shall not be less than 100 psi (689 kPa).*

At least one core shall be taken from each building for each 5,000 square feet (465 m^2) of area of composite concrete construction and not less than three cores shall be taken from each project. The architect or structural engineer in responsible charge of the project or his or her representative shall designate the location for sampling.

1910A.5 Proof tests for post-installed anchors in concrete. *When post-installed anchors are used in lieu of cast-in place bolts, the proof test loads, frequency and acceptance criteria shall be in accordance with this section.*

Exceptions. *Proof tests are not required for the following:*

1. *Undercut anchors that allow visual confirmation of full set.*
2. *Repetitively installed anchors (with 3 or more identical anchors) of diameter one-quarter ($^1/_4$) in. or less used for distributed systems or architectural components.*
3. *Power actuated fasteners used to attach tracks of interior nonstructural partition walls resisting only shear loads and with at least three fasteners per segment of track.*
4. *Shear dowels across cold joints in slabs on grade where the slab is not structural in accordance with Section 1907A.1.*

1910A.5.1 General. *Test loads or torques, test frequencies, and acceptance criteria shall be shown on the construction documents.*

If any anchor fails testing, all untested anchors of the same type and installed by the same trade shall be tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.

Anchors to be tested shall be selected at random by the special inspector or inspector of record (IOR), when 100 percent of the anchors are not tested.

The testing of the post-installed anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency.

1910A.5.2 Proof testing procedure. *Post-installed anchors shall be tension tested to verify proper installation in accordance with ASTM E3121 with test frequency and test loads in accordance with Sections 1910A.5.3 and 1910A.5.4, respectively. Tension tests do not require displacement measurement unless specified on the approved construction documents.*

Exception: *Torque-controlled post-installed anchors and screw-type anchors shall be permitted to be tested using torque based on a valid evaluation report and criteria adopted in this code.*

1910A.5.3 Test frequency.

1910A.5.3.1 Structural applications. *100 percent of post-installed anchors used for structural applications shall be proof tested.*

Exceptions:

1. ***Sill bolts.*** *When post-installed anchors are used for sill plate or bottom track bolting applications, 10 percent of the anchors shall be tested.*
2. ***Rebar dowels.*** *When adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, 25 percent of the dowels shall be tested if all of the following conditions are met:*
   - *2.1. The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*
   - *2.2. The number of dowels in any one member equals or exceeds 12.*
   - *2.3. The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

1910A.5.3.2 Nonstructural applications. *50 percent of post-installed anchors used in nonstructural applications shall be proof tested. The percentage of tested anchors applies to each set of anchors of a common type (e.g., adhesive, wedge, or shell and sleeve for expansion bolts), size, and embedment depth and to each group of anchors. Four or more anchors connected to a common element shall be defined as a group.*

Exceptions:

1. ***Repetitive anchors.*** *When anchors are used repetitively (with 3 or more identical anchors) in distribution systems (such as pipe, duct or conduit supports) or architectural systems (such as suspended ceilings, cladding, and partitions), 20 percent of anchors, including at least one anchor in each group, shall be tested.*
2. ***Anchors with low tension.*** *When the design tension on anchors is less than 100 pounds and those anchors are clearly noted on the approved construction documents, 10 percent of anchors shall be tested.*
3. ***[OSHPD 4]*** *In state detention and correctional facilities, tension testing is not required for post-installed anchors used for attaching nonstructural components, such as grab bars and shower seats, to concrete walls if the components do not contribute to security/detainment, life safety and the continuous operation of the institution following an event of extreme environmental loading from flood, wind, snow or earthquakes, as determined by the enforcing agency.*

1910A.5.4 Test loads. *Required test loads shall be determined by one of the following methods:*

1. *Twice the maximum allowable tension load or one and a quarter ($1^1/_4$) times the maximum design strength of anchors as provided in an approved evaluation report using criteria adopted in this code or determined in accordance with Chapter 17 of ACI 318.*

   Tension test load need not exceed 80 percent of the nominal yield strength of the anchor element ($= 0.8\, A_{se}\, f_{yo}$).
2. *The manufacturer's recommended installation torque based on an approved evaluation report using criteria adopted in this code.*

1910A.5.5 Test acceptance criteria. *Proof tests shall satisfy the following minimum requirements.*

1. ***Tension test:*** *Anchors shall be tested in the unconfined condition in accordance with ASTM E3121 except that the minimum clearance to the test frame shall be 1.5 times the anchor's embedment depth. Test load shall be maintained for a minimum of 15 seconds and shall exhibit no discernible movement during the tension test, e.g., as evidenced by loosening of the washer under the nut or an abrupt decrease in the gauge pressure.*

   Exception: *Adhesive anchors shall be permitted to be tested in confined conditions in accordance with ASTM E3121 when the approved construction documents indicate that concrete breakout does not control the design tensile strength.*
2. ***Torque test:*** *Torque-controlled post-installed anchors tested with a calibrated torque wrench shall attain the specified torque within $^1/_2$ turn of the nut; or one-quarter ($^1/_4$) turn of the nut for a $^3/_8$ inch sleeve anchor only.*

   Screw-type anchors tested with a calibrated torque wrench shall attain the specified torque within one-quarter ($^1/_4$) turn of the screw after initial seating of the screw head.

SECTION 1911A—EXISTING CONCRETE STRUCTURES

1911A.1 Existing concrete structures.

The structural use of existing concrete with a core strength less than 1,500 psi (10.3MPa) is not permitted in rehabilitation work.

tests. Additional cores shall be permitted to be taken at the direction of the registered design professional and with approval of the enforcement agency.

Exceptions:

1. *Core sampling and testing is not required for non-bearing nonshear masonry walls, not exceeding total wall height of 12 feet above the top of the foundation, built with single-wythe hollow unit concrete masonry that attaches opposite face shells using webs cast as single unit, when designed using an f'_m not exceeding 2,000 psi (13.79MPa).*
2. *An infrared thermographic survey or other nondestructive test procedures shall be permitted to be approved as an alternative system to detect voids or delamination in grouted masonry in conjunction with reduced core sampling and testing. A minimum of two cores shall be taken from each building for each 10,000 square feet (930 m^2) of the wall.*

SECTION 2106—SEISMIC DESIGN

2106.1 Seismic design requirements for masonry. Masonry structures and components shall comply with the requirements in Chapter 7 of TMS 402 depending on the structure's seismic design category.

2106.1.1 TMS 402, Sections 5.4.1.4. [OSHPD 1R, 2 & 5] *Replace TMS 402, Section 5.4.1.4 Items (a), (b), (d) & (e) by the following:*

a. Vertical reinforcement shall be enclosed by lateral ties at least $^3/_8$ inch (*9.5 mm*) in diameter.
b. Vertical spacing of lateral ties, over the full height of the column, shall not exceed *8* longitudinal bar diameters, *24* lateral tie bar diameters, *8 inches (203 mm)*, *or one-half the* least cross-sectional dimension of the member.
d. Lateral ties shall be embedded in grout.
e. Lateral ties shall be located vertically not more than one-half lateral tie spacing above the top of the footing or slab in any story, and shall be spaced not more than one-half a lateral tie spacing nor 2 inches (51 mm) below the lowest horizontal reinforcement in beam, girder, slab, or drop panel above. *The top tie shall be within 2 inches (51 mm) of the top of the column.*

2106.1.2 TMS 402, Chapter 5. [OSHPD 1R, 2 & 5] *Add TMS 402, Section 5.7 as follows:*

5.7 – Lateral Support of Members

5.7.1 – Lateral support of masonry may be provided by cross walls, columns, pilasters, counterforts or buttresses where spanning horizontally, or by floors, beams, girts or roofs where spanning vertically. Where walls are supported laterally by vertical elements, the stiffness of each vertical element shall exceed that of the tributary area of the wall.

2106.1.3 TMS 402, Sections 7.4.4.1 and 7.4.5.1. [OSHPD 1R, 2 & 5] *Replace TMS 402, Section 7.4.4.1 as follows and delete Section 7.4.5.1:*

7.4.4.1 Minimum reinforcement requirements for masonry walls. *The total area of reinforcement in reinforced masonry walls shall not be less than 0.003 times the sectional area of the wall. Neither the horizontal nor the vertical reinforcement shall be less than one third of the total. Horizontal and vertical reinforcement shall be spaced at not more than 24 inches (610 mm) center to center. Where other than running bond is used in reinforced hollow unit masonry, the open-end type of unit shall be used with vertical reinforcement spaced a maximum of 16 inches (406 mm) on center.*

All cells shall be solidly filled with grout.

Exception: *Reinforced hollow unit masonry used for freestanding site walls or interior nonbearing nonshear wall partitions shall have horizontal reinforcing spaced not more than 4 feet (1.2 m) on center, except for locations in Seismic Design Category F, and may be grouted only in cells containing vertical and horizontal reinforcement.*

7.4.4.1.1 *The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall reinforcement shall have dowels of equal size and equally matched spacing in all footings. Reinforcement shall be continuous around wall corners and through intersections. Only reinforcement which is continuous in the wall shall be considered in computing the minimum area of reinforcement. Reinforcement with splices conforming to TMS 402 shall be considered as continuous reinforcement.*

7.4.4.1.2 *Horizontal reinforcing bars in bond beams shall be provided in the top of footings, at the top of wall openings, at roof and floor levels, and at the top of parapet walls. For walls 12 inches (nominal) (305 mm) or more in thickness, horizontal and vertical reinforcement shall be equally divided into two layers, except where designed as retaining walls. Where reinforcement is added above the minimum requirements, such additional reinforcement need not be so divided.*

7.4.4.1.3 *In bearing walls of every type of reinforced masonry, there shall be trim reinforcement of not less than one No. 5 bar or two No. 4 bars on all sides of, and adjacent to, every opening which exceeds 16 inches (406 mm) in either direction, and such bars shall extend not less than 48 diameters, but in no case less than 24 inches (610 mm) beyond the corners of the opening. The bars required by this paragraph shall be in addition to the minimum reinforcement required elsewhere.*

7.4.4.1.4 *When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns.*

7.4.4.1.5 *Joint reinforcement shall not be used as principal reinforcement in masonry.*

SECTION 2107—ALLOWABLE STRESS DESIGN

2107.1 General. The design of masonry structures using allowable stress design shall comply with Section 2106 and the requirements of Chapters 1 through 8 of TMS 402 except as modified by Sections 2107.2 through 2107.3 ***[OSHPD 1R, 2 & 5]*** *through 2107.5.*

2107.2 TMS 402, Section 6.1.7.1, lap splices. As an alternative to Section 6.1.7.1, it shall be permitted to design lap splices in accordance with Section 2107.2.1.

2107.2.1 Lap splices. The minimum length of lap splices for reinforcing bars in tension or compression, l_d, shall be:

Equation 21-1 $l_d = 0.002 d_b f_s$

For SI: $l_d = 0.29 d_b f_s$

but not less than 12 inches (305 mm). The length of the lapped splice shall be not less than 40 bar diameters.

In regions of moment where the design tensile stresses in the reinforcement are greater than 80 percent of F_s, the lap length of splices shall be increased not less than 50 percent of the minimum required length, but need not be greater than 72 d_b. Other equivalent means of stress transfer to accomplish the same 50 percent increase shall be permitted. Where epoxy coated bars are used, lap length shall be increased by 50 percent.

2107.3 TMS 402, Section 6.1.7, splices of reinforcement. Add to Section 6.1.7 as follows:

6.1.7 – Splices of reinforcement. Lap splices, welded splices or mechanical splices are permitted in accordance with the provisions of this section. Welding shall conform to AWS D1.4. Welded splices shall be of ASTM A706 steel reinforcement. Reinforcement larger than No. 9 (M #29) shall be spliced using mechanical connections in accordance with Section 6.1.7.2.

2107.4 Reserved.

2107.5 [OSHPD 1R, 2 & 5] TMS 402, Section 8.3.4.4 Walls. *Modify TMS 402 by adding Section 8.3.4.4 as follows by adding:*

8.3.4.4.1 *The minimum thickness of walls is given in this section. Stresses shall be determined on the basis of the net thickness of the masonry, with consideration for reduction, such as raked joints.*

8.3.4.4.2 *The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. Masonry walls shall not exceed the height or length-to-thickness ratio or the minimum thickness as specified in this chapter and as set forth in Table 8.3.4.4.*

8.3.4.4.3 *Every pier or wall section with a width less than three times its thickness shall be designed and constructed as required for columns if such pier is a structural member. Every pier or wall section with a width between three and five times its thickness or less than one half the height of adjacent openings shall have all horizontal steel in the form of ties except that in walls 12 inches (305 mm) or less in thickness such steel may be in the form of hair-pins.*

TABLE 8.3.4.4—MINIMUM THICKNESS OF MASONRY WALLS[1, 2]

TYPE OF MASONRY	*MAXIMUM RATIO UNSUPPORTED HEIGHT OR LENGTH TO THICKNESS[2,3]*	*NOMINAL MINIMUM THICKNESS (inches)*
BEARING OR SHEAR WALLS:		
1. Stone masonry	*14*	*16*
2. Reinforced grouted masonry	*25*	*6*
3. Reinforced hollow unit masonry	*25*	*6*
NONBEARING WALLS:		
4. Exterior reinforced walls	*30*	*6*
5. Interior partitions reinforced	*36*	*4*

1. *For walls of varying thickness, use the least thickness when determining the height or length to thickness ratio.*
2. *In determining the height or length-to-thickness ratio of a cantilevered wall, the dimension to be used shall be twice the dimension of the end of the wall from the lateral support.*
3. *Cantilevered walls not part of a building and not carrying applied vertical loads need not meet these minimum requirements but their design must comply with stress and overturning requirements.*

SECTION 2108—STRENGTH DESIGN OF MASONRY

2108.1 General. The design of masonry structures using strength design shall comply with Section 2106 and the requirements of Chapters 1 through 7 and Chapter 9 of TMS 402, except as modified by Sections 2108.2 through 2108.3.

➡ **2108.2 TMS 402, Section 6.1.6, development.** Add a second paragraph to Section 6.1.6 as follows:

The required development length of reinforcement need not be greater than 72 d_b.

2108.3 TMS 402, Section 6.1.6.1.1, splices. Add to Sections 6.1.7.2.1 and 6.1.7.3.1 as follows:

6.1.7.3.1 – Welded splices shall not be permitted in plastic hinge zones of intermediate or special reinforced walls.

6.1.7.2.1 – Mechanical splices shall be classified as Type 1 or 2 in accordance with Section 18.2.7.1 of ACI 318. Type 1 mechanical splices shall not be used within a plastic hinge zone or within a beam-column joint of intermediate or special reinforced masonry shear walls. Type 2 mechanical splices are permitted in any location within a member.

less than 20 psi (138 kPa) for Type II adhesive when tested in accordance with ANSI A136.1. Tile set in organic adhesives shall be installed in accordance with ANSI A108.4.

2103*A*.2.3.7 Portland cement grouts. Portland cement grouts used for the installation of ceramic tile shall comply with ANSI A118.6. Portland cement grouts for tile work shall be installed in accordance with ANSI A108.10.

2103*A*.2.4 Mortar for adhered masonry veneer. Mortar for use with adhered masonry veneer shall conform to Section 13.3 of TMS 402.

2103*A*.3 Grout. Grout shall comply with Article 2.2 of TMS 602.

2103A.3.1 Aggregate. *Coarse grout shall be used in grout spaces between wythes of 2 inches (50.8 mm) or more in width as determined in accordance with TMS 602 Table 7, footnote 3, and in all grouted cells of hollow unit masonry construction.*

2103*A*.4 Metal reinforcement and accessories. Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602. Where unidentified reinforcement, *or bar reinforcement without mill certification,* is approved for use, not less than three tension and three bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work. *Alternatively, the frequency of sampling for unidentifiable reinforcing bars specified in Section 1910A.2 can be used.*

2103A.5 Air entrainment. *Air-entraining materials or air-entraining admixtures shall not be used in grout.*

2103A.6 Specified compressive strength of masonry and grout*. Replace TMS 402 Table 4.3.1 by the following:*

TABLE 4.3.1—SPECIFIED COMPRESSIVE STRENGTH REQUIREMENTS

TYPE OF MASONRY	SPECIFIED COMPRESSIVE STRENGTH OF MASONRY	SPECIFIED COMPRESSIVE STRENGTH OF GROUT
Concrete masonry	*2,000 psi (13.79 MPa)* ≤ f'_m ≤ *3,000 psi (20.68 MPa)*	$f'_g \geq f'_m \leq$ 5,000 psi (34.47 MPa)
Clay masonry	*1,500 psi (10.34 MPa)* ≤ f'_m ≤ *4,500 psi (31.02 MPa)*	$f'_g \leq$ 6,000 (41.37 MPa)

SECTION 2104*A*—CONSTRUCTION

2104*A*.1 Masonry construction. Masonry construction shall comply with the requirements of Sections 2104*A*.1.1 *through* 2104*A*.1.3 and with the requirements of either TMS 602 or TMS 604.

2104*A*.1.1 Support on wood. Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section 2304*A*.13.

2104*A*.1.2 Molded cornices. Unless structural support and anchorage are provided to resist the overturning moment, the center of gravity of projecting masonry or molded cornices shall lie within the middle one-third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of approved noncombustible material anchored in an approved manner.

2104A.1.3 Reinforced grouted masonry.

2104A.1.3.1 [DSA-SS] TMS 602, Article 3.2 F Cleanouts. *Replace TMS 602, Article 3.2 F with the following:*

3.2 F. *Cleanouts* - Provide cleanouts in the bottom course of masonry for each grout pour when the grout pour height exceeds *the height limits given in Section 2104A.1.3.5 Item 3.*

1. *Cleanout openings in hollow unit masonry shall be provided in every cell at the bottom of each pour of grout. Alternatively, if the course at the bottom of the pour is constructed entirely of inverted double open-end bond beam units, cleanout openings need only be provided for access to every reinforced cell at the bottom of each pour of grout.*
2. *Cleanouts in multi-wythe masonry shall be provided for each pour by leaving out every other unit in the bottom wythe of the section being poured or by cleanout openings in the foundation.*
3. *The foundation or other horizontal construction joints at the cleanouts shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed after inspection and before grouting.*

2104A.1.3.2 TMS 602, Article 3.3 B Placing mortar and units. *Modify TMS 602, Article 3.3 B.2.c as follows:*

c. Remove masonry protrusions extending *greater than* $^1/_4$ inch (*6.4* mm) into cells or cavities to be grouted.

2104A.1.3.3 TMS 602, Article 3.4 B Reinforcement. *Modify TMS 602, Article 3.4 B.1 through Article 3.4 B.3 as follows:*

1. Support reinforcement to prevent displacement caused by construction loads or by placement of grout or mortar. *Reinforcement and embedded items shall be clean, properly positioned and securely anchored against moving prior to grouting.*
2. Completely embed reinforcing bars and *embedded items* in grout in accordance with Article 3.5.
3. Maintain clear distance between reinforcing bars and the interior of masonry unit or formed surface of at least $^1/_2$ inch (12.7 mm), *and a minimum of one bar diameter,* except where cross webs of hollow units are used as supports for horizontal reinforcement.

2104A.1.3.4 TMS 602, Article 3.4 E Anchor bolts. *Replace TMS 602, Article 3.4 E.3 and add Articles 3.4 E.5 and 3.4 E.6 as follows:*

3. *Anchor bolts in the wythe or face shells of hollow masonry units shall be positioned to maintain a minimum of* $^1/_2$ *inch (12.7 mm) of grout between the bolt circumference and the wythe or the face shell. For the portion of the bolt that is within the grouted cell, maintain a clear distance between the bolt and the face of masonry unit and between the head of the bolt and*

the formed surface of grout of at least $^1/_4$ inch (6.4 mm) when using fine grout and at least $^1/_2$ inch (12.7 mm) when using coarse grout. Bolts shall be solidly embedded in grout.

5. *Bent bar anchor bolts shall not be allowed. The maximum size anchor shall be $^1/_2$-inch (12.7 mm) diameter for 6-inch (152 mm) nominal masonry, $^3/_4$-inch (19.1 mm) diameter for 8-inch (203 mm) nominal masonry, $^7/_8$-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25.4 mm) diameter for 12-inch (305 mm) nominal masonry.*
6. *Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.*

2104A.1.3.5 [DSA-SS] TMS 602, Article 3.5 C Grout pour height. *Replace TMS 602, Article 3.5 C and Table 7 as follows:*

1. Do not exceed the grout pour height given in Table 7. *Grout pours not terminated at the top of constructed masonry shall comply with TMS 602, Articles 3.5 C.3.a through 3.5 C.3.c.*
2. *The top of the grout pour shall be in the top course of the constructed masonry. Grout pours not terminated within the top course of the constructed masonry shall comply with TMS 602, Articles 3.5 C.3.a through 3.5 C.3.c.*
3. *Grout pours in excess of 4 feet (1219 mm) or 5 feet 4 inches (1651 mm) for 10-inch (254 mm) nominal or wider for hollow unit masonry shall be subject to approval of the enforcement agency and the following:*
   a. *Grouting shall be done in a continuous pour in lifts not exceeding the requirements of TMS 602, Article 3.5 D.*
   b. *The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.*
   c. *Cleanout openings shall be provided at the bottom of each pour of grout.*

TABLE 7—GROUT SPACE REQUIREMENTS

GROUT TYPE[1]	MAXIMUM GROUT POUR HEIGHT, FT (M)	MINIMUM CLEAR WIDTH OF GROUT SPACE,[2,3] IN. (MM)	MINIMUM CLEAR GROUT SPACE DIMENSIONS FOR GROUTING CELLS OF HOLLOW UNITS,[3] IN. × IN. (MM × MM)
Coarse	1 (0.3)	$2^1/_2$ *(63.5)*	*2* × 3 *(50.8* × 76.2)
Coarse	*4[4] (1.22)*	$2^1/_2$ *(63.5)*	$2^1/_2$ × 3 (63.5 × 76.2)
Coarse	12.67[5] (3.86)	$3^1/_2$ *(88.9)*	3 × 3[5] (76.2 × 76.2)

1. Coarse grout is defined in ASTM C476.
2. For grouting between masonry wythes.
3. Minimum clear width of grout space and minimum clear grout space dimension are the net dimension of the space determined by subtracting masonry protrusions and the diameters of horizontal reinforcement from the as-built cross section of the grout space.
4. *Maximum pour height can be increased to 5.33 feet for 10-inch nominal or wider hollow unit masonry.*
5. *Maximum pour height can be increased to 16 feet for hollow unit masonry walls with a nominal thickness of 12 inches or more and minimum clear grout space dimensions of 3 in. x 4 in. (76.2 mm x 102 mm).*

2104A.1.3.6 [DSA-SS] TMS 602, Article 3.5 D Grout lift height. *Modify TMS 602, Article 3.5 D as follows:*

3. *Grout lift height shall not exceed 4 feet (1219 mm).*

   Exception: *The 4 feet (1219 mm) maximum lift height may be increased to 5 feet 4 inches (1.63 m) for 10-inch (254 mm) nominal and larger hollow unit masonry.*

2104A.1.3.7 Reserved.

2104A.1.3.8 TMS 602, Article 3.5 F.1 Grout key. *Replace TMS 602, Article 3.5 F.1 as follows:*

1. *Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by terminating grout a minimum of $1^1/_2$ inches (38.1 mm) and a maximum of one-half the masonry unit height below a mortar joint, except at the top of the wall. Where bond beams occur, the grout pour shall be terminated a minimum of $^1/_2$ inch (12.7 mm) below the mortar joint. Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25.4 mm) above reinforcing steel for each grout pour.*

2104A.1.3.9 TMS 602, Article 3.5 Grout placement. *Add the following to TMS 602, Article 3.5:*

3.5 I. *Additional grouting requirements:*

1. *Place grout by pumping or an approved alternate method prior to initial set and loss of plasticity.*
2. *Place grout so that all spaces to be grouted do not contain voids.*
3. *Grout shall not be handled nor pumped utilizing aluminum equipment unless it can be demonstrated with the materials and equipment to be used that there will be no deleterious effect on the strength of the grout.*

2104A.1.3.10 Reinforced grouted multi-wythe masonry.

2104A.1.3.10.1 General. *Reinforced grouted multi-wythe masonry is that form of composite construction made with clay or shale brick or made with solid concrete building brick in which interior spaces of masonry are filled by pouring grout around reinforcement therein as the work progresses.*

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 22 – STEEL

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	**X**			**X**	**X**								**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)									**X**		**X**	**X**			**X**									
Adopt only those sections that are listed below																								
Chapter / Section																								
2201.1.1									X		X	X			X									
2201.1.2									X		X	X			X									
2201.1.3									X		X	X			X									
2201.1.4									X															
2201.1.5									X		X	X			X									
2201.4.1											X	X			X									
2201.5.1											X	X			X									
2202.1											X	X			X									
2202.2.1											X	X			X									
2202.2.1.2											X	X			X									
2202.2.2											X	X			X									
2202.3											X	X			X									
2202.4											X	X			X									
2207.4											X	X			X									
2207.6											X	X			X									
2208.1											X	X			X									
2204.2											X	X			X									
2206.1.1.2											X	X			X									
2206.1.3											X	X			X									
2206.2											X	X			X									
2214.1											X	X			X									
2215									X															
2216											X	X			X									

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

CHAPTER

22 STEEL

User notes:

About this chapter: Chapter 22 provides the minimum requirements for the design and construction of structural steel (including composite construction), cold-formed steel, steel joists, steel cable structures and steel storage racks. This chapter specifies appropriate design and construction standards for these types of structures. It also provides a road map of the applicable technical requirements for steel structures. Chapter 22 requires that the design and use of steel structures and components be in accordance with the applicable specifications and standards of the American Institute of Steel Construction, the American Iron and Steel Institute, the Steel Joist Institute and the American Society of Civil Engineers.

This chapter was extensively reorganized for the 2024 edition. For complete information, see the relocations table in the Preface information of this code.

ICC code development note: Code change proposals to this chapter will be considered by the IBC—Structural Code Development Committee during the 2025 (Group B) Code Development Cycle.

SECTION 2201—GENERAL

2201.1 Scope. The provisions of this chapter govern the quality, design, fabrication and erection of steel construction.

2201.1.1 Application. [DSA-SS/CC, OSHPD] *The scope of application of Chapter 22 is as follows:*

1. *Structures regulated by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development (OSHPD), which include hospital buildings removed from general acute care service, skilled nursing facility buildings, intermediate care facility buildings and acute psychiatric hospital buildings, as listed in Sections 1.10.1, 1.10.2 and 1.10.5.*
2. *Structures regulated by the Division of the State Architect-Structural Safety/Community Colleges (DSA-SS/CC), which include those applications listed in Section 1.9.2.2.*

2201.1.2 Amendments in this chapter. [DSA-SS/CC, OSHPD] *DSA-SS/CC, OSHPD adopt this chapter as amended.*

2201.1.3 Identification of amendments. [DSA-SS/CC, OSHPD]

1. ***[OSHPD 1R, 2 & 5]*** *Office of Statewide Hospital Planning and Development (OSHPD) amendments appear in this chapter preceded by the appropriate acronym, as follows:*

   [OSHPD 1R*] - For applications listed in Section 1.10.1.*

   [OSHPD 2] *- For applications listed in Section 1.10.2.*

   [OSHPD 5] *- For applications listed in Section 1.10.5*
2. ***[DSA-SS/CC]*** *Division of the State Architect - Structural Safety/Community Colleges amendments appear in this chapter preceded by the appropriate acronym, as follows:*

   [DSA-SS/CC] *- For applications listed in Section 1.9.2.2*

2201.1.4 Reference to other chapters. [DSA-SS/CC] *Where reference within this chapter is made to sections in Chapter 17, the provisions in Chapter 17A shall apply instead.*

2201.1.5 Additional amendments. [DSA-SS/CC] *See Section 2215 for additional requirements.*

2201.2 Identification. Identification of steel members shall be in accordance with the applicable referenced standards within this chapter. Other steel furnished for structural load-carrying purposes shall be identified for conformity to the ordered grade in accordance with the specified ASTM standard or other specification and the provisions of this chapter. Where the steel grade is not readily identifiable from marking and test records, the steel shall be tested to verify conformity to such standards.

2201.3 Protection. The protection of steel members shall be in accordance with the applicable referenced standards within this chapter.

2201.4 Connections. The design and installation of steel connections shall be in accordance with the applicable referenced standards within this chapter. For special inspection of welding or installation of high-strength bolts, see Section 1705.2.

2201.4.1 Restrained welded connections. [OSHPD 1R, 2 & 5] *Welded structural steel connections having a medium or high level of restraint, as defined by AWS D1.1 Annex H, shall have a minimum pre-heat temperature of not less than 150°F (66°C). Welded structural steel connections with welds to flange, web, wall or plate having a high level of restraint shall maintain a post-heat temperature of 300°F (149°C) for a minimum of 1 hour after completion of welding.*

2201.5 Anchor rods. Anchor rods shall be set in accordance with the approved construction documents. The protrusion of the threaded ends through the connected material shall fully engage the threads of the nuts, but shall not be greater than the length of the threaded portion of the bolts.

2201.5.1 Shear transfer at column base plate. [OSHPD 1R, 2 & 5] *Where the holes in column base plates are more than $^1/_8$ inch (3 mm) larger than the anchor rods, as permitted by AISC 360, the anchor rods shall be designed for the induced bending stresses in combination with axial and shear stresses. Alternatively, shear lugs designed in accordance with ACI 318 Section 17.11 shall be permitted to transfer shear forces between column base plates and the supporting structure.*

SECTION 2202—STRUCTURAL STEEL AND COMPOSITE STRUCTURAL STEEL AND CONCRETE

2202.1 General. The design, fabrication and erection of structural steel elements and composite structural steel and concrete elements in buildings, structures and portions thereof shall be in accordance with AISC 360.

Exceptions**: **[OSHPD 1R, 2 & 5]

1. *For members designed based on tension, the slenderness ratio (L/r) shall not exceed 300, except for the design of hangers and bracing in accordance with NFPA 13 and for rod hangers in tension.*
2. *For members designed based on compression, the slenderness ratio (KL/r) shall not exceed 200, except for the design of hangers and bracing in accordance with NFPA 13.*

2202.2 Seismic design. Where required, the seismic design, fabrication and erection of buildings, structures and portions thereof shall be in accordance with Section 2202.2.1 or 2202.2.2, as applicable.

2202.2.1 Structural steel seismic force-resisting systems and composite structural steel and concrete seismic force-resisting systems. The design, detailing, fabrication and erection of structural steel seismic force-resisting systems and composite structural steel and concrete seismic force-resisting systems shall be in accordance with the provisions of Section 2202.2.1.1 or 2202.2.1.2, as applicable.

*[**OSHPD 1R, 2 & 5**] Seismic requirements for composite structural steel and concrete construction shall be considered as an alternative system, except as permitted by Section 2202.4.1.*

2202.2.1.1 Seismic Design Category B or C. Structures assigned to Seismic Design Category B or C shall be of any construction permitted in Section 2202. Where a response modification coefficient, R, in accordance with ASCE 7, Table 12.2-1, is used for the design of structures assigned to Seismic Design Category B or C, the structures shall be designed and detailed in accordance with the requirements of AISC 341. Beam-to-column moment connections in structural steel special moment frames and intermediate moment frames shall be prequalified in accordance with AISC 341, Section K1, qualified by testing in accordance with AISC 341, Section K2, or shall be prequalified in accordance with AISC 358.

Exception: The response modification coefficient, R, designated for "Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" in ASCE 7, Table 12.2-1, shall be permitted for structural steel systems designed and detailed in accordance with AISC 360, and need not be designed and detailed in accordance with AISC 341.

2202.2.1.2 Seismic Design Category D, E or F. Structures assigned to Seismic Design Category D, E or F shall be designed and detailed in accordance with AISC 341, except as permitted in ASCE 7, Table 15.4-1. Beam-to-column moment connections in structural steel special moment frames and intermediate moment frames shall be prequalified in accordance with AISC 341, Section K1, qualified by testing in accordance with AISC 341, Section K2, or shall be prequalified in accordance with AISC 358. ***[OSHPD 1R, 2 & 5]*** *All structural steel seismic force-resisting systems in ASCE 7 Table 15.4-1 shall be designed in accordance with AISC 341.*

2202.2.2 Structural steel elements. The design, detailing, fabrication and erection of structural steel elements in seismic force-resisting systems other than those covered in Section 2202.2.1, including struts, collectors, chords and foundation elements, shall be in accordance with AISC 341 where either of the following applies:

1. The structure is assigned to Seismic Design Category D, E or F, except as permitted in ASCE 7, Table 15.4-1.
2. A response modification coefficient, R, greater than 3 in accordance with ASCE 7, Table 12.2-1, is used for the design of the structure assigned to Seismic Design Category B or C.

[OSHPD 1R, 2 & 5] *All structural steel elements in seismic force-resisting systems shall satisfy the requirements in AISC 341.*

2202.3 Modifications to AISC 341. [OSHPD 1R, 2 & 5]

2202.3.1 Section A4. *Modify Section A4.1 Item (c) by adding the following:*

(c) Locations and dimensions of protected zones. The fabricator shall permanently mark protected zones of structural elements in the seismic force-resisting system in the building that are designated on the construction documents. If these markings are obscured during construction, such as after the application of fire protection, the owner's designated representative shall re-mark the protected zones as they are designated on the construction documents. Primers or paints used to mark protected zones on steel surfaces, which are to receive sprayed fire-resistance material, shall comply with California Building Code Section 704.13.3.2.

2202.3.2 Section I2. *Replace Section I2.1 item (d) as follows:*

(d) Decking attachments that penetrate the beam flange shall not be placed on beam flanges within the protected zone, except power-actuated fasteners up to 0.18 in. diameter are permitted, provided that the penetration is less than 85% of beam flange thickness.

2202.4 Modifications to AISC 358. [OSHPD 1R, 2 & 5]

2202.4.1 Modifications to AISC 358 Chapter 10. *Steel and concrete ConXtech ConXL composite special moment frame connections shall be permitted, provided:*

a. Beams are provided with Reduced Beam Sections (RBS);

b. *Web extension to beam web two-sided fillet welds are sized to develop expected strength of the beam web and shall not be less than a $^1/_4$ inch fillet weld; and*

c. *The built-up box column wall thickness shall not be less than 1.25 inches and the HSS column wall thickness shall not be less than $^1/_2$ inch.*

2202.4.2 Modifications to AISC 358 Chapter 11 Welded Moment Connection. *The welded sideplate steel moment connection shall be permitted, provided:*

1. *The beams shall consist of either rolled or built-up wide flange sections.*
2. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*
3. *For SMF and IMF systems, U-shaped cover plates shall be used and the hinge-to-hinge span to beam depth, L_h/d, shall be greater than or equal to 5.*
4. *The width-to-thickness ratios for beam flanges shall not be less than 3.*
5. *The spacing for lateral bracing of wide flange beams, L_b, shall include the length of the side plate at beam ends.*
6. *The extension of the side plates beyond the face of the column shall be within the range of 0.77d to 1.0d.*
7. *The gap-to-side plate thickness ratio shall range from 2.1 to 2.3.*

   Exception: *The gap-to-side plate thickness ratio shall be permitted to be modified for moment connections with unequal beam sizes on opposite sides of the column or when orthogonal beams acting as drag connections frame into the side plate.*
8. *Demand critical fillet welds {2}, {5}, {5a} and {7} shall have Magnetic Particle Testing (MT) in accordance with AWS D1.1 for procedure, technique and acceptance. Inspect the beginning and end of these welds for a 6-inch length, plus any location along the length of the weld where a start and restart is visually noted for a distance of 6 inches on either side of the start/stop location.*

2202.4.3 Modifications to AISC 358 Chapter 11 Bolted Moment Connection *The bolted sideplate steel moment connection shall be permitted, provided:*

1. *The beams shall consist of either rolled or built-up wide flange sections. Columns shall consist of rolled or built-up wide flange sections or noncomposite built-up box or HSS with a minimum wall thickness of $^3/_4$ inch (19 mm), or satisfy the requirements of width-to-thickness ratios of highly ductile members in AISC 341-16.*
2. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*
3. *For SMF and IMF systems, on the sideplate standard or configuration A the U-shaped cover plates shall be used with the k dimension extension. The k dimension extension length is defined as beam depth $d_b/6$, rounded to the nearest $^1/_2$ inch (12.7 mm).*
4. *The hinge-to-hinge span to beam depth, L_h/d, shall be greater than or equal to 4.5.*
5. *The width-to-thickness ratios for beam flanges shall not be less than 3.5.*

   Exception: *For width-to-thickness ratios less than 3.5 the C_{pr} shall be calculated in accordance with that for welded sideplate connections but in no case shall the width-to-thickness ratio be less than 3.0.*
6. *The minimum bolt-to-bolt spacing shall not be less than 3 bolt diameters.*
7. *The extension of the side plates beyond the face of the column shall be within the range of 0.65d to 1.5d.*
8. *The gap-to-side plate thickness ratio shall range from 2.1 to 2.3.*

   Exception: *The gap-to-side plate thickness ratio shall be permitted to be modified for moment connections with unequal beam sizes on opposite sides of the column or when orthogonal beams acting as drag connections frame into the side plate.*
9. *Demand Critical fillet welds {2}, {5}, {5a} and {8} shall have Magnetic Particle Testing (MT) in accordance with AWS D1.1 for procedure, technique and acceptance. Inspect the beginning and end of these welds for a 6-inch (152 mm) length, plus any location along the length of the weld where a start and restart is visually noted for a distance of 6 inches (152 mm) on either side of the start/stop location.*
10. *The connection specific factor to account for peak connection strength, C_{pr}, shall be between 1.15 and 1.35. Calculations shall be submitted to OSHPD for review and approval.*
11. *For in-plane collectors transferring axial loads into the sideplate connection, coordination between sideplate and the registered design professional in responsible charge will be required to confirm the collector connection is sufficient to transfer the load into the moment frame system. This requirement shall be satisfied by designing the sideplate connections in the first bay of a multi-bay sideplate moment frame or an end bay to have a minimum connection capacity, including combined shear ($V_u + V_g$) and moment (M_{pr}) demands, of at least 1.2 times the M_{pr} at the plastic hinge location when the axial load, as determined by ASCE 7, Section 12.10.2.1 without Ω_o, exceeds 0.1 F_yA_g of the sideplate beam.*
12. *A complete frame analysis for gravity and design wind loading using LRFD load combinations in Section 1605.1 shall be performed including Demand/Capacity Ratios. Frame beam member nominal moment strengths (M_n) used for gravity and design wind loading for the bolted sideplate connection using Class A or Class B faying surfaces shall be taken as $0.80F_yZ$ for frame beams up to 300 plf and $0.60F_yZ$ for frame beams greater than 300 plf.*
13. *For moment frame beams with maximum beam shear greater than 90 percent of the vertical bolt shear capacity, a secondary check is to be provided to confirm the vertical bolt shear capacities are sufficient.*

14. *Bolted sideplate connections used on heavy-shallow frame beams for beams greater than 200 plf and shallower than 24 inches (610 mm) in depth shall be considered as an alternative system.*
15. *Skewed beams shall utilize the link-beam fabrication method with CJP welded splices for skew angles. The skew angle shall be less than 15 degrees.*
16. *For two-sided bolted sideplate connections sharing the same side plates at the same height and depth across the column, the vertical offset in the beams shall not exceed 10 inches (254 mm).*

2202.4.4 Modifications to AISC 358 Chapter 12. *The Simpson Strong-Tie (SST) Strong Frame bolted moment connection shall be permitted, provided:*

1. *Only T-stub yield links are permitted. End plate yield links are not permitted.*
2. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*
3. *Beam flange width-to-thickness ratio shall satisfy AISC 341 Table D1.1b.*
4. *Yield-Link stem-to-beam flange connection bolts shall not slip under wind design demand loads. Yield-Link stem-to-beam flange connection shall be designed to prevent slip using AISC 360 Equation J3-4, where the slip resistance, μ, is taken to be 0.3.*
5. *Double shear plate connection is permitted to increase connection axial capacity for collector loads. A partial joint penetration (PJP) groove weld for second shear plate is permissible due to space restrictions.*

2202.4.5 Modifications to AISC 358 Chapter 15. *The DuraFuse Frames (DFF) bolted moment connection shall be permitted, provided:*

1. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*
2. *DFF connection bolts shall not slip under wind design demand loads. The connection shall be designed to prevent slip using AISC 360 Equation J3-4, where the slip resistance is taken to be 0.3.*
3. *Beam flange width-to-thickness ratio shall satisfy AISC 341 Table D1.1b.*
4. *The beam weight shall be limited to a maximum of 232 pounds per foot (345 kg/m).*

SECTION 2203—STRUCTURAL STAINLESS STEEL

2203.1 General. The design, fabrication and erection of austenitic and duplex structural stainless steel shall be in accordance with AISC 370.

SECTION 2204—COLD-FORMED STEEL

2204.1 General. The design of cold-formed carbon and low-alloy steel structural members not covered in Sections 2206 through 2209 shall be in accordance with AISI S100. The design of cold-formed steel diaphragms shall be in accordance with additional provisions of AISI S310 as applicable. Where required, the seismic design of cold-formed steel structures shall be in accordance with the additional provisions of Section 2204.2.

2204.2 Seismic design. The design and detailing of cold-formed steel seismic force-resisting systems shall be in accordance with Sections 2204.2.1 and 2204.2.2, as applicable.

[OSHPD 1R, 2 & 5] *Cold-formed steel structures shall be designed and detailed in accordance with the requirements of AISI S100 and AISI S400. Cold-formed steel special bolted moment frames are not permitted by OSHPD.*

2204.2.1 CFS special bolted moment frames. Where a response modification coefficient, *R*, in accordance with ASCE 7, Table 12.2-1, is used for the design of cold-formed steel special bolted moment frames, the structures shall be designed and detailed in accordance with the requirements of AISI S400.

2204.2.2 Cold-formed steel seismic force-resisting systems. The response modification coefficient, *R*, designated in ASCE 7 Table 12.2-1 for “Steel systems not specifically detailed for seismic resistance, excluding cantilever column systems" shall be permitted for systems designed and detailed in accordance with AISI S100. Such systems need not be designed and detailed in accordance with AISI S400.

SECTION 2205—COLD-FORMED STAINLESS STEEL

2205.1 General. The design of cold-formed stainless steel structural members shall be in accordance with ASCE 8.

[OSHPD 1R, 2 & 5] *Modify AISI S100 Chapter J (Connections and Joints, Section J7.2) by the following: Power-actuated fastener allowable design strength shall not exceed that permitted in the evaluation report qualified by ICC AC 70 or ASCE 7, Section 13.4.5.*

SECTION 2206—COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION

2206.1 Structural framing. For cold-formed steel light-frame construction, the design and installation of the following structural framing systems, including their members and connections, shall be in accordance with AISI S240, and Sections 2206.1.1 through 2206.1.3, as applicable:

1. Floor and roof systems.

2209.3 Certification. For steel storage racks that are 8 feet (2438 mm) in height or greater to the top load level and assigned to Seismic Design Category D, E, or F at completion of the storage rack installation, a certificate of compliance shall be submitted to the owner or the owner's authorized agent stating that the work was performed in accordance with approved construction documents.

SECTION 2210—METAL BUILDING SYSTEMS

2210.1 General. The design, fabrication and erection of a metal building system shall be in accordance with the provisions of this section.

2210.1.1 Design. The design of metal building systems shall be in accordance with Sections 2210.1.1.1 through 2210.1.1.4, as applicable.

2210.1.1.1 Structural steel. The design, fabrication and erection of structural steel shall be in accordance with Section 2202.

2210.1.1.2 Cold-formed steel. The design of cold-formed carbon and low-alloy steel structural members shall be in accordance with Section 2204.

2210.1.1.3 Steel joists. The design of steel joists shall be in accordance with Section 2207.

2210.1.1.4 Steel cable. The design, fabrication and erection of steel cables, including related connections, shall be in accordance with Section 2214.

2210.2 Seismic design. Where required, the seismic design, fabrication and erection of the structural steel seismic force-resisting system shall be in accordance with Section 2202.2.1 or 2202.2.2, as applicable.

SECTION 2211—INDUSTRIAL BOLTLESS STEEL SHELVING

2211.1 General. The design, testing and utilization of industrial boltless steel shelving shall be in accordance with MHI ANSI/MH 28.2. Where required by ASCE 7, the seismic design of industrial boltless steel shelving shall be in accordance with Chapter 15 of ASCE 7.

SECTION 2212—INDUSTRIAL STEEL WORK PLATFORMS

2212.1 General. The design, testing and utilization of industrial steel work platforms shall be in accordance with MHI ANSI/MH 28.3. Where required by ASCE 7, the seismic design of industrial steel work platforms shall be in accordance with Chapter 15 of ASCE 7.

SECTION 2213—STAIRS, LADDERS AND GUARDING FOR STEEL STORAGE RACKS AND INDUSTRIAL STEEL WORK PLATFORMS

2213.1 General. The design and installation of stairs, ladders and guarding serving steel storage racks and industrial steel work platforms used in material handling structures shall be in accordance with MHI ANSI/MH 32.1.

SECTION 2214—STEEL CABLE STRUCTURES

2214.1 General. The design, fabrication and erection including related connections, and protective coatings of steel cables for buildings shall be in accordance with ASCE 19.

[OSHPD 1R, 2 & 5] *Steel cables with glass or polymer fabric material acting as a tensile membrane structure shall be considered as an alternative system.*

SECTION 2215—ADDITIONAL REQUIREMENTS FOR COMMUNITY COLLEGES [DSA-SS/CC]

2215.1 General.

2215.1.1 Shear transfer at column base plate. *Where the holes in column base plates are more than $^{1}/_{8}$ inch (3 mm) larger than the anchor rods, as permitted by AISC 360, the anchor rods shall be designed for the induced bending stresses in combination with axial and shear stresses. Alternatively, shear lugs designed in accordance with ACI 318 Section 17.11 shall be permitted to transfer shear forces between column base plates and the supporting structure.*

2215.2 Modifications to AISC 341.

2215.2.1 Section B5. *Modify exception of Section B5.2 as follows:*

Exception: The forces specified in this section need not be applied to truss diaphragms designed as a part of a three-dimensional system in which the seismic force-resisting system types consist of ordinary moment frames, ordinary concentrically braced frames, ordinary cantilever column systems, special cantilever column systems, or combinations thereof, and where *each diagonal bracing member resists no more than 30 percent of the diaphragm shear at each line of resistance and where* the truss diagonal members conform to Sections F1.4b and F1.5 and the connections conform to Section F1.6.

2215.2.2 Section D2. *Modify Section D2.6c(b)(2) as follows:*

(2) The moment calculated using the *load combinations of the applicable building code, including the amplified seismic load, provided the connection or other mechanism within the column base is designed to have the ductility necessary to accommodate the column base rotation resulting from the design story drift.*

2215.3 Seismic requirements for composite structural steel and concrete construction. *In addition to the requirements of Section 2202.2.1, steel and concrete ConXtech ConXL composite special moment frame with the approved moment connections in accordance with AISC 358 Chapter 10 shall be permitted provided:*

1. *Beams are provided with reduced beam sections (RBS);*

2. *Web extension to beam web two-sided fillet welds are sized to develop expected strength of the beam web and shall not be less than a $^1/_4$-inch fillet weld; and*
3. *The built-up box column wall thickness shall not be less than 1.25 inches and the HSS column wall thickness shall not be less than $^1/_2$ inch.*

2215.4 Steel joists.

2215.4.1 Design approval. *Joist and joist girder design calculations and profiles with member sizes and connection details, and joist placement plans shall be provided to the enforcement agency and approved prior to joist fabrication, in accordance with Title 24, Part 1. Joist and joist girder design calculations and profiles with member sizes and connection details shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the joist design. Alterations to the approved joist and joist girder design calculations and profiles with member sizes and connection details, or to fabricated joists are subject to the approval of the enforcement agency.*

2215.4.2 Joist chord bracing. *The chords of all joists shall be laterally supported at all points where the chords change direction.*

2215.5 Cold-formed steel light-frame construction.

2215.5.1 Trusses.

2215.5.1.1 Analysis submittals. *Complete engineering analysis and truss design drawings shall accompany the construction documents submitted to the enforcement agency for approval. When load testing is required the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.*

2215.5.1.2 Deferred submittals. *Deferred submittal per Section I1.4.2 of AISI 202 is not permitted by DSA-SS/CC.*

2215.5.2 Anchorage for shear. *Cold-formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall in accordance with Section 2304.3.4, Item 2.*

2215.5.3 Limitations on shear wall assemblies. *Shear wall assemblies in accordance with Sections E5, E6 and E7 of AISI-S400 are not permitted within the seismic force-resisting system of buildings or structures assigned to Risk Category II, III, IV or buildings designed to be relocatable.*

2215.6 Testing.

2215.6.1 Tests of high-strength bolts, nuts and washers. *High-strength bolts, nuts and washers shall be sampled and tested in accordance with Section 1705A.2.8.*

2215.6.2 Tests of end-welded studs. *End-welded studs shall be sampled and tested in accordance with the requirements of the AWS D1.1.*

SECTION 2216—TESTING AND FIELD VERIFICATION [OSHPD 1R, 2 & 5]

2216.1 Tests of high-strength bolts, nuts and washers*. High-strength bolts, nuts and washers shall be sampled and tested by an approved agency for conformance with the requirements of applicable ASTM standards.*

A minimum of nine samples per lot, as defined in the ASTM standards for bolts [not nuts and washers], shall be tested for tensile properties in accordance with ASTM F606, but need not exceed three samples per 400 bolts.

2216.2 Tests of end-welded studs. *End-welded studs shall be tested in accordance with the requirements of the AWS D1.1, Clauses 9.7 and 9.8.*

Exception: *Fillet-welded studs exempted by AWS D1.1, Clause 9.5*

2202A.4.3 Modifications to AISC 358 Chapter 11 Bolted Moment Connection. *The bolted sideplate steel moment connection shall be permitted, provided:*

1. *The beams shall consist of either rolled or built-up wide flange sections. Columns shall consist of rolled or built-up wide flange sections or noncomposite built-up box or HSS with a minimum wall thickness of $^3/_4$ inch (19 mm), or satisfy the requirements of width-to-thickness ratios of highly ductile members in AISC 341.*
2. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*
3. *For SMF and IMF systems, on the sideplate standard or configuration A the U-shaped cover plates shall be used with the k dimension extension. The k dimension extension length is defined as beam depth d_b/6, rounded to the nearest $^1/_2$ inch (12.7 mm).*
4. *The hinge-to-hinge span to beam depth, L_H/d, shall be greater than or equal to 4.5.*
5. *The width-to-thickness ratios for beam flanges shall not be less than 3.5.*

   Exception: *For width-to-thickness ratios less than 3.5 the C_{pr} shall be calculated in accordance with that for welded sideplate connections but in no case shall the width-to-thickness ratio be less than 3.0.*
6. *The minimum bolt-to-bolt spacing shall not be less than 3 bolt diameters.*
7. *The extension of the side plates beyond the face of the column shall be within the range of 0.65d to 1.5d.*
8. *The gap-to-side plate thickness ratio shall range from 2.1 to 2.3.*

   Exception: *The gap-to-side plate thickness ratio shall be permitted to be modified for moment connections with unequal beam sizes on opposite sides of the column or when orthogonal beams acting as drag connections frame into the side plate.*
9. *Demand Critical fillet welds {2}, {5}, {5a} and {8} shall have Magnetic Particle Testing (MT) in accordance with AWS D1.1 for procedure, technique and acceptance. Inspect the beginning and end of these welds for a 6-inch (152 mm) length, plus any location along the length of the weld where a start and restart is visually noted for a distance of 6 inches (152 mm) on either side of the start/stop location.*
10. *The connection specific factor to account for peak connection strength, C_{pr}, shall be between 1.15 and 1.35. Calculations shall be submitted to OSHPD for review and approval.*
11. *For in-plane collectors transferring axial loads into the sideplate connection, coordination between sideplate and the registered design professional in responsible charge will be required to confirm the collector connection is sufficient to transfer the load into the moment frame system. This requirement shall be satisfied by designing the sideplate connections in the first bay of a multi-bay sideplate moment frame or an end bay to have a minimum connection capacity, including combined shear ($V_u + V_g$) and moment (M_{pr}) demands, of at least 1.2 times the M_{pr} at the plastic hinge location when the axial load, as determined by ASCE 7, Section 12.10.2.1 without Ω_o, exceeds 0.1 F_yA_g of the sideplate beam.*
12. *A complete frame analysis for gravity and design wind loading using LRFD load combinations in Section 1605A.1 shall be performed including Demand/Capacity Ratios. Frame beam member nominal moment strengths (M_n) used for gravity and design wind loading for the bolted sideplate connection using Class A or Class B faying surfaces shall be taken as 0.80 F_yZ for frame beams up to 300 plf and 0.60 F_yZ for frame beams greater than 300 plf.*
13. *For moment frame beams with maximum beam shear greater than 90 percent of the vertical bolt shear capacity, a secondary check is to be provided to confirm the vertical bolt shear capacities are sufficient.*
14. *Bolted sideplate connections used on heavy-shallow frame beams for beams greater than 200 plf and shallower than 24 inches (610 mm) in depth shall be considered as an alternative system.*
15. *Skewed beams shall utilize the link-beam fabrication method with CJP welded splices for skew angles. The skew angle shall be less than 15 degrees.*
16. *For two-sided bolted sideplate connections sharing the same side plates at the same height and depth across the column, the vertical offset in the beams shall not exceed 10 inches (254 mm).*

2202A.4.4 Modifications to AISC 358 Chapter 12. *The Simpson Strong-Tie (SST) Strong Frame bolted moment connection shall be permitted, provided:*

1. *Only T-stub yield links are permitted. End plate yield links are not permitted.*
2. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*
3. *Beam flange width-to-thickness ratio shall satisfy AISC 341 Table D1.1b.*
4. *Yield-Link stem-to-beam flange connection bolts shall not slip under wind design demand loads. Yield-Link stem to beam flange connection shall be designed to prevent slip using AISC 360 Equation J3-4, where the slip resistance, μ, is taken to be 0.3.*
5. *Double shear plate connection is permitted to increase connection axial capacity for collector loads. A partial joint penetration (PJP) groove weld for second shear plate is permissible due to space restrictions.*

2202A.4.5 Modifications to AISC 358 Chapter 15. *The DuraFuse Frames (DFF) bolted moment connection shall be permitted, provided:*

1. *The biaxial dual-strong axis and column minor axis configurations of the moment connection shall be considered as an alternative system.*

2. *DFF connection bolts shall not slip under wind design demand loads. The connection shall be designed to prevent slip using AISC 360 Equation J3-4, where the slip resistance is taken to be 0.3.*
3. *Beam flange width-to-thickness ratio shall satisfy AISC 341 Table D1.1b.*
4. *The beam weight shall be limited to a maximum of 232 pounds per foot (345 kg/m).*

2202A.5 Modifications to AISC 341. [DSA-SS]

2202A.5.1 Section B5. *Modify exception of Section B5.2 as follows:*

Exception: The forces specified in this section need not be applied to truss diaphragms designed as a part of a three-dimensional system in which the seismic force-resisting system types consist of ordinary moment frames, ordinary concentrically braced frames, ordinary cantilever column systems, special cantilever column systems, or combinations thereof, and where *each diagonal bracing member resists no more than 30 percent of the diaphragm shear at each line of resistance and where* the truss diagonal members conform to Sections F1.4b and F1.5 and the connections conform to Section F1.6.

2202A.5.2 Section D2. *Modify Section D2.6c(b)(2) as follows:*

(2) The moment calculated using the *load combinations of the applicable building code, including the amplified seismic load, provided the connection or other mechanism within the column base is designed to have the ductility necessary to accommodate the column base rotation resulting from the design story drift.*

2202A.6 Modifications to AISC 358. [DSA-SS]

2202A.6.1 Modifications to AISC 358 Chapter 10. [DSA-SS] *Steel and concrete ConXtech ConXL composite special moment frame connections shall be permitted, provided:*

1. *Beams are provided with reduced beam sections (RBS);*
2. *Web extension to beam web two-sided fillet welds are sized to develop expected strength of the beam web and shall not be less than a $^{1}/_{4}$ inch fillet weld; and*
3. *The built-up box column wall thickness shall not be less than 1.25 inches and the HSS column wall thickness shall not be less than $^{1}/_{2}$ inch.*

SECTION 2203*A*—STRUCTURAL STAINLESS STEEL

2203*A*.1 General. The design, fabrication and erection of austenitic and duplex structural stainless steel shall be in accordance with AISC 370.

SECTION 2204*A*—COLD-FORMED STEEL

2204*A*.1 General. The design of cold-formed carbon and low-alloy steel structural members not covered in Sections 2206*A* through 2209*A* shall be in accordance with AISI S100. The design of cold-formed steel diaphragms shall be in accordance with additional provisions of AISI S310 as applicable.

SECTION 2205*A*—COLD-FORMED STAINLESS STEEL

2205*A*.1 General. The design of cold-formed stainless steel structural members shall be in accordance with ASCE 8.

SECTION 2206*A*—COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION

2206*A*.1 Structural framing. For cold-formed steel light-frame construction, the design and installation of the following structural framing systems, including their members and connections, shall be in accordance with AISI S240, and Sections 2206*A*.1.1 through 2206*A*.1.3, as applicable:

1. Floor and roof systems.
2. Structural walls.
3. Shear walls, strap-braced walls and diaphragms that resist in-plane lateral loads.
4. Trusses.

2206*A*.1.1 Seismic requirements for cold-formed steel structural systems. The design of cold-formed steel light-frame construction to resist seismic forces shall be in accordance with the provisions of Section 2206*A*.1.1.1 or 2206*A*.1.1.2, as applicable.

2206*A*.1.1.1 Seismic Design Categories B and C. *Not permitted by DSA-SS and OSHPD.*

2206*A*.1.1.2 Seismic Design Categories D through F. In cold-formed steel light-frame construction assigned to Seismic Design Category D, E or F, the seismic force-resisting system shall be designed and detailed in accordance with AISI S400. *The following additional requirements apply:*

1. *Cold-formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall in accordance with Section 2304.3.4, Item 2.*
2. *Shear wall assemblies in accordance with Sections E5, E6 and E7 of AISI 400 are not permitted within the seismic force-resisting system of buildings.*

2206*A*.1.2 Prescriptive framing. *Not permitted by DSA-SS and OSHPD.*

SECTION 2211*A*—INDUSTRIAL BOLTLESS STEEL SHELVING

2211*A*.1 General. The design, testing and utilization of industrial boltless steel shelving shall be in accordance with MHI ANSI/MH 28.2. Where required by ASCE 7, the seismic design of industrial boltless steel shelving shall be in accordance with Chapter 15 of ASCE 7.

SECTION 2212*A*—INDUSTRIAL STEEL WORK PLATFORMS

2212*A*.1 General. The design, testing and utilization of industrial steel work platforms shall be in accordance with MHI ANSI/MH 28.3. Where required by ASCE 7, the seismic design of industrial steel work platforms shall be in accordance with Chapter 15 of ASCE 7.

SECTION 2213*A*—STAIRS, LADDERS AND GUARDING FOR STEEL STORAGE RACKS AND INDUSTRIAL STEEL WORK PLATFORMS

2213*A*.1 General. The design and installation of stairs, ladders and guarding serving steel storage racks and industrial steel work platforms used in material handling structures shall be in accordance with MHI ANSI/MH 32.1.

SECTION 2214*A*—STEEL CABLE STRUCTURES

2214*A*.1 General. The design, fabrication and erection including related connections, and protective coatings of steel cables for buildings shall be in accordance with ASCE 19. *Steel cables with glass or polymer fabric material acting as a tensile membrane structure is an alternative system.*

SECTION 2215A—[DSA-SS] LIGHT MODULAR STEEL MOMENT FRAMES FOR PUBLIC ELEMENTARY AND SECONDARY SCHOOLS, AND COMMUNITY COLLEGES

2215A.1 General.

2215A.1.1 Configuration. *Light modular steel moment frame buildings shall be constructed of factory-assembled modules comprising a single-story moment-resisting space frame supporting a floor and roof. Individual modules shall not exceed a width of 14 feet (4.25 m) nor a length of 72 feet (22 m). All connections of beams to corner columns shall be designed as moment-resisting in accordance with the criteria of Section 2215A.2. Modules may be stacked to form multistory structures not exceeding 35 feet or two stories in height. When stacked modules are evaluated separately, seismic forces on each module shall be distributed in accordance with Section 12.8.3 of ASCE 7, considering the modules in the stacked condition. See Section 2215A.2.5 of this code.*

2215A.1.2 Design, fabrication and erection. *The design, fabrication and erection of light modular steel moment- frame buildings shall be in accordance with the AISC Specification for Structural Steel Buildings (ANSI/AISC 360) and the AISI North American Specification for the Design of Cold-Formed Steel Structural Members (AISI S100), as applicable, and the requirements of this section. The maximum dead load of the roof and elevated floor shall not exceed 25 psf and 50 psf (1197 Pa and 2394 Pa), respectively. The maximum dead load of the exterior walls shall not exceed 45 psf (2155 Pa).*

2215A.2 Seismic requirements. *In addition to the other requirements of this code, the design, materials and workmanship of light modular steel moment frames shall comply with the requirements of this section. The response modification coefficient R shall be equal to $3^1/_2$. C_d and Ω_0 shall be equal to 3.0.*

2215A.2.1 Base materials. *Beams, columns and connection materials shall be limited to those materials permitted under the AISC Specification for Structural Members (ANSI/AISC 360) and the AISI North American Specification for the Design of Cold-Formed Steel Structural Members (AISI S100). All columns shall conform with standard AISC 360 shapes.*

2215A.2.2 Beam-to-column strength ratio. *At each moment-resisting connection the following shall apply:*

$$\frac{\sum S_{bi}F_{ybi}}{\sum S_{cj}F_{ycj}} \geq 1.4 \quad \textbf{(Equation 22A-1)}$$

where:

F_{ybi} *= The specified yield stress of beam "i."*

F_{ycj} *= The specified yield stress of column "j."*

S_{bi} *= The flexural section modulus of each beam "i" that is moment connected to the column "j" at the connection.*

S_{cj} *= The flexural section modulus of each column "j" that is moment connected to the beam "i" at the connection.*

Exceptions:

1. *Beam-to-column connections at the floor level beams of first or second-story modules need not comply with this requirement.*
2. *Beam-to-column strength ratios less than 1.4 are allowed if proven to be acceptable by analysis or testing.*

2215A.2.3 Welding. *Weld filler metals shall be capable of producing weld metal with a minimum Charpy V-Notch toughness of 20 ft-lb at 0°F. Where beam bottom flanges attach to columns with complete joint penetration groove welds and weld backing is used at the bottom surface of the beam flange, such backing shall be removed and the root pass back-gouged, repaired and reinforced with a minimum $^3/_{16}$ inch (5 mm) fillet weld.*

2215A.2.4 Connection design. *Connections of beams to columns shall have the design strength to resist the maximum seismic load effect, E_m, calculated in accordance with Section 12.4.3 of ASCE 7.*

2215A.2.5 Multistory assemblies. *Analysis of multistory assemblies shall be permitted to consider the stacked modules as a single assembly, with restraint conditions between the stacked units that represent the actual method of attachment. Alternatively, it shall be permitted to analyze the individual modules of stacked assemblies independently, with lateral and vertical reactions from modules above applied as concentrated loads at the top of the supporting module.*

SECTION 2216A—TESTING AND FIELD VERIFICATION

2216A.1 Tests of high-strength bolts, nuts and washers. *High-strength bolts, nuts and washers shall be sampled and tested in accordance with Section 1705A.2.8* ***[OSHPD 1 & 4]*** *and this section.*

[OSHPD 1 and 4] *A minimum of nine samples per lot, as defined in the ASTM standards for bolts [not nuts and washers], shall be tested for tensile properties in accordance with ASTM F606, but need not exceed three samples per 400 bolts.*

2216A.2 Tests of end-welded studs. *End-welded studs shall be tested in accordance with the requirements of the AWS D1.1, Clauses 9.7 and 9.8.*

Exception: *Fillet-welded studs exempted by AWS D1.1 Clause 9.5.*

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 23 – WOOD

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	**X**												**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)				**X**	**X**			**X**	**X**	**X**	**X**	**X**		**X**	**X**									
Adopt only those sections that are listed below			**X**																			**X**		
Chapter / Section																								
2301.1				X																				
2301.1.1								X	X	X	X	X		X	X									
2301.1.2								X	X	X	X	X		X	X									
2301.1.3								X	X	X	X	X		X	X									
2303.1.3.1								X	X	X	X	X		X	X									
2301.1.4								X	X	X				X										
2301.1.4.1								X		X				X										
2301.1.4.2									X															
2301.1.5								X	X	X	X	X		X	X									
2303.2 – 2303.2.9			X																					
2303.4.1.4.1								X	X	X	X	X		X	X									
2303.4.3.1								X	X	X	X	X		X	X									
2304.3.1.1				X																				
2304.3.4								X	X	X	X	X		X	X									
2304.4.1								X	X	X	X	X		X	X									
2304.10.2.1								X		X	X	X		X	X									
2304.12.1.1.1																						X		
2304.12.1.2								X		X	X	X		X	X									
2304.12.1.4.1								X		X	X	X		X	X									
2304.12.8																						X		
2304.12.9																						X		
2305.1.3								X	X	X	X	X		X	X									
2308.2								X	X		X	X			X									
2308.2.8								X	X		X	X			X									
2309.1.1								X	X		X	X			X									

The state agency does not adopt sections identified with the following symbol: †

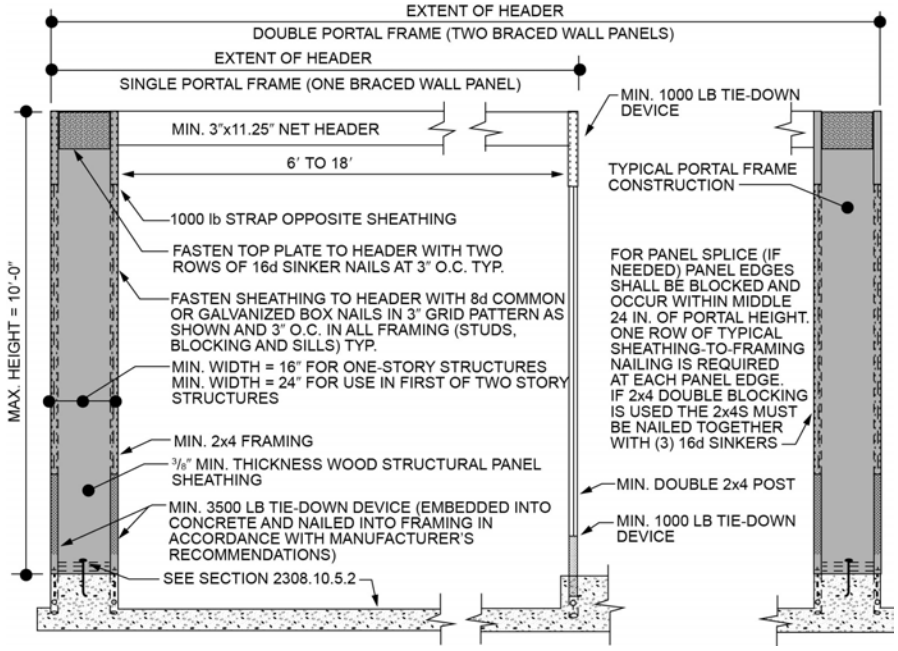
The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

with Figure 2308.10.5.2. A built-up header consisting of not fewer than two 2-inch by 12-inch (51 mm by 305 mm) boards, fastened in accordance with Item 24 of Table 2304.10.2 shall be permitted to be used. A spacer, if used, shall be placed on the side of the built-up beam opposite the wood structural panel sheathing. The header shall extend between the inside faces of the first full-length outer studs of each panel. The clear span of the header between the inner studs of each panel shall be not less than 6 feet (1829 mm) and not more than 18 feet (5486 mm) in length. A strap with an uplift capacity of not less than 1,000 pounds (4,400 N) shall fasten the header to the inner studs opposite the sheathing. One anchor bolt not less than $^{5}/_{8}$ inch (15.9 mm) diameter and installed in accordance with Section 2308.7.1 shall be provided in the center of each sill plate. The studs at each end of the panel shall have a hold-down device fastened to the foundation with an uplift capacity of not less than 3,500 pounds (15 570 N).

Where a panel is located on one side of the opening, the header shall extend between the inside face of the first full-length stud of the panel and the bearing studs at the other end of the opening. A strap with an uplift capacity of not less than 1,000 pounds (4400 N) shall fasten the header to the bearing studs. The bearing studs shall have a hold-down device fastened to the foundation with an uplift capacity of not less than 1,000 pounds (4400 N). The hold-down devices shall be an embedded strap type, installed in accordance with the manufacturer's recommendations. The PFH panels shall be supported directly on a foundation that is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom. Where the continuous foundation is required to have a depth greater than 12 inches (305 mm), a minimum 12-inch by 12-inch (305 mm by 305 mm) continuous footing or turned-down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned-down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped not less than 15 inches (381 mm) with the reinforcement required in the continuous foundation located directly under the braced wall line.

Where a PFH is installed at the first story of two-story buildings, each panel shall have a length of not less than 24 inches (610 mm).

FIGURE 2308.10.5.2—PORTAL FRAME WITH HOLD-DOWNS (PFH)



For SI:1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

2308.10.6 Cripple wall bracing. Cripple walls shall be braced in accordance with Section 2308.10.6.1 or 2308.10.6.2.

2308.10.6.1 Cripple wall bracing in Seismic Design Categories A, B and C. For the purposes of this section, cripple walls in Seismic Design Categories A, B and C having a stud height exceeding 14 inches (356 mm) shall be considered to be a story and shall be braced in accordance with Table 2308.10.1. Spacing of edge nailing for required cripple wall bracing shall not exceed 6 inches (152 mm) on center along the foundation plate and the top plate of the cripple wall. Nail size, nail spacing for field nailing and more restrictive boundary nailing requirements shall be as required elsewhere in the code for the specific bracing material used.

2308.10.6.2 Cripple wall bracing in Seismic Design Categories D and E. For the purposes of this section, cripple walls in Seismic Design Categories D and E shall not have a stud height exceeding 14 inches (356 mm), and studs shall be solid blocked in accordance with Section 2308.9.6 for the full dwelling perimeter and for the full length of interior braced walls lines supported on foundations, excepting ventilation and access openings.

2308.10.7 Connections of braced wall panels. Braced wall panel joints shall occur over studs or blocking. Braced wall panels shall be fastened to studs, top and bottom plates and at panel edges. Braced wall panels shall be applied to nominal 2-inch-wide [actual $1^1/_2$-inch (38 mm)] or larger stud framing.

2308.10.7.1 Bottom plate connection. Braced wall line bottom plates shall be connected to joists or full-depth blocking below in accordance with Table 2304.10.2, or to foundations in accordance with Section 2308.10.7.3.

2308.10.7.2 Top plate connection. Where joists or rafters are used, braced wall line top plates shall be fastened over the full length of the braced wall line to joists, rafters, rim boards or full-depth blocking above in accordance with Table 2304.10.2, as applicable, based on the orientation of the joists or rafters to the braced wall line. Blocking shall be not less than 2 inches (51 mm) in nominal thickness and shall be fastened to the braced wall line top plate as specified in Table 2304.10.2. Notching or drilling of holes in blocking in accordance with the requirements of Section 2308.6 shall be permitted.

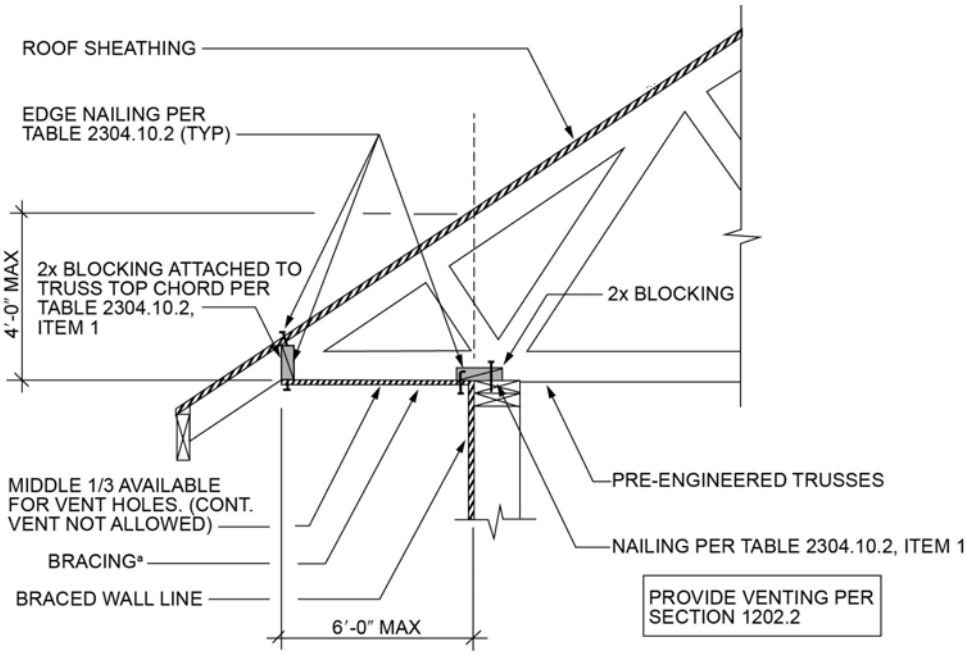
At exterior gable end walls, braced wall panel sheathing in the top story shall be extended and fastened to the roof framing where the spacing between parallel exterior braced wall lines is greater than 50 feet (15 240 mm).

Where roof trusses are used and are installed perpendicular to an exterior braced wall line, lateral forces shall be transferred from the roof diaphragm to the braced wall over the full length of the braced wall line by blocking of the ends of the trusses or by other approved methods providing equivalent lateral force transfer. Blocking shall be not less than 2 inches (51 mm) in nominal thickness and equal to the depth of the truss at the wall line and shall be fastened to the braced wall line top plate as specified in Table 2304.10.2. Notching or drilling of holes in blocking in accordance with the requirements of Section 2308.6 shall be permitted.

Exception: Where the roof sheathing is greater than $9^1/_4$ inches (235 mm) above the top plate, solid blocking is not required where the framing members are connected using one of the following methods:

1. In accordance with Figure 2308.10.7.2(1).
2. In accordance with Figure 2308.10.7.2(2).
3. Full-height engineered blocking panels designed for values listed in AWC WFCM.
4. A design in accordance with accepted engineering methods.

FIGURE 2308.10.7.2(1)—BRACED WALL LINE TOP PLATE CONNECTION



For SI:1 foot = 304.8 mm. a. Methods of bracing shall be as described in Table 2308.10.3(1) DWB, WSP, SFB, GB, PBS, PCP or HPS.

CHAPTER

24 GLASS AND GLAZING

User notes:

About this chapter: Chapter 24 establishes regulations for glass and glazing used in buildings and structures. Engineering and design requirements are included in the chapter for glazing that is subjected to wind and snow loads. Another concern of this chapter is glass and glazing used in areas where it is likely to be impacted by the occupants. Section 2406 identifies hazardous locations where glazing must either be safety glazing or protected to prevent impacts by occupants. Safety glazing must meet stringent standards and be appropriately marked or identified. Additional requirements are provided for glass and glazing in guards, handrails, elevator hoistways and elevator cars, as well as in athletic facilities.

ICC code development note: Code change proposals to this chapter will be considered by the IBC—Structural Code Development Committee during the 2025 (Group B) Code Development Cycle.

SECTION 2401—GENERAL

2401.1 Scope. The provisions of this chapter shall govern the materials, design, construction and quality of glass, light-transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures. Light-transmitting plastic glazing shall also meet the applicable requirements of Chapter 26.

2401.1.1 Application. [DSA-SS, DSA-SS/CC, OSHPD] *The scope of application of Chapter 24 is as follows:*

1. *Applications listed in Sections 1.10.1, 1.10.2, 1.10.4 and 1.10.5 regulated by the Department of Health Care Access and Information/Office of Statewide Hospital Planning and Development (OSHPD). These applications include hospitals, hospital buildings removed from general acute care service, skilled nursing facility buildings, intermediate care facility buildings, correctional treatment centers and acute psychiatric hospital buildings.*
2. *Applications listed in Sections 1.9.2.1 and 1.9.2.2, regulated by the Division of the State Architect-Structural Safety (DSA-SS and DSA-SS/CC). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*

2401.1.2 Amendments in this chapter. [DSA-SS, DSA-SS/CC, OSHPD] *DSA-SS, DSA-SS/CC, OSHPD adopt this chapter as amended.* <

1. *OSHPD amendments appear in this chapter preceded with the appropriate acronym, as follows:*

   [OSHPD 1] *- For applications listed in Section 1.10.1.*

   [OSHPD 1R] *- For applications listed in Section 1.10.1.*

   [OSHPD 2] *- For applications listed in Section 1.10.2.*

   [OSHPD 4] *- For applications listed in Section 1.10.4.*

   [OSHPD 5] *- For applications listed in Section 1.10.5.*
2. *Division of the State Architect - Structural Safety amendments appear in this chapter preceded by the appropriate acronym, as follows:*

   [DSA-SS] *- For applications listed in Section 1.9.2.1.*

   [DSA-SS/CC] *- For applications listed in Section 1.9.2.2.*

SECTION 2402—GLAZING REPLACEMENT

2402.1 General. The installation of replacement glass shall be as required for new installations.

SECTION 2403—GENERAL REQUIREMENTS FOR GLASS

2403.1 Identification. Each pane shall bear the manufacturer's mark designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved construction documents that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 2406.3.

Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification mark shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

2403.2 Glass supports. Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, detailed construction documents, detailed shop drawings and analysis or test data ensuring safe performance for the specific installation shall be prepared by a registered design professional.

2403.2.1 Additional Requirements. [DSA-SS, DSA-SS/CC and OSHPD 1, 1R, 2, 4 & 5] *In addition to the requirements of Section 2403.2, glass supports shall comply with the following:*

1. *The construction documents and analysis or test data required per Section 2403.2 shall be submitted to the enforcement agency for approval.*
2. *Glass firmly supported on all four edges shall be glazed with minimum laps and edge clearances set forth in Table 2403.2.1.*

   Exception: *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction.*

TABLE 2403.2.1—MINIMUM GLAZING REQUIREMENTS

FIXED WINDOWS AND OPENABLE WINDOWS OTHER THAN HORIZONTAL SIDING					
Glass Area	***Up to 6 sq. ft.***	***6 to 14 sq. ft.***	***14 to 32 sq. ft.***	***32 to 50 sq. ft.***	***Over 50 sq. ft.***
× 0.0929 for m², × 25.4 for mm					
1. Minimum Frame Lap	$^1/_4$"	$^1/_4$"	$^5/_{16}$"	$^3/_8$"	$^1/_2$"
2. Minimum Glass Edge Clearance	$^1/_8$"[1,2]	$^1/_8$"[1,2]	$^3/_{16}$"[1]	$^1/_4$"	$^1/_4$"[1]
3. Continuous Glazing Rabbet and Glass Retainer[3]	*Required*				
4. Resilient Setting Material[4]	*Not Required*	*Required*			
SLIDING DOORS AND HORIZONTAL SLIDING WINDOWS					
Glass Area		***Up to 14 sq. ft.***	***14 to 32 sq. ft.***	***32 to 50 sq. ft.***	***Over 50 sq. ft.***
× 0.0929 for m², × 25.4 for mm					
5. Minimum Glass Frame Lap		$^1/_4$"	$^5/_{16}$"	$^3/_8$"	$^1/_2$"
6. Minimum Glass Edge Clearance		$^1/_8$"[2]	$^3/_{16}$"	$^1/_4$"	$^1/_4$"
7. Continuous Glazing Rabbet and Glass Retainer[3]		*Required above third story*	*Required*		
8. Resilient Setting Material[4]		*Not Required*		*Required*	

1. *Glass edge clearance in fixed openings shall not be less than required to provide for wind and earthquake drift.*
2. *Glass edge clearance at all sides of pane shall be a minimum of $^3/_{16}$ inch (4.8 mm) where height of glass exceeds 3 feet (914 mm).*
3. *Glass retainers such as metal, wood or vinyl face stops, glazing beads, gaskets, glazing clips and glazing channels shall be of sufficient strength and fixation to serve this purpose.*
4. *Resilient setting material shall include preformed rubber or vinyl plastic gaskets or other materials which are proved to the satisfaction of the building official to remain resilient.*

2403.3 Glass framing. To be considered firmly supported, the framing members for each individual pane of glass shall be designed so that the deflection of the edge of the glass perpendicular to the glass pane does not exceed $^1/_{175}$ of the glass edge length where the glass edge length is not more than 13 feet 6 inches (4115 mm), or $^1/_{240}$ of the glass edge length + $^1/_4$ inch (6.4 mm) where the glass edge length is greater than 13 feet 6 inches (4115 mm), when subjected to the larger of the positive or negative load where loads are combined as specified in Section 1605.

2403.4 Interior glazed areas. Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall be not greater than the thickness of the panels when a force of 50 pounds per linear foot (plf) (730 N/m) is applied horizontally to one panel at any point up to 42 inches (1067 mm) above the walking surface.

2403.5 Louvered windows or jalousies. Float, wired and patterned glass in louvered windows and jalousies shall be not thinner than nominal $^3/_{16}$ inch (4.8 mm) and not longer than 48 inches (1219 mm). Exposed glass edges shall be smooth.

Wired glass with wire exposed on longitudinal edges shall not be used in louvered windows or jalousies.

Where other glass types are used, the design shall be submitted to the building official for approval.

SECTION 2404—WIND, SNOW, SEISMIC AND DEAD LOADS ON GLASS

2404.1 Vertical glass. Glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads due to basic wind speed, *V*, in Section 1609 for components and cladding. Glass in glazed curtain walls, glazed storefronts and glazed partitions shall meet the seismic requirements of ASCE 7, Section 13.5.9. The load resistance of glass under uniform load shall be determined in accordance with ASTM E1300.

The design of vertical glazing shall be based on Equation 24-1.

Equation 24-1 $0.6F_{gw} \le F_{ga}$

where:

F_{gw} = Wind load on the glass due to basic wind speed, *V*, computed in accordance with Section 1609.

F_{ga} = Short duration load on the glass as determined in accordance with ASTM E1300.

2404.2 Sloped glass. Glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunrooms, sloped roofs and other exterior applications shall be designed to resist the most critical combinations of loads determined by Equations 24-2, 24-3 and 24-4.

Equation 24-2 $F_g = 0.6W_o - D$

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 25 – GYPSUM PANEL PRODUCTS AND PLASTER

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	**X**			**X**	**X**								**X**			**X**								
Adopt entire chapter as amended (amended sections listed below)								**X**	**X**	**X**	**X**	**X**		**X**	**X**									
Adopt only those sections that are listed below																					**X**			
Chapter / Section																								
2501.1.1								X	X	X	X	X		X	X									
2501.1.2								X	X	X	X	X		X	X									
2501.1.3								X	X	X	X	X		X	X									
2503.2								X	X	X	X	X		X	X									
2503.2, Exception												X												
2504.2								X	X	X	X	X		X	X									
2504.2.1, Exception												X												
2505.3								X	X	X	X	X		X	X									
2505.3, Exception												X												
2507.3								X	X	X	X	X		X	X									
2508.6.6								X	X	X	X	X		X	X									
2508.6.6, Exception												X												
2510.6.3																					X			
2514.1, *Exception*								X		X	X	X		X	X									

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 30 – ELEVATORS AND CONVEYING SYSTEMS

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	X							X	X		X	X	X	X	X	X								
Adopt entire chapter as amended (amended sections listed below)			X							X														
Adopt only those sections that are listed below						X	X																	
Chapter / Section																								
3001.2			X																					
3001.3			X																					
3001.4			X			X	X																	
3001.5			X																					
3001.7			X																					
3002.4a – 3002.4.6a			X																					
3002.5			X																					
3002.6.1			X																					
3002.9			X																					
3002.10 – 3002.11			X																					
3003.1			X																					
3003.1.4			X																					
3003.1.5			X																					
3003.2			X																					
3003.2.1			X																					
3003.2.1.1			X																					
3003.2.1.2			X																					
3003.4 – 3003.4.4			X																					
3005.1 – 3005.2			X																					
3005.4.1			X																					
3006.2			X																					
3006.3			X																					
3007.1			X																					
3007.6.1			X																					
3008.1			X																					
3008.1.4			X																					
3008.2.1			X																					
3008.7.1			X																					
3009.1 – 3009.3			X																					
3010										X														

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

3. Control spaces.
4. Machinery spaces outside of the hoistway enclosure.

The fire-resistance rating shall be not less than the required rating of the hoistway enclosure served by the machinery. Openings in the fire barriers shall be protected with assemblies having a fire protection rating not less than that required for the hoistway enclosure doors.

Exceptions:

1. For other than fire service access elevators and occupant evacuation elevators, where machine rooms, machinery spaces, control rooms and control spaces do not abut and do not have openings to the hoistway enclosure they serve, the fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both, shall be permitted to be reduced to a 1-hour fire-resistance rating.
2. For other than fire service access elevators and occupant evacuation elevators, in buildings four stories or less above grade plane where machine room, machinery spaces, control rooms and control spaces do not abut and do not have openings to the hoistway enclosure they serve, the machine room, machinery spaces, control rooms and control spaces are not required to be fire-resistance rated.

3005.4.1 Automatic sprinkler system. *Automatic sprinklers shall not be required to be installed in the elevator hoistway, elevator machine room, elevator machinery space, elevator control space or elevator control room where the following is met:*

The elevator machine room, elevator machinery space, elevator control space or elevator control room shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both. The fire-resistance rating shall not be less than the required rating of the hoistway enclosure served by the machinery. Openings in the fire barriers shall be protected with assemblies having a fire protection rating not less than that required for the hoistway enclosure doors. The exceptions to Section 3005.4 shall not apply.

3005.5 Shunt trip. Where elevator hoistways, elevator machine rooms, control rooms and control spaces containing elevator control equipment are protected with automatic sprinklers, a means installed in accordance with Section 21.4 of NFPA 72 shall be provided to automatically disconnect the main line power supply to the affected elevator prior to the application of water. This means shall not be self-resetting. The activation of automatic sprinklers outside the hoistway, machine room, machinery space, control room or control space shall not disconnect the main line power supply.

3005.6 Plumbing systems. Plumbing systems shall not be located in elevator equipment rooms.

SECTION 3006—ELEVATOR LOBBIES AND HOISTWAY DOOR PROTECTION

3006.1 General. Enclosed elevator lobbies and elevator hoistway door protection shall be provided in accordance with the following:

1. Where elevator hoistway door protection is required by Section 3006.2, such protection shall be provided in accordance with Section 3006.3.
2. Where enclosed elevator lobbies are required for underground buildings, such lobbies shall comply with Section 405.4.3.
3. Where an area of refuge is required and an enclosed elevator lobby is provided to serve as an area of refuge, the enclosed elevator lobby shall comply with Section 1009.6.4.
4. Where fire service access elevators are provided, enclosed elevator lobbies shall comply with Section 3007.6.
5. Where occupant evacuation elevators are provided, enclosed elevator lobbies shall comply with Section 3008.6.

3006.2 Elevator hoistway door protection required. Elevator hoistway doors shall be protected in accordance with Section 3006.3 where an elevator hoistway connects more than *two stories in any state institution or other state-owned or specified state occupied building regulated by the Office of the State Fire Marshal, and more than three stories for all other buildings. Hoistway opening protection is* required to be enclosed within a shaft enclosure in accordance with Section 712.1.1 and any of the following conditions apply:

1. The building is not protected throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.
2. *Group A occupancies.*
3. *Group E occupancies.*
4. *Group H occupancies.*
5. *Group I occupancies.*
6. *Group L occupancies.*
7. *Group R-1, R-2, R-2.1 and R-2.2 occupancies.*
8. *High-rise buildings.*
9. The elevator hoistway door is located in the wall of a corridor required to be fire-resistance rated in accordance with Section 1020.1.

See Section 403.6 for additional requirements for high-rise buildings.

Exceptions:

1. Protection of elevator hoistway doors is not required where the elevator serves only open parking garages in accordance with Section 406.5.
2. Protection of elevator hoistway doors is not required at the levels of exit discharge, provided that the levels of exit discharge is equipped with an automatic sprinkler system in accordance with Section 903.3.1.1.

3. Protection of elevator hoistway doors is not required on levels where the elevator hoistway doors open to the exterior.

3006.2.1 Rated corridors. Where corridors are required to be fire-resistance rated in accordance with Section 1020.2, elevator hoistway openings shall be protected in accordance with Section 3006.3.

3006.3 Elevator hoistway door protection. Where Section 3006.2 requires protection of the elevator hoistway doors, the protection shall be provided by one of the following:

1. An enclosed elevator lobby shall be provided at each floor to separate the elevator hoistway doors from each floor with fire partitions in accordance with Section 708. In addition, doors protecting openings in the fire partitions shall comply with Section 716.2.2.1. Penetrations of the fire partitions by ducts and air transfer openings shall be protected as required for corridors in accordance with Section 717.5.4.1.
2. An enclosed elevator lobby shall be provided at each floor to separate the elevator hoistway doors from each floor by smoke partitions in accordance with Section 710. In addition, doors protecting openings in the smoke partitions shall comply with Sections 710.5.2.2, 710.5.2.3 and 716.2.6.1. Penetrations of the smoke partitions by ducts and air transfer openings shall be protected as required for corridors in accordance with Section 717.5.4.1.
3. Additional doors or other devices shall be provided at each elevator hoistway door in accordance with Section 3002.6. Such doors or other devices shall comply with the smoke and draft control door assembly requirements in Section 716.2.2.1.1 when tested in accordance with UL 1784 without an artificial bottom seal.
4. ***[SFM]*** *When approved, in other than Group I-2 occupancies elevator hoistway shall be pressurized in accordance with Section 909.21.*
5. A smoke-protective curtain assembly for hoistways shall be provided at each elevator hoistway door opening in accordance with Section 3002.6. Such curtain assemblies shall comply with the smoke and draft control requirements in Section 716.2.2.1.1 when tested in accordance with UL 1784 without an artificial bottom seal. Such curtain assemblies shall be equipped with a control unit listed to UL 864. Such curtain assemblies shall comply with Section 2.11.6.3 *California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 6, Elevator Safety Orders*. Installation and maintenance shall be in accordance with NFPA 105.
6. ***[SFM]*** *Enclosed elevator lobbies are not required where the hoistway door has a fire-protection rating as required by Section 707.6 and the hoistway door opening is also protected by a listed and labeled smoke containment system complying with ICC ES AC 77.*

3006.4 Means of egress. Elevator lobbies shall be provided with not less than one means of egress complying with Chapter 10 and other provisions in this code. Egress through an enclosed elevator lobby shall be permitted in accordance with Item 1 of Section 1016.2. Electrically locked exit access doors providing egress from elevator lobbies shall be permitted in accordance with Section 1010.2.14.

SECTION 3007—FIRE SERVICE ACCESS ELEVATOR

3007.1 General. Where required by Section 403.6.1, every floor above and including the lowest level of fire department vehicle access of the building shall be served by fire service access elevators complying with Sections 3007.1 through 3007.9. Except as modified in this section, fire service access elevators shall be installed in accordance with this chapter and *California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 6, Elevator Safety Orders.*

Exceptions:

1. *Below grade* parking garage *floors* shall not be required to *be served by* fire service access elevators.
2. The elevator shall not be required to serve the top floor of a building where that floor is utilized only for equipment for building systems.

3007.2 Automatic sprinkler system. The building shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, except as otherwise permitted by Section 903.3.1.1.1 and as prohibited by Section 3007.2.1.

3007.2.1 Prohibited locations. Automatic sprinklers shall not be installed in machine rooms, elevator machinery spaces, control rooms, control spaces and elevator hoistways of fire service access elevators.

3007.2.2 Automatic sprinkler system monitoring. The automatic sprinkler system shall have a sprinkler control valve supervisory switch and water-flow-initiating device provided for each floor that is monitored by the building's fire alarm system.

3007.3 Water protection. Water from the operation of an automatic sprinkler system outside the enclosed lobby shall be prevented from infiltrating into the hoistway enclosure in accordance with an approved method.

3007.4 Shunt trip. Means for elevator shutdown in accordance with Section 3005.5 shall not be installed on elevator systems used for fire service access elevators.

3007.5 Hoistway enclosures. The fire service access elevator hoistway shall be located in a shaft enclosure complying with Section 713.

3007.5.1 Structural integrity of hoistway enclosures. The fire service access elevator hoistway enclosure shall comply with Sections 403.2.2.1 through 403.2.2.4.

3007.5.2 Hoistway lighting. When firefighters' emergency operation is active, the entire height of the hoistway shall be illuminated at not less than 1 footcandle (11 lux) as measured from the top of the car of each fire service access elevator.

CHAPTER

31 SPECIAL CONSTRUCTION

User notes:

About this chapter: Chapter 31 provides regulations for unique buildings and building elements. Those include buildings such as membrane structures, greenhouses and relocatable buildings. Special elements include pedestrian walkways and tunnels, awnings, canopies and marquees, vehicular gates, solar energy systems, public use restrooms in flood hazard areas, and intermodal shipping containers.

ICC code development note: Code development reminder: Code change proposals to sections preceded by the designation [F] and [BE] will be considered by a code development committee meeting during the 2024 (Group A) Code Development Cycle. All other code change proposals will be considered by a code development committee meeting during the 2025 (Group B) Code Development Cycle.

SECTION 3101—GENERAL

3101.1 Scope. The provisions of this chapter shall govern special building construction including membrane structures, temporary structures, pedestrian walkways and tunnels, awnings and canopies, marquees, signs, telecommunications and broadcast towers, swimming pools, spas and hot tubs, automatic vehicular gates, solar energy systems, greenhouses, relocatable buildings and intermodal shipping containers.

SECTION 3102—MEMBRANE STRUCTURES

3102.1 General. The provisions of Sections 3102.1 through 3102.8 shall apply to air-supported, air-inflated, membrane-covered cable, membrane-covered frame and tensile membrane structures, collectively known as membrane structures, erected for a period of 180 days or longer. Those erected for a shorter period of time shall comply with the *California Fire Code*. Membrane structures covering water storage facilities, water clarifiers, water treatment plants, sewage treatment plants, greenhouses and similar facilities not used for human occupancy are required to meet only the requirements of Sections 3102.3.1 and 3102.7. Membrane structures erected on a building, balcony, deck or other structure for any period of time shall comply with this section.

3102.2 Tensile membrane structures and air-supported structures. Tensile membrane structures and air-supported structures, including permanent and temporary structures, shall be designed and constructed in accordance with ASCE 55. The provisions in Sections 3102.3 through 3102.6 shall apply.

3102.3 Type of construction. Noncombustible membrane structures shall be classified as Type IIB construction. Noncombustible frame or cable-supported structures covered by an approved membrane in accordance with Section 3102.3.1 shall be classified as Type IIB construction. Heavy timber frame-supported structures covered by an approved membrane in accordance with Section 3102.3.1 shall be classified as Type IV-HT construction. Other membrane structures shall be classified as Type V construction.

Exception: Plastic less than 30 feet (9144 mm) above any floor used in greenhouses, where occupancy by the general public is not authorized, and for aquaculture pond covers is not required to meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

3102.3.1 Membrane and interior liner material. Membranes and interior liners shall be either noncombustible as set forth in Section 703.3 *shall be flame resistant in accordance with the provisions set forth in CCR, Title 19, Division 1, Chapter 8. Tops and sidewalls shall be made either from fabric that has been flame resistant treated with an approved exterior chemical process by an approved application concern, or from inherently flame resistant fabric approved and listed by the State Fire Marshal (see CCR, Title 19, Division 1, Chapter 8).*

Exception: Plastic less than 20 mil (0.5 mm) in thickness used in greenhouses, where occupancy by the general public is not authorized, and for aquaculture pond covers is not required to meet the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

3102.4 Allowable floor areas. The area of a membrane structure shall not exceed the limitations specified in Section 506.

3102.5 Maximum height. Membrane structures shall not exceed one story nor shall such structures exceed the height limitations in feet specified in Section 504.3.

Exception: Noncombustible membrane structures serving as roofs only.

3102.6 Mixed construction. Membrane structures shall be permitted to be utilized as specified in this section as a portion of buildings of other types of construction. Height and area limits shall be as specified for the type of construction and occupancy of the building.

3102.6.1 Noncombustible membrane. A noncombustible membrane shall be permitted for use as the roof or as a skylight of any building or atrium of a building of any type of construction provided that the membrane is not less than 20 feet (6096 mm) above any floor, balcony or gallery.

3102.6.1.1 Membrane. A membrane meeting the fire propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701 shall be permitted to be used as the roof or as a skylight on buildings of Type IIB, III, IV-HT and V construction, provided that the membrane is not less than 20 feet (6096 mm) above any floor, balcony or gallery.

3102.7 Engineering design. The structure shall be designed and constructed to sustain dead loads; loads due to tension or inflation; live loads including wind, snow or flood and seismic loads and in accordance with Chapter 16.

3102.7.1 Lateral restraint. For membrane-covered frame structures, the membrane shall not be considered to provide lateral restraint in the calculation of the capacities of the frame members.

3102.8 Inflation systems. Air-supported and air-inflated structures shall be provided with primary and auxiliary inflation systems to meet the minimum requirements of Sections 3102.8.1 through 3102.8.3.

3102.8.1 Equipment requirements. The inflation system shall consist of one or more blowers and shall include provisions for automatic control to maintain the required inflation pressures. The system shall be so designed as to prevent overpressurization of the system.

3102.8.1.1 Auxiliary inflation system. In addition to the primary inflation system, in buildings larger than 1,500 square feet (140 m^2) in area, an auxiliary inflation system shall be provided with sufficient capacity to maintain the inflation of the structure in case of primary system failure. The auxiliary inflation system shall operate automatically when there is a loss of internal pressure and when the primary blower system becomes inoperative.

3102.8.1.2 Blower equipment. Blower equipment shall meet all of the following requirements:

1. Blowers shall be powered by continuous-rated motors at the maximum power required for any flow condition as required by the structural design.
2. Blowers shall be provided with inlet screens, belt guards and other protective devices as required by the building official to provide protection from injury.
3. Blowers shall be housed within a weather-protecting structure.
4. Blowers shall be equipped with backdraft check dampers to minimize air loss when inoperative.
5. Blower inlets shall be located to provide protection from air contamination. The location of inlets shall be approved.

3102.8.2 Standby power. Wherever an auxiliary inflation system is required, an approved standby power-generating system shall be provided. The system shall be equipped with a suitable means for automatically starting the generator set upon failure of the normal electrical service and for automatic transfer and operation of all of the required electrical functions at full power within 60 seconds of such service failure. Standby power shall be capable of operating independently for not less than 4 hours.

3102.8.3 Support provisions. A system capable of supporting the membrane in the event of deflation shall be provided for in air-supported and air-inflated structures having an occupant load of 50 or more or where covering a swimming pool regardless of occupant load. The support system shall be capable of maintaining membrane structures used as a roof for Type I construction not less than 20 feet (6096 mm) above floor or seating areas. The support system shall be capable of maintaining other membranes not less than 7 feet (2134 mm) above the floor, seating area or surface of the water.

SECTION 3103—TEMPORARY STRUCTURES

3103.1 General. The provisions of Sections 3103.1 through 3103.8 shall apply to structures erected for a period of less than 180 days. Temporary special event structures, tents, umbrella structures and other membrane structures erected for a period of less than 180 days shall also comply with the *California Fire Code*. Temporary structures erected for a longer period of time and public-occupancy temporary structures shall comply with applicable sections of this code.

Exceptions:

1. Public-occupancy temporary structures complying with Section 3103.1.1 shall be permitted to remain in service for 180 days or more but not more than 1 year where approved by the building official.
2. Public-occupancy temporary structures within the confines of an existing structure are not required to comply with Section 3103.6.

[DSA-SS, DSA-SS/CC] *The classification of public-occupancy temporary structure shall not be applied to any school building as defined in Section 4-314 of the California Administrative Code.*

3103.1.1 Extended period of service time. Public-occupancy temporary structures shall be permitted to remain in service for 180 days or more without complying with requirements in this code for new building or structures where extensions for up to 1 year are granted by the Building Official in accordance with Section 108.1 and where the following conditions are satisfied:

1. Additional inspections as determined by the building official shall be performed by a qualified person to verify that site conditions and the approved installation comply with the conditions of approval at the time of final inspection.
2. A qualified person shall perform follow-up inspections after initial occupancy at intervals not exceeding 180 days to verify the site conditions and the installation conform to the approved site conditions and installation requirements. Inspection records shall be kept and shall be made available for verification by the building official.
3. An examination shall be performed by a registered design professional to determine the adequacy of the temporary structure to resist the structural loads required in Section 3103.6.
4. Relocation of the public-occupancy temporary structure shall require a new permit application.
5. The use or occupancy approved at the time of final inspection shall remain unchanged.

adopted. These interim licensing standards or similar written instructions shall have the same force and effect as regulations until January 1, 2027.

[Added by Stats. 2024, Ch. 745 (AB 2866) Effective January 1, 2025.]

115927. *Notwithstanding any other provision of law, this article shall not be subject to further modification or interpretation by any regulatory agency of the state, this authority being reserved exclusively to local jurisdictions, as provided for in paragraph (7) subdivision (a) of Section 115922 and subdivision (c) of Section 115925.*

[Amended by Stats. 2018, Ch. 957, Sec. 13. (SB 1078) Effective January 1, 2019.]

115928. *Whenever a building permit is issued for the construction of a new swimming pool or spa, the pool or spa shall meet all of the following requirements:*

(a) (1) The suction outlets of the pool or spa for which the permit is issued shall be equipped to provide circulation throughout the pool or spa as prescribed in paragraphs (2) and (3).

(2) The swimming pool or spa shall either have at least two circulation suction outlets per pump that shall be hydraulically balanced and symmetrically plumbed through one or more "T" fittings, and that are separated by a distance of at least three feet in any dimension between the suction outlets, or be designed to use alternatives to suction outlets, including, but not limited to, skimmers or perimeter overflow systems to conduct water to the recirculation pump.

(3) The circulation system shall have the capacity to provide a complete turnover of pool water, as specified in Section 3124B of Chapter 31B of the California Building Standards Code (Title 24 of the California Code of Regulations).

(b) Suction outlets shall be covered with antientrapment grates, as specified in the ANSI/APSP-16 performance standard or successor standard designated by the federal Consumer Product Safety Commission, that cannot be removed except with the use of tools. Slots or openings in the grates or similar protective devices shall be of a shape, area and arrangement that would prevent physical entrapment and would not pose any suction hazard to bathers.

(c) Any backup safety system that an owner of a new swimming pool or spa may choose to install in addition to the requirements set forth in subdivisions (a) and (b) shall meet the standards as published in the document, "Guidelines for Entrapment Hazards: Making Pools and Spas Safer," Publication Number 363, March 2005, United States Consumer Product Safety Commission.

[Amended by Stats. 2012, Ch. 679, Sec. 2. (AB 2114) Effective January 1, 2013.]

115928.5. *Whenever a building permit is issued for the remodel or modification of an existing swimming pool, toddler pool or spa, the permit shall require that the suction outlet or suction outlets of the existing swimming pool, toddler pool or spa be upgraded so as to be equipped with antientrapment grates, as specified in the ANSI/APSP-16 performance standard or a successor standard designated by the federal Consumer Product Safety Commission.*

[Amended by Stats. 2012, Ch. 679, Sec. 3. (AB 2114) Effective January 1, 2013.]

115929. *(a) The Legislature encourages a private entity, in consultation with the Epidemiology and Prevention for Injury Control Branch of the department, to produce an informative brochure or booklet, for consumer use, explaining the child drowning hazards of, possible safety measures for, and appropriate drowning hazard prevention measures for, home swimming pools and spas, and to donate the document to the department.*

(b) The Legislature encourages the private entity to use existing documents from the United States Consumer Product Safety Commission on pool safety.

(c) If a private entity produces the document described in subdivisions (a) and (b) and donates it to the department, the department shall review and approve the brochure or booklet.

(d) Upon approval of the document by the department, the document shall become the property of the state and a part of the public domain. The department shall place the document on its Web site in a format that is readily available for downloading and for publication. The department shall review the document in a timely and prudent fashion and shall complete the review within 18 months of receipt of the document from a private entity.

(Added by Stats. 2003, Ch. 422, Sec. 3. Effective January 1, 2004.)

SECTION 3110—AUTOMATIC VEHICULAR GATES

3110.1 General. Automatic vehicular gates shall comply with the requirements of Sections 3110.2 and 3110.3 and other applicable sections of this code.

3110.2 Vehicular gates intended for automation. Vehicular gates intended for automation shall be designed, constructed and installed to comply with the requirements of ASTM F2200.

3110.3 Vehicular gate openers. Vehicular gate openers, where provided, shall be listed in accordance with UL 325.

SECTION 3111—SOLAR ENERGY SYSTEMS

3111.1 General. Solar energy systems shall comply with the requirements of this section.

3111.1.1 Wind resistance. Rooftop-mounted photovoltaic (PV) panel systems and solar thermal collectors shall be designed in accordance with Section 1609.

Exception: [DSA-SS, DSA-SS/CC, HCD-1, HCD-2] *Rooftop-mounted photovoltaic (PV) panel systems and solar thermal collectors shall be designed in accordance with Section 1511.10 of this code.*

3111.1.2 Roof live load. Roof structures that provide support for solar energy systems shall be designed in accordance with Section 1607.22.

3111.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with this section, the *California Plumbing Code*, the *California Mechanical Code* and the *California Fire Code*. Where light-transmitting plastic covers are used, solar thermal collectors shall be designed in accordance with Section 2606.12.

3111.2.1 Equipment. Solar thermal systems and components shall be listed and labeled in accordance with ICC 900/SRCC 300 and ICC 901/SRCC 100.

3111.3 Photovoltaic solar energy systems. Photovoltaic solar energy systems shall be designed and installed in accordance with this section, the *California Fire Code*, *the California Electrical Code and* the manufacturer's installation instructions.

3111.3.1 Equipment. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

3111.3.2 Fire classification. Rooftop-mounted photovoltaic (PV) panel systems shall have a fire classification in accordance with Section 1505.9. Building-integrated photovoltaic (BIPV) systems installed as roof coverings shall have a fire classification in accordance with Section 1505.8.

3111.3.3 Building-integrated photovoltaic (BIPV) systems. BIPV systems installed as roof coverings shall be designed and installed in accordance with Section 1507.

[F] 3111.3.4 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Section 1205 of the *California Fire Code*.

3111.3.5 Elevated photovoltaic (PV) support structures. Elevated PV support structures shall comply with either Section 3111.3.5.1 or 3111.3.5.2.

Exception: Elevated PV support structures that are installed over agricultural uses.

3111.3.5.1 Photovoltaic (PV) panels installed over open-grid framing or a noncombustible deck. Elevated PV support structures with PV panels installed over open-grid framing or over a noncombustible deck shall have PV panels tested, listed and labeled with a fire type rating in accordance with UL 1703 or with both UL 61730-1 and UL 61730-2. Photovoltaic panels marked "not fire rated" shall not be installed on elevated PV support structures.

3111.3.5.2 Photovoltaic (PV) panels installed over a roof assembly. Elevated PV support structures with a PV panel system installed over a roof assembly shall have a fire classification in accordance with Section 1505.9.

3111.3.6 Ground-mounted photovoltaic (PV) panel systems. Ground-mounted photovoltaic panel systems shall be designed and installed in accordance with Chapter 16 and the *California Fire Code*.

3111.3.6.1 Fire separation distances. Ground-mounted photovoltaic panel systems shall be subject to the fire separation distance requirements determined by the local jurisdiction.

SECTION 3112—GREENHOUSES

3112.1 General. The provisions of this section shall apply to greenhouses that are designed and used for the cultivation, maintenance, or protection of plants.

[BE] 3112.2 Accessibility. Greenhouses shall be accessible in accordance with Chapter 11. ***[HCD 1]*** *Greenhouses accessory to covered multifamily dwellings, as defined in Chapter 2, used as a common use facility, shall be on an accessible route in accordance with Chapter 11A.*

3112.3 Structural design. Greenhouses shall comply with the structural design requirements for greenhouses in Chapter 16.

Exception: [DSA-SS and DSA-SS/CC] *Greenhouses considered to be school buildings shall comply with the structural design requirements in Chapter 16A and in accordance with Part 1, California Administrative Code, Title 24, CCR.*

3112.4 Glass and glazing. Glass and glazing used in greenhouses shall comply with Section 2405.

3112.5 Light-transmitting plastics. Light-transmitting plastics shall be permitted in lieu of plain glass in greenhouses and shall comply with Section 2606.

3112.6 Membrane structures. Greenhouses that are membrane structures shall comply with Section 3102.

3112.6.1 Plastic film. Plastic films used in greenhouses shall comply with Section 3102.3.

SECTION 3113—RELOCATABLE BUILDINGS

3113.1 General. The provisions of this section shall apply to relocatable buildings. Relocatable buildings manufactured after the effective date of this code shall comply with the applicable provisions of this code. ***[DSA-SS and DSA-SS/CC]*** *as enforced by the enforcement agency.*

Exception: This section shall not apply to manufactured housing used as dwellings.

[HCD] *The provisions of Section 3113 are not applicable to commercial modulars, manufactured homes, mobilehomes, multi-unit manufactured housing and special purpose commercial modulars as defined in Health and Safety Code Sections 18001.8, 18007, 18008, 18008.7 and 18012.5, respectively. These structures are subject to installation/reinstallation requirements specified in the Mobilehome*

Parks Act (Health and Safety Code Section 18200 et seq.) and the California Code of Regulations, Title 25, Division 1, Chapter 2. Manufactured homes must meet unit identification (data plate) and certification label requirements as specified in the Code of Federal Regulations, Title 24, Subtitle B, Chapter XX, Part 3280 and Health and Safety Code Section 18032. Commercial modulars and special purpose commercial modulars must meet identification requirements in the California Code of Regulations, Title 25, Division 1, Chapter 3, Subchapter 2.

3113.1.1 Compliance. A newly constructed relocatable building shall comply with the requirements of this code for new construction. ***[DSA-SS and DSA-SS/CC]*** *as enforced by the enforcement agency.* An existing relocatable building that is undergoing alteration, addition, change of occupancy or relocation shall comply with Chapter 14 of the *California Existing Building Code*.

Exception: [DSA-SS and DSA-SS/CC] *An existing relocatable public school building that is undergoing alteration, addition or change of occupancy shall comply with Chapter 3 of the California Existing Building Code.*

3113.2 Supplemental information. Supplemental information specific to a relocatable building shall be submitted to the authority having jurisdiction. It shall, as a minimum, include the following in addition to the information required by Section 105:

Exception: [DSA-SS and DSA-SS/CC] *Supplemental information specific to a relocatable building shall be submitted to the enforcement agency. It shall, as a minimum, include the following in addition to the information required by Section 1603A:*

1. Manufacturer's name and address.
2. Date of manufacture.
3. Serial number of module.
4. Manufacturer's design drawings.
5. Type of construction in accordance with Section 602.
6. Design loads including: roof live load, roof snow load, floor live load, wind load and seismic site class, use group and design category.
7. Additional building planning and structural design data.
8. Site-built structure or appurtenance attached to the relocatable building.

3113.3 Manufacturer's data plate. Each relocatable module shall have a data plate that is permanently attached on or adjacent to the electrical panel, and shall include the following information:

1. Occupancy group.
2. Manufacturer's name and address.
3. Date of manufacture.
4. Serial number of module.
5. Design roof live load, design floor live load, snow load, wind and seismic design.
6. Approved quality assurance agency or approved inspection agency.
7. Codes and standards of construction.
8. Envelope thermal resistance values.
9. Electrical service size.
10. Fuel-burning equipment and size.
11. Special limitations if any.

Exception: [DSA-SS and DSA-SS/CC] *Each relocatable module shall have two metal identification labels permanently attached to the structure as enforced by the enforcement agency.*

3113.4 Inspection agencies. The building official is authorized to accept reports of inspections conducted by approved inspection agencies during off-site construction of the relocatable building, and to satisfy the applicable requirements of Sections 110.3 through 110.3.12.1.

Exception: [DSA-SS and DSA-SS/CC] *Each relocatable module shall be inspected during construction and installation at the project site by project inspectors acceptable to the enforcement agency in accordance with Part 1, California Administrative Code, Title 24, CCR.*

SECTION 3114—INTERMODAL SHIPPING CONTAINERS

[OSHPD 1, 1R, 2, 4 & 5] *Not permitted by OSHPD.*

3114.1 General. The provisions of Section 3114and other applicable sections of this code shall apply to intermodal shipping containers that are repurposed for use as buildings or structures, or as a part of buildings or structures.

Exceptions: ***[DSA-SS & DSA-SS/CC]*** *Not permitted by DSA.*

1. Intermodal shipping containers previously approved as existing relocatable buildings complying with Chapter 14 of the *California Existing Building Code.*
2. Stationary storage battery arrays located in intermodal shipping containers complying with Chapter 12 of the *California Fire Code.*
3. Intermodal shipping containers that are listed as equipment complying with the standard for equipment, such as air chillers, engine generators, modular data centers, and other similar equipment.

4. Intermodal shipping containers housing or supporting experimental equipment are exempt from the requirements of Section 3114, provided that they comply with all of the following:
    4.1. Such units shall be single stand-alone units supported at grade level and used only for occupancies as specified under Risk Category I in Table 1604.5.
    4.2. Such units are located a minimum of 8 feet (2438 mm) from adjacent structures, and are not connected to a fuel gas system or fuel gas utility.
    4.3. In hurricane-prone regions and flood hazard areas, such units are designed in accordance with the applicable provisions of Chapter 16.
5. ***[HCD]*** *Shipping containers constructed or converted off-site that meet the definition of Factory-built Housing in Health and Safety Code Section 19971 or Commercial Modular(s) as defined in Health and Safety Code Section 18001.8 shall be approved by the Department of Housing and Community Development.*

3114.2 Construction documents. The construction documents shall contain information to verify the dimensions and establish the physical properties of the steel components and wood floor components of the intermodal shipping container, in addition to the information required by Sections 107 and 1603.

3114.3 Intermodal shipping container information. Intermodal shipping containers shall bear an existing data plate containing the following information as required by ISO 6346 and verified by an approved agency. A report of the verification process and findings shall be provided to the building owner.

1. Manufacturer's name or identification number.
2. Date manufactured.
3. Safety approval number.
4. Identification number.
5. Maximum operating gross mass or weight (kg) (lbs).
6. Allowable stacking load for 1.8G (kg) (lbs).
7. Transverse racking test force (Newtons).
8. Valid maintenance examination date.

Where approved by the building official, the markings and existing data plate are permitted to be removed from the intermodal shipping containers before they are repurposed for use as buildings or structures or as a part of buildings or structures.

3114.4 Protection against decay and termites. Wood structural floors of intermodal shipping containers shall be protected from decay and termites in accordance with the applicable provisions of Section 2304.12.1.1.

3114.5 Under-floor ventilation. The space between the bottom of the floor joists and the earth under any intermodal shipping container, except spaces occupied by basements and cellars, shall be provided with ventilation in accordance with Section 1202.4.

3114.6 Roof assemblies. Intermodal shipping container roof assemblies shall comply with the applicable requirements of Chapter 15.

Exception: Single-unit, stand-alone intermodal shipping containers not attached to, or stacked vertically over, other intermodal shipping containers, buildings or structures. ***[DSA-SS & DSA-SS/CC]*** *Not permitted by DSA.*

3114.7 Joints and voids. Joints and voids that create concealed spaces between connected or stacked intermodal shipping containers at fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system in accordance with Section 715.

3114.8 Structural. Intermodal shipping containers that conform to ISO 1496-1 and are repurposed for use as buildings or structures, or as a part of buildings or structures, shall be designed in accordance with Chapter 16 and this section.

3114.8.1 Foundations and supports. Intermodal shipping containers repurposed for use as a permanent building or structure shall be supported on foundations or other supporting structures designed and constructed in accordance with Chapters 16 through 23.

3114.8.1.1 Anchorage. Intermodal shipping containers shall be anchored to foundations or other supporting structures as necessary to provide a continuous load path for all applicable design and environmental loads in accordance with Chapter 16.

3114.8.1.2 Stacking. Intermodal shipping containers used to support stacked units shall comply with Section 3114.8.4.

3114.8.2 Welds. The strength of new welds and connections shall be of not less than the strength provided by the original connections. All new welds and connections shall be designed and constructed in accordance with Chapters 16, 17 and 22.

3114.8.3 Structural design. The structural design for the intermodal shipping containers repurposed for use as a building or structure, or as part of a building or structure, shall comply with Section 3114.8.4 or 3114.8.5.

3114.8.4 Detailed design procedure. A structural analysis meeting the requirements of this section shall be provided to the building official to demonstrate the structural adequacy of the intermodal shipping containers.

Exception: Structures using an intermodal shipping container designed in accordance with Section 3114 8.5.

3114.8.4.1 Material properties. Structural material properties for existing intermodal shipping container steel components shall be established by Section 2201.2.

3114.8.4.2 Seismic design parameters. The seismic force-resisting system shall be designed and detailed in accordance with ASCE 7 and one of the following:

1. Where all or portions of the profiled steel panel elements are considered to be the seismic force-resisting system, design and detailing shall be in accordance with the AISI S100 and ASCE 7, Table 12.2-1 requirements for steel systems not specifically detailed for seismic resistance, excluding cantilever column systems. ***[DSA-SS & DSA-SS/CC]*** *Not permitted by DSA.*
2. Where all or portions of the profiled steel panel elements are not considered to be part of the seismic force-resisting system, an independent seismic force-resisting system shall be selected and detailed in accordance with ASCE 7, Table 12.2-1.
3. Where all or portions of the profiled steel panel elements are retained and integrated into a seismic force-resisting system other than as permitted by Item 1, seismic design parameters shall be developed from testing and analysis in accordance with Section 104.2.3 and ASCE 7, Section 12.2.1.1 or 12.2.1.2.

3114.8.4.3 Allowable shear value. The allowable shear values for the profiled steel panel side walls and end walls shall be determined in accordance with the design approach selected in Section 3114.8.4.2. Where penetrations are made in the side walls or end walls designated as part of the lateral force-resisting system, the penetrations shall be substantiated by rational analysis.

3114.8.5 Simplified structural design procedure of single-unit containers. Single-unit intermodal shipping containers conforming to the limitations of Section 3114.8.5.1 shall be permitted to be designed in accordance with Sections 3114.8.5.2 and 3114.8.5.3. ***[DSA-SS & DSA-SS/CC]*** *Not permitted by DSA.*

3114.8.5.1 Limitations. The use of Section 3114.8.5 is subject to the following limitations:

1. The intermodal shipping container shall be a single-unit, stand-alone unit supported on a foundation and shall not be in contact with or supporting any other shipping container or other structure.
2. The intermodal shipping container top and bottom rails, corner castings, and columns or any portion thereof shall not be notched, cut, or removed in any manner.
3. The intermodal shipping container shall be erected in a level and horizontal position with the floor located at the bottom.
4. The intermodal shipping container shall be located in Seismic Design Category A, B, C or D.

3114.8.5.2 Structural design assumptions. Where permitted by Section 3114.8.5.1, single-unit, stand-alone intermodal shipping containers shall be designed using the following assumptions for the profile steel panel lateral-force resisting system:

1. The appropriate detailing requirements contained in Chapters 16 through 23.
2. Response modification coefficient, R = 2.
3. Overstrength factor, $\Omega_0 = 2.5$.
4. Deflection amplification factor, $C_d = 2$.
5. Limits on structural height, $h_n = 9.5$ feet (2900 mm).

3114.8.5.3 Allowable shear. The allowable shear for the profiled steel panel side walls (longitudinal) and end walls (transverse) for wind design and seismic design using the coefficients of Section 3114.8.5.2 shall be in accordance with Table 3114.8.5.3, provided that all of the following conditions are met:

1. The total linear length of all openings in any individual side wall or end wall shall be limited to not more than 50 percent of the length of that side wall or end wall, as shown in Figure 3114.8.5.3(1).
2. Any full-height wall length, or portion thereof, less than 4 feet (1219 mm) shall not be considered as a portion of the lateral force-resisting system, as shown in Figure 3114.8.5.3(2).
3. All side walls or end walls used as part of the lateral force-resisting system shall have an existing or new boundary element on all sides to form a continuous load path, or paths, with adequate strength and stiffness to transfer all forces from the point of application to the final point of resistance, as shown in Figure 3114.8.5.3(3).
4. Where openings are made in intermodal shipping container walls, floors or roofs, for doors, windows and other openings:
    4.1. The openings shall be framed with steel elements that are designed in accordance with Chapters 16 and 22.
    4.2. The cross section and material grade of any new steel element shall be equal to or greater than the steel element removed.
5. A maximum of one penetration not greater than 6 inches (152 mm) in diameter for conduits, pipes, tubes or vents, or not greater than 16 square inches (10 323 mm2) for electrical boxes, is permitted for each individual 8-foot (2438 mm) length of lateral force-resisting wall. Penetrations located in walls that are not part of the lateral force-resisting system shall not be limited in size or quantity. Existing intermodal shipping container vents shall not be considered a penetration, as shown in Figure 3114.8.5.3(4).

6. End wall doors designated as part of the lateral force-resisting system shall be intermittently welded closed around the full perimeter of the door panels.

TABLE 3114.8.5.3—ALLOWABLE SHEAR VALUES FOR PROFILED STEEL PANEL SIDE WALLS AND END WALLS FOR WIND OR SEISMIC LOADING

CONTAINER DESIGNATION[b]	CONTAINER DIMENSION (nominal length)	CONTAINER DIMENSION (nominal height)	ALLOWABLE SHEAR VALUES (PLF)[a, c]	
			Side Wall	End Wall
1EEE	45 feet	9.5 feet	75	843
1EE		8.5 feet		
1AAA	40 feet	9.5 feet	84	
1AA		8.5 feet		
1A		8.0 feet		
1AX		< 8.0 feet		
1BBB	30 feet	9.5 feet	112	
1BB		8.5 feet		
1B		8.0 feet		
1BX		< 8.0 feet		
1CC	20 feet	8.5 feet	168	
1C		8.0 feet		
1CX		< 8.0 feet		
1D	10 feet	8.0 feet	337	
1DX		< 8.0 feet		

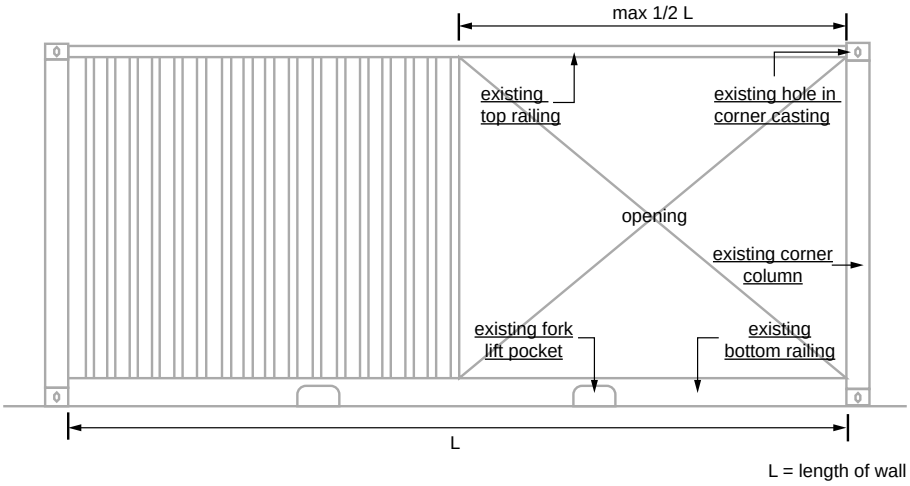
For SI: 1 foot = 304.8 mm.

a. The allowable strength shear values for the side walls and end walls of the intermodal shipping containers are derived from ISO 1496-1 and reduced by a factor of safety of 5.

b. Container designation type is derived from ISO 668.

c. Limitations of Sections 3114.8.5.1 and 3114.8.5.3 shall apply.

FIGURE 3114.8.5.3(1)—BRACING UNIT DISTRIBUTION—MAXIMUM LINEAR LENGTH



CHAPTER

33 SAFEGUARDS DURING CONSTRUCTION

User notes:

About this chapter: While the balance of the chapters in this code specify how a building is to be designed and constructed in order to be in compliance with the code, Chapter 33 looks to the actual construction process. Parameters are provided for demolition and for protecting adjacent property during demolition and construction. This chapter also addresses the need for a fire watch during nonworking hours for certain buildings once the construction has progressed significantly. Issues such as how to provide egress while the building is growing, the timing of standpipe and sprinkler installation, and protection of pedestrians are addressed.

ICC code development note: Code change proposals to sections preceded by the designation [F] will be considered by a code development committee meeting during the 2024 (Group A) Code Development Cycle. All other code change proposals will be considered by a code development committee meeting during the 2025 (Group B) Code Development Cycle.

SECTION 3301—GENERAL

3301.1 Scope. The provisions of this chapter shall govern safety during construction and the protection of adjacent public and private properties. Fire safety during construction shall also comply with the applicable provisions of Chapter 33 of the *California Fire Code*.

3301.2 Storage and placement of construction equipment and materials. Construction equipment and materials shall be stored and placed so as not to endanger the public, the workers or adjoining property for the duration of the construction project.

[BS] 3301.3 Roof loads. Structural roof components shall be capable of supporting the roof-covering system and the material and equipment loads that will be encountered during installation of the system.

3301.4 Maintenance of exits, existing structural elements, fire protection devices and sanitary safeguards. Required exits, existing structural elements, fire protection devices and sanitary safeguards shall be maintained at all times during alterations, repairs or additions to any building or structure.

Exceptions:

1. Where such required elements or devices are being altered or repaired, adequate substitute provisions shall be made.
2. Maintenance of such elements and devices is not required where the existing building is not occupied.

3301.5 Removal of waste materials Waste materials shall be removed in a manner that prevents injury or damage to persons, adjacent properties and public rights-of-way.

[F] SECTION 3302—OWNER'S RESPONSIBILITY FOR FIRE PROTECTION

[F] 3302.1 Site safety plan. The owner or owner's authorized agent shall be responsible for the development, implementation and maintenance of an approved, written site safety plan establishing a fire prevention program at the project site applicable throughout all phases of the construction, repair, alteration or demolition work. The plan shall be submitted and approved before a building permit is issued. Any changes to the plan shall address the requirements of this chapter and other applicable portions of the *California Fire Code*, the duties of staff and staff training requirements. The plan shall be submitted for approval in accordance with the *California Fire Code*.

[F] 3302.1.1 Components of site safety plans. Site safety plans shall include the following, as applicable:

1. Name and contact information of site safety director.
2. Documentation of the training of the site safety director and fire watch personnel.
3. Procedures for reporting emergencies.
4. Fire department vehicle access routes.
5. Location of fire protection equipment, including portable fire extinguishers, standpipes, fire department connections and fire hydrants.
6. Smoking and cooking policies, designated areas to be used where approved, and signage locations in accordance with the *California Fire Code.*
7. Location and safety considerations for temporary heating equipment.
8. Hot-work permit plan.
9. Plans for control of combustible waste material.
10. Locations and methods for storage and use of flammable and combustible liquids and other hazardous materials.
11. Provisions for site security and, where required, for a fire watch.
12. Changes that affect this plan.
13. Other site-specific information required by the *California Fire Code*.

[F] 3302.2 Site safety director. The owner shall designate a person to be the site safety director. The site safety director shall be responsible for ensuring compliance with the site safety plan. The site safety director shall have the authority to enforce the provisions of this chapter and other provisions as necessary to secure the intent of this chapter. Where guard service is provided in accordance with the *California Fire Code*, the site safety director shall be responsible for the guard service.

[F] 3302.3 Daily fire safety inspection. The site safety director shall be responsible for the completion of a daily fire safety inspection at the project site. Each day, all building and outdoor areas shall be inspected to ensure compliance with the inspection list in this section. The results of each inspection shall be documented and maintained on-site until a certificate of occupancy has been issued. Documentation shall be immediately available for on-site inspection and review.

1. Any contractors entering the site to perform hot work each day have been instructed in the hot work safety requirements in the *California Fire Code*, and hot work is performed only in areas approved by the site safety director.
2. Temporary heating equipment is maintained away from combustible materials in accordance with the equipment manufacturer's instructions.
3. Combustible debris, rubbish and waste material is removed from the building in areas where work is not being performed.
4. Temporary wiring does not have exposed conductors.
5. Flammable liquids and other hazardous materials are stored in locations that have been approved by the site safety director when not involved in work that is being performed.
6. Fire apparatus access roads required by the *California Fire Code* are maintained clear of obstructions that reduce the width of the usable roadway to less than 20 feet (6096 mm).
7. Fire hydrants are clearly visible from access roads and are not obstructed.
8. The location of fire department connections to standpipe and in-service sprinkler systems are clearly identifiable from the access road and such connections are not obstructed.
9. Standpipe systems are in service and continuous to the highest work floor, as specified in Section 3311.
10. Portable fire extinguishers are available in locations required by Section 3309 and for roofing operations in accordance with the *California Fire Code*.
11. Where a fire watch is required, fire watch records complying with the *California Fire Code* are up-to-date.

[F] 3302.3.1 Violations. Failure to properly conduct, document and maintain documentation required by this section shall constitute an unlawful act in accordance with Section 114.1 and shall result in the issuance of a notice of violation to the site safety director in accordance with Section 114.2. Upon the third offense, the building official is authorized to issue a stop work order in accordance with Section 115, and work shall not resume until satisfactory assurances of future compliance have been presented to and approved by the building official.

SECTION 3303—DEMOLITION

3303.1 Construction documents. Construction documents and a schedule for demolition shall be submitted where required by the building official. Where such information is required, work shall not be done until such construction documents or schedule, or both, are approved.

3303.2 Pedestrian protection. The work of demolishing any building shall not be commenced until pedestrian protection is in place as required by this chapter.

3303.3 Means of egress. A horizontal exit shall not be destroyed unless and until a substitute means of egress has been provided and approved.

3303.4 Vacant lot. Where a structure has been demolished or removed, the vacant lot shall be filled and maintained to the existing grade or in accordance with the ordinances of the jurisdiction having authority.

3303.5 Water accumulation. Provision shall be made to prevent the accumulation of water or damage to any foundations on the premises or on adjacent property.

3303.6 Utility connections. Service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the applicable governing authority.

[F] 3303.7 Fire safety during demolition. Fire safety during demolition shall comply with the applicable requirements of this code and the applicable provisions of Chapter 33 of the *California Fire Code*.

SECTION 3304—SITE WORK

3304.1 Excavation and fill. Excavation and fill for buildings and structures shall be constructed or protected so as not to endanger life or property. Stumps and roots shall be removed from the soil to a depth of not less than 12 inches (305 mm) below the surface of the ground in the area to be occupied by the building. Wood forms that have been used in placing concrete, if within the ground or between foundation sills and the ground, shall be removed before a building is occupied or used for any purpose. Before completion, loose or casual wood shall be removed from direct contact with the ground under the building.

3304.1.1 Slope limits. Slopes for permanent fill shall be not steeper than one unit vertical in two units horizontal (50-percent slope). Cut slopes for permanent excavations shall be not steeper than one unit vertical in two units horizontal (50-percent slope). Deviation from the foregoing limitations for cut slopes shall be permitted only upon the presentation of a soil investigation report acceptable to the building official.

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 35 – REFERENCED STANDARDS

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DHS	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	X												X			X								
Adopt entire chapter as amended (amended sections listed below)			X	X	X	X		X	X	X	X	X		X	X									
Adopt only those sections that are listed below							X																	X
Chapter / Section																								
AAMA 501.4-18								X	X	X	X	X		X	X									
AAMA 501.6-18								X	X	X	X	X		X	X									
AAMA TIR A8-16								X	X	X	X	X		X	X									
ACI 318-19																								X
ACI 355.2-22								X	X	X	X	X		X	X									
ACI 355.4-19 (21)								X	X	X	X	X		X	X									
ACI 440.2R-17								X	X	X	X	X		X	X									
ACI 506R-16								X	X	X	X	X		X	X									
ACI 506.2-13 (18)								X	X	X	X	X		X	X									
ACI 506.4R-19								X	X	X	X	X		X	X									
ACI 506.6T-17								X	X	X	X	X		X	X									
ACI 548.15-20								X	X	X	X	X		X	X									
ANSI S3.41			X																					
ASCE/SEI 41-13								†	†	X	†	†		†	†									
ASCE/SEI 41-17								X	X	†	†	†		†	†									
ASCE/SEI 41-23								X	X	X	X	X		X	X									
ASHRAE 171-2017								X	X	X	X	X		X	X									
ASME A17.1/CSA B44			X				X																	
ASME A18.1							X																	
ASME BPE-2009			X																					
ASME B31.3-2014																								X
ASTM A227/A227M-17				X	X																			
ASTM A229/A229M-17				X	X																			
ASTM A615/A615M-*22*								X	X	X	X	X		X	X									
ASTM A706/A706M-*22a*								X	X	X	X	X		X	X									
ASTM A1064-22								X	X	X	X	X		X	X									
ASTM C595/C595M-21								X	X	X	X	X		X	X									
ASTM C618-23e1								X	X	X	X	X		X	X									
ASTM C635/C635M-*22*								X	X	X	X	X		X	X									
ASTM C989-22								X	X	X	X	X		X	X									
ASTM C1019-20								X	X	X	X	X		X	X									
ASTM C1249-18 (2023)								X	X	X	X	X		X	X									
ASTM C1392-20								X	X	X	X	X		X	X									
ASTM C1394-20								X	X	X	X	X		X	X									
ASTM C1401-23								X	X	X	X	X		X	X									
ASTM C1586-20								X	X	X	X	X		X	X									
ASTM C1714/C1714M-23								X	X	X	X	X		X	X									
ASTM C1823/C1823M-20								X	X	X	X	X		X	X									
ASTM D1586-18e1								X	X	X	X	X		X	X									
ASTM D3966-22								X	X	X	X	X		X	X									
ASTM D5778-20								X	X	X	X	X		X	X									
ASTM E580/E580M-22								X	X	X	X	X		X	X									

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 35 – REFERENCED STANDARDS—continued

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD							BSCC	DHS	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5	6								
Adopt entire chapter	X												X			X								
Adopt entire chapter as amended (amended sections listed below)			X	X	X	X		X	X	X	X	X		X	X									
Adopt only those sections that are listed below							X																	X
Chapter / Section																								
ASTM E662-17a			X					X	X															
ASTM E2632/E2632M-13			X																					
ASTM E2707-15			X																					
ASTM E2726/E2726-12a			X																					
ASTM E3121-17								X	X	X	X	X		X	X									
ASTM F606/F606M-21								X	X	X	X	X		X	X									
ASTM F1292-99							X																	
ASTM F1292-04							X																	
ASTM F1487-01							X																	
ASTM F1951-99							X																	
ASTM F2374			X																					
ANSI/AWC NDS w/*2024* Suppl.								X	X	X	X	X		X	X									X
AWS B5.1-2013-AMD1								X	X	X	X	X		X	X									
AWS D1.1/D1.1M-20								X	X	X	X	X		X	X									
AWS D1.2/D1.2M-14								X	X	X	X	X		X	X									
AWS D1.3/D1.3M-2018								X	X	X	X	X		X	X									
AWS D1.6/D1.6M-2017								X	X	X	X	X		X	X									
AWS D1.8/D1.8M-2021								X	X	X	X	X		X	X									
AWS QCI-16								X	X	X	X	X		X	X									
BHMA A156.10-2011							X																	
BHMA A156.19-2013							X																	
ANSI/DASMA 103-2017				X	X																			
FM 1950-2022								X	X	X	X	X		X	X									
FM 3011-99			X																					
FM 3260-00			X																					
ICC 300-*23*								X	X	X	X	X		X	X									
*ICC-ES AC01-24**								X	X	X	X	X		X	X									
*ICC-ES AC58-24**								X	X	X	X	X		X	X									
*ICC-ES AC70-24**								X	X	X	X	X		X	X									
ICC-ES AC77			X																					
*ICC-ES AC125-24**								X	X	X	X	X		X	X									
*ICC-ES AC156-24**								X	X	X	X	X		X	X									
*ICC-ES AC178-24**								X	X	X	X	X		X	X									
*ICC-ES AC193-24**								X	X	X	X	X		X	X									
*ICC-ES AC232-24**								X	X	X	X	X		X	X									
*ICC-ES AC308-24**								X	X	X	X	X		X	X									
ICC ES AC331			X																					
*ICC-ES AC358-24**								X	X	X	X	X		X	X									
*ICC-ES AC446-24**								X	X	X	X	X		X	X									
ISO 9001-15								X	X	X	X	X		X	X									
NFPA 11-*24*			X																					
NFPA 13-*25*			X																					

CHAPTER

35 REFERENCED STANDARDS

User notes:

About this chapter:

The *California Building Code* contains numerous references to standards promulgated by other organizations that are used to provide requirements for materials and methods of construction. This chapter contains a comprehensive list of all standards that are referenced in this code. These standards, in essence, are part of this code to the extent of the reference to the standard.

[DSA-SS, DSA-SS/CC, OSHPD 1 & 4] Reference to other chapters. *In addition to the code sections referenced, the standards listed in this chapter are applicable to the respective code sections in Chapters 16A, 17A, 18A, 19A, 21A and 22A.*

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.4.

AA Aluminum Association, 1400 Crystal Drive, Suite 430, Arlington, VA 22202

ADM—2020: Aluminum Design Manual
1604.3.5, 2002.1

ASM 35—00: Aluminum Sheet Metal Work in Building Construction (Fourth Edition)
2002.1

AAMA Fenestration and Glazing Industry Alliance (formerly American Architectural Manufacturers Association), 1900 E Golf Road, Suite 1250, Schaumburg, IL 60173

711—22: Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products
1404.4

714—23: Voluntary Specification for Liquid-Applied Flashing Used to Create a Water-Resistive Seal around Exterior Wall Openings in Buildings
1404.4

1402—09: Standard Specifications for Aluminum Siding, Soffit and Fascia
1403.5.1

2502—19: Comparative Analysis Procedure for Window and Door Products
1709.5

AAMA/WDMA/CSA 101/I.S.2/A440—22: North American Fenestration Standard/Specification for Windows, Doors, and Skylights
1709.5.1, 2405.5*, 1709A.5.1*

501.4-18: Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts
[OSHPD 1 & 4] Section 7.2.5, *Replace "elastic design displacement" with "design story drifts associated with the design earthquake".*
2410.1

501.6-18: Recommended Dynamic Test Method for Determining the Seismic Drift Causing Glass Fallout from a Wall System
2410.1

TIR A8-16: Structural Performance of Composite Thermal Barrier Framing Systems
2411.1

ACI American Concrete Institute, 38800 Country Club Drive, Farmington Hills, MI 48331-3439

117—10: Specification for Tolerances for Concrete Construction and Materials
1901.7.1

216.1—14: Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies
Table 721.1(2), 722.1

318—19: Building Code Requirements for Structural Concrete
722.2.4.3, 1604.3.2, 1616.2.1, 1616.3.1, 1704.5, Table 1705.3, 1705.3.2, *1705A.3.9, Table 1705A.3,* 1808.8.2, Table 1808.8.2, 1808.8.5, 1808.8.6, 1809.14, 1810.1.3, 1810.2.4.1, 1810.3.2.1.1, 1810.3.2.1.2, 1810.3.8, 1810.3.9.2, 1810.3.9.4.2.1, 1810.3.9.4.2.2, 1810.3.10.1, 1810.3.11, 1810.3.11.1, 1810.3.12, 1810.3.12, 1810.3.13, *1810A.3.10.4,* 1901.2, 1901.3, *1901A.3, 1901.3.4.4,* 1902.1, *1902A.1, 1903A,* 1903.1, *1904A,* 1904.1, 1904.2, *1905A,* 1905.1, 1905.2, 1905.3, 1905.4, 1905.5.1, 1905.6, 1905.6.2, 1905.7, 1905.7.1, 1905.7.2, 1907.1, 1908.1, *1909.2.6.4, 1909.3, 1909.4, 1910.3, 1910A.5.4*

355.2—22: Post-Installed Mechanical Anchors in Concrete—Qualification Requirements and Commentary
1617A.1.19, 1901.3.2

355.4—19(21): Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary
1617A.1.19, 1901.3.3

440.2R—17: Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures
1911.3, 1911A.3

440.11—22: Building Code Requirements for Structural Concrete Reinforced with Glass Fiber Reinforced Polymer (GFRP) Bars – Code Requirements
1901.2.1

506R—16: Guide to Shotcrete
1908.1, 1908A.1

506.2—13 (18): Specification for Shotcrete
1705A.3.9, 1908.1, 1908A.1, 1909.4

506.4R—19: Guide for the Evaluation of Shotcrete
1908.1, 1908A.1, 1909.4

506.6T—17: Visual Shotcrete Core Quality Evaluation
1908.1, 1908A.1, 1909.4

548.15-20: Specification for Crack Repair by Epoxy Injection
1911.2, 1911A.2

550.5—18: Code Requirements for the Design of Precast Concrete Diaphragms for Earthquake Motions
Table 1705.3

ITG—7-09: Specification for Tolerances for Precast Concrete
1901.7.2

AISC American Institute of Steel, 130 East Randolph Street, Suite 2000, Chicago, IL 60601-6219

ANSI/AISC 341—22: Seismic Provisions for Structural Steel Buildings
1705.13.1.1, 1705.13.1.2, 1705.14.1.1, 1705.14.1.2, *Table 1705A.2.1,* 1810.3.5.3.1, 2202.2.1.1, 2202.2.1.2, 2202.2.2, *2202A.5, 2205.3, 2215.2*

ANSI/AISC 358—22: Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications
Table 1705A.2.1, 2202.2.1, 2202.2.1.2, *2202.3, 2202A.3, 2202A.6, 2215.3, 2205A, 2205.4, 2206A.2, 2206.2.1*

ANSI/AISC 360—22: Specification for Structural Steel Buildings
722.5.2.2.1, 1604.3.3, 1705.2.1, *1705A.2.1, Table 1705A.2.1, 1705A.2.5, 2201A.5.1,* 2202.1, 2202.2.1.1, *2204.4, 2204A.4, 2215.1.1, 2215A.1.2, 2215A.2.1*

ANSI/AISC 370—21: Specification for Structural Stainless Steel Buildings
1705.2.2, *1705.2.2, Table 1705A.2.1, 1705A.2.2,* 2203.1

AISI American Iron and Steel Institute, 25 Massachusetts Avenue, NW Suite 800, Washington, DC 20001

AISI S100—16(2020) w/S2—20: North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020), with Supplement 2, 2020 Edition
1604.3.3, 1905.7.2, 2204, 2204.2.2, *2204A.1*

AISI S202—20: Code of Standard Practice for Cold-formed Steel Structural Framing, 2020 Edition
2206.1.3.1, 2206.1.3.1

AISI S220—20: North American Standard for Cold-Formed Steel Nonstructural Framing, 2020 Edition
2203.1, 2206.2, 2206.3, Table 2506.2, Table 2507.2

AISI S230—2019: North American Standard for Cold-formed Steel Framing—Prescriptive Method for One and Two Family Dwellings, 2019 Edition
1609.1.1, 1609.1.1.1, 2204.1, 2206.1.2

AISI S240—20: North American Standard for Cold-Formed Steel Structural Framing, 2020 Edition
Table 1404.5.2.1, Table 1404.5.2.2, *Table 1705A.2.1, 1709A.2.9,* 2206.1, 2206.1.1.1, 2206.1.3.3, 2206.3, 2212.1, *2206A.2,* Table 2506.2, Table 2507.2

AISI S310—20 w/S1—22: North American Standard for the Design of Profiled Steel Diaphragm Panels, with Supplement 1, 2022 Edition
2204.1, 2208.1

AISI S400—20: North American Standard for Seismic Design of Cold-formed Steel Structural Systems, 2020 Edition
2204.2.1, 2204.2.2, 2206.1.1.1, 2206.1.1.2*, 2215A.4.3*

ASCE/SEI American Society of Civil Engineers Structural Engineering Institute, 1801 Alexander Bell Drive, Reston, VA 20191

7—22: Minimum Design Loads and Associated Criteria for Buildings and Other Structures *with Supplement 1*

104.11, 202, Table 1504.2, 1504.8, *Table 1504.8, 1510.7.1,* 1602.1, 1603.1.4, *1603A.1.5, 1603A.2,* Table 1604.3, *1604.4, 1604A.4,* 1604.5, Table 1604.5, 1604.8.2, 1604.9, 1605.1, 1605.1.1, 1605.2, 1606.3, 1607.9.1, 1607.9.1.1, 1607.9.1.2, 1607.10, 1607.12, 1608.1, 1608.2, Figure 1608.2(1), 1608.3, 1609.1.1, 1609.2, 1609.3, 1609.5, 1609.6.1, 1609.6.3.1, 1609.6.3.2, 1609.7, 1611.1, 1611.2, 1612.2, 1613.1, 1613.2, 1613.3, 1613.4, 1613.5, 1613.6, 1614.1, 1615.1, *1617, 1617A,* 1705.13, 1705.13.1.1, 1705.13.1.2, 1705.13.4, 1705.14.1.1, 1705.14.1.2, 1705.14.2, 1705.14.3, 1705.14.4, 1709.5, 1709.5.3.1, 1802.1, 1803.5.12, *1803A.6,* 1806.1, *1807A.2.5,* 1808.3, 1808.3.1, 1809.13, 1809.14, 1809.14, 1810.3.1.1, 1810.3.6.1, 1810.3.8, 1810.3.9.2, 1810.3.9.4, 1810.3.9.4.1, 1810.3.9.4.2, 1810.3.11.2, 1810.3.12, *1811A.4,* 1902.1, 1902.1.1, 2202.2.1, 2202.2.1.1, 2202.2.1.2, 2202.2.2, 2204.2.1, 2204.2.2, 2206.1.1.1, 2209.2, *2210A.2,* 2211.1, 2212.1, *2212A.1.1, 2212A.2.4,* Table 2304.6.1, Table 2306.3(3), Table 2308.11.4, 2404.1, *2410.1.1, 2410.1.2,* 2505.1, 2505.2, 2506.2.1, *3115.8.4.2*

8—22: Specification for the Design of Cold-Formed Stainless Steel Structural Members ⬅

1604.3.3, 2205.1, 2211.

19—16: Structural Applications of Steel Cables for Buildings

2214.1

24—14: Flood Resistant Design and Construction

1202.4.4, 1603.1.7, 1612.2, 1612.4, 2702.1.8 ⬅

29—05: Standard Calculation Methods for Structural Fire Protection

722.1

32—01: Design and Construction of Frost-Protected Shallow Foundations

1809.5

37—2017: Design Loads on Structures during Construction

1617A.1.18

41—13: [OSHPD 1 SPC-2 and SPC-4D only] Seismic Evaluation and Retrofit of Existing Buildings

1603A.2

41—17: [DSA-SS, DSA-SS/CC] Seismic Evaluation and Retrofit of Existing Buildings

1603A.2

41—23: [DSA-SS, DSA-SS/CC] [OSHPD 1, 1R, 2, 4 and 5] Seismic Evaluation and Retrofit of Existing Buildings

1603A.2

49—21: Wind Tunnel Testing for Buildings and Other Structures

1609.1.1

55—16: Tensile Membrane Structures

3102.2

ASHRAE ASHRAE, 180 Technology Parkway, Peachtree Corners, GA 30092

90.1—2022: Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings

1202.1

170—2021: Ventilation of Health Care Facilities

1020.6

171—2017: Method of Testing for Rating Seismic and Wind Restraints

1705.14.2, 1705A.14.2

ASME American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016

A17.1—2022/CSA B44—22: Safety Code for Elevators and Escalators

11B-407.1, 11B-407.1.1, 11B-407.4.9, 11B-408.1, 11B-409.1, 11B-411.1, 11B-810.9, 1607.12.1, 1612.2, 1613.5

A17.1—CSA B44: *the edition as referenced in: California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 6, Elevator Safety Orders* Safety Code for Elevators and Escalators

907.3.3, 911.1.6, 1009.4.1, 3001.3, Table 3001.3, 3001.5, 3002.5, *3002.6.1,* 3003.2, 3007.1, 3008.1.4, 3008.7.1

A17.7—2007/CSA B44—07(R2017): Performance-based Safety Code for Elevators and Escalators

Table 3001.3, 3001.5, 3002.5

A18.1—2023: Safety Standard for Platform Lifts and Stairway Chairlifts

1110.11, Table 3001.3

A90.1—2015: Safety Standard for Belt Manlifts

Table 3001.3

B16.18—2023: Cast Copper Alloy Solder Joint Pressure Fittings
909.13.1

B16.22—2023: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
909.13.1

B20.1—2024: Safety Standard for Conveyors and Related Equipment
Table 3001.3, 3004.3

BPE—2009: Bio-processing Equipment Standard

B31.3—*2014: [SLC]* Process Piping
415.11.6

B31.3—2022: Process Piping
415.11.7

ASSP American Society of Safety Professionals, 520 N. Northwest Highway, Park Ridge, IL 60068

ANSI/ASSP Z359.1—2020: The Fall Protection Code
1015.6, 1015.7

ASTM ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428

A6/A6M—21: Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling
1810.3.2.3, 1810.3.5.3.1, 1810.3.5.3.3

A36/A36M—19: Specification for Carbon Structural Steel
1810.3.2.3

A153/A153M—2016A: Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
2304.10.6

A227/A227M—17: Standard Specification for Steel Wire, Cold-Drawn for Mechanical Springs
1211.1.1

A229/A229M—17: Standard Specification for Steel Wire, Quenched and Tempered for Mechanical Springs
1211.1.1

A240/A240M—20a: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
Table 1507.4.3

A252/A252M—19: Specification for Welded and Seamless Steel Pipe Piles
1810.3.2.3

A283/A283M—2018: Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
1810.3.2.3

A416/A416M—18: Standard Specification for Low-Relaxation, Seven-Wire Steel Strand, for Prestressed Concrete
1810.3.2.2

A463/A463M—15(2020)e1: Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
Table 1507.4.3

A572/A572M—21e1: Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
1810.3.2.3

A588/A588M—19: Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa)- Minimum Yield Point with Atmospheric Corrosion Resistance
1810.3.2.3

A615/A615M—20: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
1704.5, 1810.3.10.2

A615/A615M—*22*: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
1704.5, 1810.3.10.2

A641/A641M—19: Specification for Zinc-coated (Galvanized) Carbon Steel Wire
2304.10.6

A653/A653M—20: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
Table 1507.4.3, 2304.10.6.1

A690/A690M—13a(2018): Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments
1810.3.2.3

A706/A706M—2016: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
1704.5, Table 1705.3, 2107.3, 2108.3

A706/A706M—*22a*: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
1704A.4, Table 1705A.3, 2107A.3, 2108A.3

A722/A722M—2018: Specification for High-Strength Steel Bars for Prestressed Concrete
1810.3.10.2, *1811.4, 1811A.4, 1812.4.2, 1812A.4.2*

A755/A755M—18: Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
Table 1507.4.3

A792/A792M—21a: Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
Table 1507.4.3

A875/A875M—21: Standard Specification for Steel Sheet, Zinc-5%, Aluminum Alloy-Coated by the Hot-Dip Process
Table 1507.4.3

A924/A924M—20: Standard Specification for General Requirements for Steel Sheet, Metallic-coated by the Hot-Dip Process
Table 1507.4.3

A1064—22: : Standard Specification for Carbon-steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
1903.8, 1903A.8

B42—20: Specification for Seamless Copper Pipe, Standard Sizes
909.13.1

B43—20: Specification for Seamless Red Brass Pipe, Standard Sizes
909.13.1

B68/B68M—19: Standard Specification for Seamless Copper Tube, Bright Annealed
909.13.1

B88—20: Specification for Seamless Copper Water Tube
909.13.1

B101—12(2019): Specification for Lead-Coated Copper Sheet and Strip for Building Construction
1403.5.3, Table 1507.2.8.2, Table 1507.4.3

B209—21: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
Table 1507.4.3

B251/B251M—2017: Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
909.13.1

B280—20: Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
909.13.1

B370—12(2019): Specification for Copper Sheet and Strip for Building Construction
1403.5.2, Table 1507.2.8.2, Table 1507.4.3

B695—2021: Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
2304.10.2.1, 2304.10.6.1, 2304.10.6.3

C5—2018: Specification for Quicklime for Structural Purposes
2109.2.4.8.7, Table 2507.2

C22/C22M—00(2021): Specification for Gypsum
Table 2506.2

C27—1998(2018): Specification for Standard Classification of Fireclay and High-Alumina Refractory Brick
2111.6

C28/C28M—10(2020): Specification for Gypsum Plasters
Table 2507.2

C31/C31M—21a: Practice for Making and Curing Concrete Test Specimens in the Field
Table 1705.3

C33/C33M—2018: Specification for Concrete Aggregates
722.3.1.4, 722.4.1.1.3

C35/C35M—01(2019): Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster
Table 2507.2

C55—2017: Specification for Concrete Building Brick
Table 722.3.2

C59/C59M—00(2020): Specification for Gypsum Casting Plaster and Molding Plaster
Table 2507.2

C61/C61M—00(2020): Specification for Gypsum Keene's Cement
Table 2507.2

C62—2017: Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
1807.1.6.3

C67/C67M—21: Test Methods of Sampling and Testing Brick and Structural Clay Tile
722.4.1.1.1, 2109.2.1.1

C73—2017: Specification for Calcium Silicate Brick (Sand-Lime Brick)
Table 722.3.2

C90—2021: Specification for Loadbearing Concrete Masonry Units
Table 722.3.2, 1807.1.6.3, 2114.3

C91/C91M—2018: Specification for Masonry Cement
Table 2507.2

C94/C94M—21b: Specification for Ready-Mixed Concrete
110.3.1, *1705A.3.3.1*

C140/C140M—22a: Test Method Sampling and Testing Concrete Masonry Units and Related Units
722.3.1.2

C141/C141M —14: Standard Specification for Hydrated Hydraulic Lime for Structural Purposes
2109.2.4.8.7

C150/C150M—21: Specification for Portland Cement
1909.2.2, 1910A.1, 1910.2.1, Table 2507.2

C172/C172M—2017: Practice for Sampling Freshly Mixed Concrete
Table 1705.3

C199—1984(2016): Test Method for Pier Test for Refractory Mortars
2111.6, 2111.9, 2113.12

C206—14: Specification for Finishing Hydrated Lime
2109.2.4.8.7, Table 2507.2

C208—2022: Specification for Cellulosic Fiber Insulating Board
Table 1508.2, 2303.1.6

C216—21: Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
Table 721.1(2), 1807.1.6.3

C270—19ae1: Specification for Mortar for Unit Masonry
Table 721.1(2), *2105.3, 2105A.3, 2115.4.1*

C315—2007(2021): Specification for Clay Flue Liners and Chimney Pots
2111.9, 2113.11.1, Table 2113.16(1)

C317/C317M—2000(2019): Specification for Gypsum Concrete
2514.1

C330/C330M—2017A: Specification for Lightweight Aggregates for Structural Concrete
202

C331/C331M—2017: Specification for Lightweight Aggregates for Concrete Masonry Units
722.3.1.4, 722.4.1.1.3

C406/C406M—15: Specification for Roofing Slate
1507.7.5

C472—20: Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete
Table 2506.2

C473—2019: Standard Test Methods for Physical Testing of Gypsum Panel Products
Table 2506.2

C474—15(2020): Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction
Table 2506.2

F1951—99: Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment:

11B-1008.2.6.1

F2006—21: Standard Safety Specification for Window Fall Prevention Devices for Non-emergency Escape (Egress) and Rescue (Ingress) Windows

1015.8

F2090—21: Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms

1015.8.1, 1015.8

F2200—2017: Standard Specification for Automated Vehicular Gate Construction

3110.2

F2374—2021: Standard Practice for Design, Manufacture, Operation, and Maintenance of Inflatable Amusement Devices

3102

AWC American Wood Council, 222 Catoctin Circle SE, Suite 201, Leesburg, VA 20175

ANSI/AWC NDS—2024: National Design Specification (NDS) for Wood Construction—with 2024 NDS Supplement <

202, 722.1, Table 1404.5.3.2, Table 1604.3, 1809.12, 1810.3.2.4, Table 1810.3.2.6, 1905.7.2, Table 2304.6.1, Table 2304.10.2, 2304.13, 2305.1.2, 2306.1, Table 2306.2(1), Table 2306.2(2), Table 2306.3(1), Table 2306.3(2), 2307.1

ANSI/AWC PWF—2021: Permanent Wood Foundation Design Specification

1805.2, 1807.1.4, 2304.10.6.2

ANSI/AWC SDPWS—2021: Special Design Provisions for Wind and Seismic

202, 1604.4, 2305.1, 2305.1.2, 2305.2, 2305.3, 2306.1, 2306.2, 2306.3, Table 2306.3(1), Table 2306.3(3), 2307.1

ANSI/AWC WFCM—2024: Wood Frame Construction Manual for One- and Two-Family Dwellings

1609.1.1, 1609.1.1.1, 2302.1, 2308.2.4, 2308.10.7.2, 2309.1

AWC STJR—2024: Span Tables for Joists and Rafters

2306.1.1, 2308.8.2.1, 2308.11.1, 2308.11.2

AWC WCD No. 4—2003: Wood Construction Data—Plank and Beam Framing for Residential Buildings

2306.1.2

AWCI Association of the Wall and Ceiling Industry, 513 West Broad Street, Suite 210, Falls Church, VA 22046

12-B—14: Technical Manual 12B, Third Edition; Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-resistive Materials; an Annotated Guide

1705.16

AWPA American Wood Protection Association, P.O. Box 361784, Birmingham, AL 35236-1784

C1—03: All Timber Products—Preservative Treatment by Pressure Processes

1505.6

M4—21: Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-treated Wood Products

1810.3.2.4.1, 2303.1.9

U1—23: USE CATEGORY SYSTEM: User Specification for Treated Wood Except Commodity Specification H

Table 1507.9.6, 1807.1.4, 1807.3.1, 1809.12, 1810.3.2.4.1, *1812.2, 1812A.2,* 2303.1.9, 2304.12.1, 2304.12.2, 2304.12.2.6, 2304.12.2.7, 2304.12.2.8, 2306.1.3

AWS American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672

B5.1—2013-AMD1: Specification for the Qualification of Welding Inspectors

1705.2.7, 1705A.2.7

D1.1/D1.1M—20: Structural Welding Code—Steel

1705.2.7, Table 1705A.2.1, 1705A.2.7, 2003.1, 2201.4.1, 2202.4.2, 2202.4.3, 2202.4.4, 2202.4.5, 2215.6.2, 2216.2, 2201A.4.1, 2202A.4.2, 2202A.4.3, 2202A.4.4, 2202A.4.5, 2216A.2

D1.2/D1.2M—14: Structural Welding Code—Aluminum

2003.1

D1.3/D1.3M—2018: Structural Welding Code—Sheet Steel

Table 1705A.2.1, 1705.2.7, 1705A.2.7

D1.4/D1.4M—2018-AMD1: Structural Welding Code—Steel Reinforcing Bars
1704.5, *1705.2.7,* Table 1705.3, 1705.3.1, 1704A.5*, 1705A.2.7,* Table 1705A.3, *1705A.3.1, 1903.5, 1903A.5,* 2107.3, 2107A.3

D1.6D/1.6M—2017: Structural Welding Code—Stainless Steel
Table 1705A.2.1, 1705A.2.7

D1.8/D1.8M—2021: Structural Welding Code—Seismic Supplement
Table 1705A.2.1, 1705.2.5, 1705A.2.7

QC1—2016: Specification for AWS Certification of Welding Inspectors
1705.2.7, 1705A.2.7

BHMA
Builders Hardware Manufacturers' Association 355 Lexington Avenue, 15th Floor New York, NY 10017

A156.10—2022: Power Operated Pedestrian Doors
1010.3.2, *11B-404.2.9, 11B-404.3*

A156.19—2019: Power Assist and Low Energy Power Operated Doors
1010.3.2, *11B-404.2.9, 11B-404.3, 11B-408.3.2.1, 11B-409.3.1*

A156.27—2019: Power and Manual Operated Revolving Pedestrian Doors
1010.3.1.1

A156.38—2019: Low Energy Power Operated Sliding and Folding Doors
1010.3.2

CEN
European Committee for Standardization (CEN), Rue de la Science 23, Brussels, Belgium 1000

BS EN 15250—2007: Slow Heat Release Appliances Fired by Solid Fuel—Requirements and Test Methods
2112.2, 2112.5

EN 1081—98: Resilient Floor Coverings—Determination of the Electrical Resistance
406.7.1

CPA
Composite Panel Association, 19465 Deerfield Avenue, Suite 306, Leesburg, VA 20176

ANSI A135.4—2012(R2020): Basic Hardboard
1403.3.1, 2303.1.7

ANSI A135.5—2012(R2020): Prefinished Hardboard Paneling
2303.1.7, 2304.7

ANSI A135.6—2012(R2020): Engineered Wood Siding
1403.3.2, 2303.1.7

ANSI A208.1—2016: Particleboard
2303.1.8, 2303.1.8.1

CPSC
Consumer Product Safety Commission, 4330 East/West Highway, Bethesda, MD 20814

16 CFR Part 1201 (2002): Safety Standard for Architectural Glazing Material
2406.2, Table 2406.2(1), 2406.3.1, 2407.1, 2407.1.4, 2408.2.1, 2408.3, 2409.2, 2409.4.1

16 CFR Part 1209 (2002): Interim Safety Standard for Cellulose Insulation
720.6

16 CFR Part 1404 (2002): Cellulose Insulation
720.6

16 CFR Part 1500 (2009): Hazardous Substances and Articles; Administration and Enforcement Regulations
202

16 CFR Part 1500.44 (2009): Method for Determining Extremely Flammable and Flammable Solids
202

16 CFR Part 1507 (2002): Fireworks Devices
202

16 CFR Part 1630 (2007): Standard for the Surface Flammability of Carpets and Rugs
804.4.1

CSA Canadian Standards Association, 8501 East Pleasant Valley Road, Cleveland, OH 44131

AAMA/WDMA/CSA 101/I.S.2/A440—22: North American Fenestration Standard/Specifications for Windows, Doors, and Skylights
1709.5.1, 2405.5

ASME A17.1—2022/CSA B44-—22 *the edition as referenced in*: Safety Code for Elevators and Escalators, *California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 6, Elevator Safety Orders*
907.3.3, 911.1.6, 1009.4.1, 1607.12.1, 3001.2, Table 3001.3, 3001.5, 3002.5, 3003.2, 3007.1, 3008.1.4, 3008.7.1

ASME A17.7—2007/CSA B44.7—07(R2021): Performance-based Safety Code for Elevators and Escalators
Table 3001.3, 3001.5, 3002.5

CSSB Cedar Shake & Shingle Bureau, P. O. Box 1178, Sumas, WA 98295-1178

CSSB—97: Grading and Packing Rules for Western Red Cedar Shakes and Western Red Cedar Shingles of the Cedar Shake and Shingle Bureau
Table 1507.8.5, Table 1507.9.6

DASMA Door & Access Systems Manufacturers Association International, 1300 Sumner Avenue, Cleveland, OH 44115

ANSI/DASMA 103—2017: Standard for Counterbalance Systems on Residential Sectional Garage Doors
1210.4

ANSI/DASMA 107—2020: Room Fire Test Standard for Garage Doors Using Foam Plastic Insulation
2603.4.1.9

ANSI/DASMA 108—2017: Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference
1709.5.2.1

ANSI/DASMA 115—2017: Standard Method for Testing Sectional Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure
1609.2.2

DHA Decorative Hardwoods Association, 42777 Trade West Dr, Sterling, VA 20166

ANSI/HPVA HP-1—2022: American National Standard for Hardwood and Decorative Plywood
2303.3, 2304.7

DOC U.S. Department of Commerce, National Institute of Standards and Technology 100 Bureau Drive, Gaithersburg, MD 20899

PS 1—22: Structural Plywood
2303.1.5, 2304.7, Table 2304.8(4), Table 2304.8(5), Table 2306.2(1), Table 2306.2(2)

PS 2—18: Performance Standard for Wood Structural Panels
2303.1.5, 2304.7, Table 2304.8(5), Table 2306.2(1), Table 2306.2(2)

PS 20—20: American Softwood Lumber Standard
202, 1810.3.2.4, 2303.1.1

DOL U.S. Department of Labor, Occupational Safety and Health Administration c/o Superintendent of Documents U.S. Government Printing Office, Washington, DC 20210

29 CFR Part 1910.1000 (2015): Air Contaminants
202

DOTn U.S. Department of Transportation, Office of Hazardous Material Safety 1200 New Jersey Avenue, SE East Building, 2nd Floor Washington, DC 20590

49 CFR 173.192—2011: Packaging for Certain Toxic Gases in Hazard Zone A
Table 415.6.5

49 CFR Parts 100–185—2015: Hazardous Materials Regulations
202

49 CFR Parts 173–178—2015: Specification of Transportation of Explosive and Other Dangerous Articles, UN 0335, UN 0336 Shipping Containers
202

49 CFR Parts 173.137—2009: Shippers—General Requirements for Shipments and Packaging—Class 8—Assignment of Packing Group
202

EN European Committee for Standardization, Rue de la Science 23 B, Brussels, Belgium 1040, Belgium

EN 459-1—15: Building Lime. Definitions, Specifications and Conformity Criteria
2109.2.4.8.7

FEMA Federal Emergency Management Agency, 500 C Street S.W., Washington, DC 20472

FEMA-TB-11—23: Crawlspace Construction for Buildings Located in Special Flood Hazard Areas
1805.1.2.1

FM FM Approvals, Headquarters Office 1151 Boston-Providence Turnpike P.O. Box 9102, Norwood, MA 02062

FM 1950—2022: American National Standard for Seismic Sway Braces for Pipe, Tubing and Conduit
1705.14.2, 1705A.14.2

3260—00: Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling

3011—99: Approval Standard for Central Station Service for Fire Alarm and Protective Equipment Supervision
907.6.6.4

4430—2012: Approval Standard for Heat and Smoke Vents
910.3.1

4450—(1989): Approval Standard for Class 1 Insulated Steel Deck Roofs—with Supplements through July 1992
1510.2

4470—2016: Approval Standard for Single-ply Polymer-modified Bitumen Sheet, Built-up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction
1504.7

4474—2020: American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures
1504.4.1, 1504.4.2, 1504.4.3

ANSI/FM 4880—2017: American National Standard for Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials
2603.4, 2603.9

GA Gypsum Association, 962 Wayne Avenue, Suite 620, Silver Spring, MD 20910

GA-216—2021: Application and Finishing of Gypsum Panel Products
Table 2508.1, 2509.2

GA-253—2021: Application of Gypsum Sheathing
Table 2508.1, 2508.2

GA-600—2021: Fire-resistance and Sound Control Design Manual, 23rd Edition
Table 721.1(1), Table 721.1(2), Table 721.1(3)

ICC International Code Council, Inc., 200 Massachusetts Avenue, NW, Suite 250, Washington, DC 20001

ICC 300—2017: ICC Standard on Bleachers, Folding and Telescopic Seating, and Grandstands
1030.1.1, 1030.7, 1607.18

ICC 300—23: [DSA-SS, DSA-SS/CC, OSHPD 1, 1R, 2, 4 and 5] Standards Specification on Bleachers, Folding and Telescopic Seating, and Grandstands
1030.1.1, 1030.7, 1607.18, 1605A.3, 1605A.3.1, 1607A.18

ICC 400—2022: Standard on Design and Construction of Log Structures
2302.1

ICC 600—2020: Standard for Residential Construction in High-Wind Regions
1609.1.1, 1609.1.1.1, 2308.2.4

ICC 900/SRCC 300—2020: Solar Thermal System Standard
3111.2.1

ICC 901/SRCC 100—2020: Solar Thermal Collector Standard
3111.2.1

ICC-ES AC 01—24*: Acceptance Criteria for Mechanical Anchors in Cracked and Uncracked Masonry Elements
1617A.1.19

ICC-ES AC 58—24*: Acceptance Criteria for Adhesive Anchors in Masonry Elements
1617A.1.19

ICC-ES AC 70—24*: Acceptance Criteria for Fasteners Power-Driven into Concrete, Steel and Masonry Elements
1617A.1.20

ICC-ES AC 77: Acceptance Criteria for Smoke Containment Systems Used with Fire-resistance-rated Elevator Hoistway Doors and Frames
3006.3

ICC-ES AC 125—24*: Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber-Reinforced Polymer (FRP) Composite Systems
1911A.3, 1911.3

ICC-ES AC 156—24*: Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components
1705A.14.3

ICC-ES AC 178—24*: Acceptance Criteria for Inspection and Verification of Concrete, and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) Composite Systems
1911A.3, 1911.3

ICC-ES AC 193—24*: Acceptance Criteria for Mechanical Anchors in Concrete Elements
1617A.1.19, 1901.3.2

ICC-ES AC 232—24*: Acceptance Criteria for Anchor Channels in Concrete Elements
1617A.1.19, 1901.3.2

ICC-ES AC 308—24*: Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements
1617A.1.19, 1901.3.3

ICC-ES AC 331: Acceptance Criteria for Smoke and Heat Vents
910.3.1

ICC-ES AC 358—24*: Acceptance Criteria for Helical Foundation Systems and Devices
1810A.3.1.5.1, 1810.3.1.5.1

ICC-ES AC 446—24*: Acceptance Criteria for Headed Cast-in Specialty Inserts in Concrete
1617A.1.19, 1901.3.2

ICC 1100—2019: Standard for Spray-applied Foam Plastic Insulation
2603.1.1

ICC/MBI 1200—2021: [OSHPD 1, 1R, 2, 4, and 5] Standard for Off-Site Construction: Planning, Design, Fabrication and Assembly
1710, 1710A

ICC/MBI 1205—2021: [OSHPD 1, 1R, 2, 4, and 5] Standard for Off-Site Construction: Inspection and Regulatory Compliance
1710, 1710A

ICC/NSSA 500—2023: ICC/NSSA Standard for the Design and Construction of Storm Shelters
202, 423.1, 423.2, 423.3.1, 423.3.2, 423.4, 423.5, 1031.2, 1604.5.1, 1604.10

SSTD 11—97: 1997 SBCCI Test Standard for Determining Wind Resistance of Concrete or Clay Roof Tiles
1504.3.1.1, 1504.3.1.2, 1504.3.1.3

** Refers to International Building Code, 2024 as a referenced standard.*

ISO International Organization for Standardization, Chemin de Blandonnet 8 CP 401 1214 Vernier, Geneva, Switzerland

ISO 668—2013: Series 1 Freight Containers—Classifications, Dimensions and Ratings
Table 3114.8.5.3

ISO 1496-1—2013: Series 1 Freight Containers—Specification and Testing - Part 1: General Cargo Containers for General Purposes
3114.8, Table 3114.8.5.3

ISO 6346—1995: Freight Containers—Coding, Identification and Marking with Amendment 3—2012
3114.3

ISO 8115—86: Cotton Bales—Dimensions and Density
Table 307.1(1), Table 415.11.1.1

ISO 8336—09: Fiber-cement Flat Sheets—Product Specification and Test Methods
1403.9, 1404.17.1, 1404.17.2, Table 2509.2

ISO 9001—15: Quality Management Systems - Requirements
1705A.14.3

MHI Material Handling Institute, 8720 Red Oak Blvd. Suite 201, Charlotte, NC 28217

ANSI MH16.1—2021: Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks
Table 1705.13.7, 2209.1

ANSI MH28.2—2022: Design, Testing and Utilization of Industrial Boltless Steel Shelving
2211.1

ANSI MH28.3—2022: Design, Testing and Utilization of Industrial Steel Work Platforms
2212.1

ANSI MH29.1—2020: Safety Requirements—Industrial Scissor Lift
Table 3001.3

ANSI MH32.1—2018: Stairs, Ladders, and Open-Edge Guards for Use with Material Handling Structures
2213.1

NAAMM National Association of Architectural Metal Manufacturers, 800 Roosevelt Road, Bldg. C, Suite 312, Glen Ellyn, IL 60137

FP 1001—18: Guide Specifications for Design of Metal Flag Poles
1609.1.1

NCMA National Concrete Masonry Association, 13750 Sunrise Valley, Herndon, VA 20171

TEK 5—8B(2005): Detailing Concrete Masonry Fire Walls
Table 721.1(2)

NFPA National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471

04—24: Standard for Integrated Fire Protection and Life Safety System Testing
901.6.2.1, 901.6.2.2

10—22: Standard for Portable Fire Extinguishers
906.2, Table 906.3(1), Table 906.3(2), 906.3.2, 906.3.4

11—*24*: Standard for Low-, Medium-, and High-Expansion Foam
904.7, 904.14, *3109F*

12—22: Standard on Carbon Dioxide Extinguishing Systems
904.8, 904.14

12A—22: Standard on Halon 1301 Fire Extinguishing Systems
904.9

13—*25*: Standard for the Installation of Sprinkler Systems *as amended
403.3.3, 712.1.3.1, 903.3.1.1, 903.3.2, 903.3.8.2, 903.3.8.5, 904.14, 905.3.4, 907.6.4, 1019.3

**NFPA 13, Amended Sections as follows:*

Revise Section 2.2 and add publications as follows:
2.2 NFPA Publications.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2013 California edition.*

Revise Section 6.4.3.1.1* as follows:

6.4.3.1.1* *Pipe joints shall not be located under foundation footings. The pipe under the building or building foundation shall not contain mechanical joints.*

Exceptions:

2. Where allowed in accordance with Section 6.4.3.1.
3. Alternate designs may be utilized where designed by a registered professional engineer and approved by the enforcing agency.

Revise Section 9.2.1.16 as follows:

9.2.1.16 *Exterior columns under 10 ft^2 (0.93m^2) in total area, formed by studs or wood joist, with no sources of ignition within the column, supporting exterior canopies that are fully protected with a sprinkler system, shall not require sprinkler protection.*

Revise Section 9.2.3.1* as follows:

9.2.3.1* *Sprinklers shall be permitted to be omitted where the exterior canopies, roofs, portecocheres, balconies, decks or similar projections are constructed with materials that are noncombustible, limited-combustible or fire retardant treated wood as defined in NFPA 703, Standard for Fire Retardant–Treated Wood and Fire-Retardant Coatings for Building Materials.*

655—19: Standard for the Prevention of Sulfur Fires and Explosions
426.1

664—20: Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
426.1

701—23: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
410.2.6, 424.2, 806.4, 3102.3, 3102.3.1, 3102.6.1.1, 3105.3

704—22: Standard System for the Identification of the Hazards of Materials for Emergency Response
202, 415.5.2

750—23: Standard on Water Mist Fire Protection Systems
202, 904.11.1.1, 904.14

770—21: Standard on Hybrid (Water and Inert Gas) Fire-Extinguishing Systems
904.13

780—*23*: Standard for the Installation of Lightning Protection Systems
2703.2, 2703.2.1, 2703.3

1124—22: Code for the Manufacture, Transportation, and Storage *and Retail Sales* of Fireworks and Pyrotechnic Articles
415.6.4.1

2001—22: Standard on Clean Agent Fire Extinguishing Systems*, as amended**
904.10

NFPA 2001, Amended Sections as follows:

Add Sections 4.3.5.1.1 and 4.3.5.2.1 to read as follows:

4.3.5.1.1 *Alarms signals from the fire extinguishing system shall not interfere with the building fire alarm signal.*

4.3.5.2.1 *The lens on visual appliances shall be "red" in color.*

Exception: Other lens colors are permitted where approved by the enforcing agency.

2010—20: Standard for Fixed Aerosol Fire-Extinguishing Systems
904.13

PCI Precast Prestressed Concrete Institute, 8770 West Bryn Mawr, Suite 1150, Chicago, IL 60631-3517

MNL-120—17: PCI Design Handbook, 8th Edition
1909A.1.1, 1909A.1.2

PCI 124—18: Specification for Fire Resistance of Precast/Prestressed Concrete
722.1, 722.2.3.1

PCI 128—19: Specification for Glass-Fiber-Reinforced Concrete Panels
1903.2

PTI Post-Tensioning Institute, 38800 Country Club Drive, Farmington Hills, MI 48331

PTI DC10.5—19: Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive and Stable Soils
1808.6.2

PTI DC35.1—14: Recommendations for Prestressed Rock and Soil Anchors
1810A.3.10.4, 1811A.2, 1812A.4, 1812A.5, 1810.3.10.4.1, 1811.2, 1812.4, 1812.5,1813.2

RMI Rack Manufacturers Institute, 8720 Red Oak Boulevard, Suite 201, Charlotte, NC 28217

ANSI MH16.1—2021: Design, Testing and Utilization of Industrial Storage Racks

ANSI MH16.3—2021: Specification for the Design, Testing and Utilization of Industrial Steel Cantilevered Storage Racks
2209.2

SBCA Structural Building Components Association, 6300 Enterprise Lane, Madison, WI 53719

ANSI/SBCA FS 100—2012(R2018): Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies
2603.10

SDI Steel Deck Institute, 2661 Clearview Road #3, Allison Park, PA 15101

ANSI/SDI QA/QC—2022: Standard for Quality Control and Quality Assurance for Installation of Steel Deck
1705.2.3

ANSI/SDI SD—2022: Standard for Steel Deck
2208.1

SFM State of California, Department of Forestry and Fire Protection, Office of the State Fire Marshal, P.O. Box 944246, Sacramento, CA 94246-2460

12-3: Releasing Systems for Security Bars in Dwellings
1031.2.1

12-7-3: Fire-testing Furnaces
NA

12-7A-1: Exterior Wall Siding and Sheathing
703A.7, 707A.2

12-7A-2: Exterior Window
703A.7, 708A.2.1

12-7A-3: Under Eave
703A.7, 707A.8

12-7A-4: Decking:
703A.7, 709A.3

12-7A-4A: Decking Alternate Method A
703A.7, 709A.3

12-7A-5: Ignition Resistant Building Material
703A.7, 709A.3

12-8-100: Room Fire Tests for Wall and Ceiling Materials
408.14, 435.6.2

12-10-1: Power Operated Exit Doors
NA

12-10-2: Single Point Latching or Locking Devices
NA

12-10-3: Emergency Exit and Panic Hardware
NA

(The Office of the State Fire Marshal standards referred to above are found in the California Code of Regulations, Title 24, Part 12.):

SJI Steel Joist Institute, 140 Evans Street, Suite 203, Florence, SC 29501

SJI 100—2020: Standard Specification for K-Series, LH-Series, and DLH-Series Open Web Steel Joists and for Joist Girders
1604.3.3, 2207.1, 2207.2, 2207.3, 2207.4, 2207.5

SJI 200—2015: Standard Specification for CJ-Series Composite Steel Joists
1604.3.3, 2207.1, 2207.2, 2207.3, 2207.4, 2207.5

SPRI Single-Ply Roofing Industry, 465 Waverly Oaks Road, Suite 421, Waltham, MA 02452

ANSI/SPRI GT-1—2022: Test Standard for External Gutter Systems
1504.6.1, 1511.7.6.1

ANSI/SPRI RP-4—2019: Wind Design Standard for Ballasted Single-ply Roofing Systems
1504.5

ANSI/SPRI VF-1—2023: External Fire Design Standard for Vegetative Roofs
1505.10

ANSI/SPRI/FM 4435/ES-1—2017: Test Standard for Edge Systems Used with Low Slope Roofing Systems
1504.6, 1511.7.6.1

325—2017: Door, Drapery, Gate, Louver and Window Operators and Systems—with Revisions through February 2020
406.2.1, 3110.3

346—05: Waterflow Indicators for Fire Protective Signaling Systems

464—03: Audible Signal Appliances—with Revisions through October 10, 2003

497B—04: Protectors for Data Communication and Fire Alarm Circuits

521—99: Heat Detectors for Fire Protective Signaling Systems—with Revisions through July 20, 2005

539—00: Single- and Multiple-Station Heat Detectors—with Revisions through August 15, 2005

555—2006: Fire Dampers—with Revisions through October 2020
717.3.1

555C—2014: Ceiling Dampers—with Revisions through January 2021
717.3.1

555S—2014: Smoke Dampers—with Revisions through October 2020
717.3.1

580—2006: Test for Uplift Resistance of Roof Assemblies—with Revisions through March 2019
1504.4.1, 1504.4.2

632—00: Electrically Actuated Transmitters

641—2010: Type L Low-temperature Venting Systems—with Revisions through April 2018
2113.11.1.4

710B—2011: Recirculating Systems—with Revisions through February 2019
904.14

723—2018: Standard for Test for Surface Burning Characteristics of Building Materials
202, 402.6.4.4, 406.7.2, 720.1, 720.4, 803.1.2, 803.5.2, 803.10, 803.11, 803.12, 803.13, 806.6, 1402.6, 1403.11.1, 1406.9, 1406.10.1, 1408.9, 1408.10.1, 1511.6.2, 1511.6.3, 2303.2, 2603.3, 2603.4.1.13, 2603.5.4, 2603.5.5, 2603.7, 2604.2.4, 2606.4, 2612.3, 2614.3, 3105.3

723S—2006: Drop-Out Ceilings Installed Beneath Automatic Sprinklers
2606.7.4

753—04: Alarm Accessories for Automatic Water Supply Valves for Fire Protection Service

790—*Edition 9—2022*: Standard Test Methods for Fire Tests of Roof Coverings—with Revisions through October 2018
1505.1, 2603.6, 2610.2, 2610.3

793—2008: Automatically Operated Roof Vents for Smoke and Heat—with Revisions through March 2017
910.3.1

813—96: Commercial Audio Equipment—with Revisions through December 7, 1999

857—13: Busways
1705A.14.3.1

864—2014: Control Units and Accessories for Fire Alarm Systems *as amended**—**with Revisions through May 2020**
909.12

****Amend No. 55.1 as follows:***

RETARD-RESET-RESTART PERIOD – MAXIMUM 30 SECONDS *—No alarm obtained from control unit. Maximum permissible time is 30 seconds.*

****Amend Section 55.2.2 as follows:***

Where an alarm verification feature is provided, the maximum retard-reset-restart period before an alarm signal can be confirmed and indicated at the control unit, including any control unit reset time and the power-up time for the detector to become operational for alarm, shall not exceed 30 seconds. (The balance of the section text is to remain unchanged).

****Add Section 55.2.9 as follows:***

Smoke detectors connected to an alarm verification feature shall not be used as releasing devices.

Exception: *Smoke detectors which operate their releasing function immediately upon alarm actuation independent of alarm verification feature.*

****Amend Section 89.1.10 as follows:***

The existing text of this section is to remain as printed with one editorial amendment as follows:

THE TOTAL DELAY (CONTROL UNIT PLUS SMOKE DETECTORS) SHALL NOT EXCEED 30 SECONDS.

(The balance of the section text is to remain unchanged).

924—2016: Emergency Lighting and Power Equipment—with Revisions through May 2020
1013.5

1034-2011: Burglary-Resistant Electric Locking Mechanisms—with Revisions through June 2020
1010.2.10, 1010.2.11, 1010.2.12.1, 1010.2.13, 1010.2.14

1040—1996: Fire Test of Insulated Wall Construction—with Revisions through April 2017
1406.10.2, 2603.9

1256—2002: Fire Test of Roof Deck Construction—with Revisions through August 2018
1508.1, 2603.3, 2603.4.1.5

1479—2015: Fire Tests of Penetration Firestops—with Revisions through May 2021
202, 714.4.1.2, 714.4.2, 714.5.1.2, 714.5.4

1482—2011: Solid-fuel Type Room Heaters—with Revisions through February 2020
2112.2, 2112.5

1489—2016: Fire Tests of Fire Resistant Pipe Protection Systems Carrying Combustible Liquids—with Revisions through October 2021
403.4.8.2

1703—2002: Flat-plate Photovoltaic Modules and Panels—with Revisions through November 2019
➡ 3111.3.1

1715—1997: Fire Test of Interior Finish Material—with Revisions through April 2017
1406.10.2, 2603.9, 2614.4

1741—2010: Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources—with Revisions through June 2021
3111.3.1

1777—2015: Chimney Liners—with Revisions through April 2019
2113.11.1, 2113.19

1784—2015: Air Leakage Tests of Door Assemblies—with Revisions through February 2020
405.4.3, 710.5.2.2, 710.5.2.2.1, 716.2.1.4, 716.2.9.1, 716.2.9.3, 3006.3, 3007.6.3, 3008.6.3

1897—2015: Uplift Tests for Roof Covering Systems—with Revisions through September 2020
1504.4.1, 1504.4.3

1975—2006: Fire Tests for Foamed Plastics Used for Decorative Purposes
402.6.2, 402.6.4.5, 424.2

1994—2015: Luminous Egress Path Marking Systems—with Revisions through July 2020
411.6, 1008.2.1, 1025.2.1, 1025.2.3, 1025.2.4, 1025.2.5, 1025.4

2034—2017: Single and Multiple Station Carbon Monoxide Alarms—with Revisions through September 2018
915.4.2, 915.4.4

2075—2013: Gas and Vapor Detectors and Sensors—with Revisions through August 2021
915.5.1, 915.5.3

2079—2015: Tests for Fire Resistance of Building Joint Systems—with Revisions through July 2020
202, 715.3.1, 715.9

2196—2017: Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables—with Revisions through December 2020
909.20.7.1, 913.2.2, 2702.3, 3007.8.1, 3008.8.2

2200—2020: Stationary Engine Generator Assemblies
2702.1.1

2202—2009: Electric Vehicle (EV) Charging System Equipment—with Revisions through February 2018
406.2.7

2525—2020: Standard for Two-Way Emergency Communications Systems for Rescue Assistance
1009.8.1

2594—2016: Electric Vehicle Supply Equipment
406.2.7

2703—2014: Mounting Systems, Mounting Devices, Clamping/Retention Devices and Ground Lugs for Use with Flat-plate Photovoltaic Modules and Panels—with Revisions through March 2021
1505.9

7103—2019: Outline of Investigation for Building-Integrated Photovoltaic Roof Coverings
Table 1504.2, 1507.16.6, 1507.17.5

8802—2020: Outline of Investigation for Germicidal Systems
1211.1

D102.2.6 Exterior walls. Exterior load-bearing walls of Type II buildings shall have a fire-resistance rating of 2 hours or more where such walls are located within 30 feet (9144 mm) of a common property line or an assumed property line. Exterior nonload-bearing walls of Type II buildings located within 30 feet (9144 mm) of a common property line or an assumed property line shall have fire-resistance ratings as required by Table 601, but not less than 1 hour. Exterior walls located more than 30 feet (9144 mm) from a common property line or an assumed property line shall comply with Table 601.

Exception: In the case of one-story buildings that are 2,000 square feet (186 m^2) or less in area, exterior walls located more than 15 feet (4572 mm) from a common property line or an assumed property line need only comply with Table 601.

D102.2.7 Architectural trim. Architectural trim on buildings located in the fire district shall be constructed of approved noncombustible materials or fire-retardant-treated wood.

D102.2.8 Permanent canopies. Permanent canopies are permitted to extend over adjacent open spaces provided that all of the following are met:

1. The canopy and its supports shall be of noncombustible material, fire-retardant-treated wood, Type IV construction or of 1-hour fire-resistance-rated construction.

   Exception: Any textile covering for the canopy shall be flame resistant as determined by tests conducted in accordance with NFPA 701 after both accelerated water leaching and accelerated weathering.
2. Any canopy covering, other than textiles, shall have a flame spread index not greater than 25 when tested in accordance with ASTM E84 or UL 723 in the form intended for use.
3. The canopy shall have one long side open.
4. The maximum horizontal width of the canopy shall be not greater than 15 feet (4572 mm).
5. The fire resistance of exterior walls shall not be reduced.

D102.2.9 Roof structures. Structures, except aerial supports 12 feet (3658 mm) high or less, flagpoles, water tanks and cooling towers, placed above the roof of any building within the fire district shall be of noncombustible material and shall be supported by construction of noncombustible material.

D102.2.10 Plastic signs. The use of plastics complying with Section 2611 for signs is permitted provided that the structure of the sign in which the plastic is mounted or installed is noncombustible.

D102.2.11 Plastic veneer. Exterior plastic veneer is not permitted in the fire district.

SECTION D103—CHANGES TO BUILDINGS

D103.1 Existing buildings within the fire district. An existing building shall not be increased in height or area unless it is of a type of construction permitted for new buildings within the fire district or is altered to comply with the requirements for such type of construction. Nor shall any existing building be extended on any side, nor square footage or floors added within the existing building unless such modifications are of a type of construction permitted for new buildings within the fire district.

D103.2 Other alterations. Nothing in Section D103.1 shall prohibit other alterations within the fire district provided that such alterations do not create a change of occupancy that is otherwise prohibited or increase the fire hazard.

D103.3 Moving buildings. Buildings shall not hereafter be moved into the fire district or to another lot in the fire district unless the building is of a type of construction permitted in the fire district.

SECTION D104—BUILDINGS LOCATED PARTIALLY IN THE FIRE DISTRICT

D104.1 General. Any building located partially in the fire district shall be of a type of construction required for the fire district, unless the major portion of such building lies outside of the fire district and all portions of it extend not more than 10 feet (3048 mm) inside the boundaries of the fire district.

SECTION D105—EXCEPTIONS TO RESTRICTIONS IN FIRE DISTRICT

D105.1 General. The preceding provisions of this appendix shall not apply in the following instances:

1. Temporary buildings used in connection with duly authorized construction.
2. A private garage used exclusively as such, not more than one story in height, nor more than 650 square feet (60 m^2) in area, located on the same lot with a dwelling.
3. Fences not over 8 feet (2438 mm) high.
4. Coal tipples, material bins and trestles of Type IV construction.
5. Water tanks and cooling towers conforming to Sections 1510.3 and 1510.4.
6. Greenhouses less than 15 feet (4572 mm) high.
7. Porches on dwellings not over one story in height, and not over 10 feet (3048 mm) wide from the face of the building, provided that such porch does not come within 5 feet (1524 mm) of any property line.
8. Sheds open on a long side not over 15 feet (4572 mm) high and 500 square feet (46 m^2) in area.
9. One- and two-family dwellings where of a type of construction not permitted in the fire district can be extended 25 percent of the floor area existing at the time of inclusion in the fire district by any type of construction permitted by this code.

10. Wood decks less than 600 square feet (56 m^2) where constructed of 2-inch (51 mm) nominal wood, pressure treated for exterior use.
11. Wood veneers on exterior walls conforming to Section 1404.6.
12. Exterior plastic veneer complying with Section 2605.2 where installed on exterior walls required to have a fire-resistance rating not less than 1 hour, provided that the exterior plastic veneer does not exhibit sustained flaming as defined in NFPA 268.

SECTION D106—REFERENCED STANDARDS

D106.1 General. See Table D106.1 for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix that reference the standard.

TABLE D106.1—REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ASTM E84—21A	*Standard Test Method for Surface Burning Characteristics of Building Materials*	D102.2.8
NFPA 268—22	*Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source*	D105.1
NFPA 701—23	*Standard Methods of Fire Tests for Flame-Propagation of Textiles and Films*	D102.2.8
UL 723—2018	*Standard for Test for Surface Burning Characteristics of Building Materials*	D102.2.8

H112.4 Height limitation. A projecting sign shall not be erected on the wall of any building so as to project above the roof or cornice wall or, on buildings without a cornice wall, above the roof level except that a sign erected at a right angle to the building, the horizontal width of which sign is perpendicular to such a wall and does not exceed 18 inches (457 mm), is permitted to be erected to a height not exceeding 2 feet (610 mm) above the roof or cornice wall or above the roof level where there is no cornice wall. A sign attached to a corner of a building and parallel to the vertical line of such corner shall be deemed to be erected at a right angle to the building wall.

H112.5 Additional loads. Projecting sign structures that will be used to support an individual on a ladder or other servicing device, whether or not specifically designed for the servicing device, shall be capable of supporting the anticipated additional load, but not less than a 100-pound (445 N) concentrated horizontal load and a 300-pound (1334 N) concentrated vertical load applied at the point of assumed or most eccentric loading. The building component to which the projecting sign is attached shall be designed to support the additional loads.

SECTION H113—MARQUEE SIGNS

H113.1 Materials. Marquee signs shall be constructed entirely of metal or other approved noncombustible material except as provided for in Sections H106.1.1 and H107.1.

H113.2 Attachment. Marquee signs shall be attached to approved marquees that are constructed in accordance with Section 3106.

H113.3 Dimensions. Marquee signs, whether on the front or side, shall not project beyond the perimeter of the marquee.

H113.4 Height limitation. Marquee signs shall not extend more than 6 feet (1829 mm) above, or 1 foot (305 mm) below such marquee. Signs shall not have a vertical dimension greater than 8 feet (2438 mm).

SECTION H114—PORTABLE SIGNS

H114.1 General. Portable signs shall conform to requirements for ground, roof, projecting, flat and temporary signs where such signs are used in a similar capacity. The requirements of this section shall not be construed to require portable signs to have connections to surfaces, tie-downs or foundations where provisions are made by temporary means or configuration of the structure to provide stability for the expected duration of the installation.

SECTION H115—THICKNESS OF SIGNS

H115.1 General. Tables H115.1(1) and H115.1(2) provide requirements for the size, thicknesses and types of glass panels and projection signs, respectively.

TABLE H115.1(1)—SIZE, THICKNESS AND TYPE OF GLASS PANELS IN SIGNS

MAXIMUM SIZE OF EXPOSED PANEL		MINIMUM THICKNESS OF GLASS (inches)	TYPE OF GLASS
Any dimension (inches)	Area (square inches)		
30	500	$^1/_8$	Plain, plate or wired
45	700	$^3/_{16}$	Plain, plate or wired
144	3,600	$^1/_4$	Plain, plate or wired
> 144	> 3,600	$^1/_4$	Wired glass

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm^2.

TABLE H115.1(2)—THICKNESS OF PROJECTION SIGN

PROJECTION (feet)	MAXIMUM THICKNESS (feet)
5	2
4	2.5
3	3
2	3.5
1	4

For SI: 1 foot = 304.8 mm.

SECTION H116—REFERENCED STANDARDS

H116.1 General. See Table H116.1 for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix that reference the standard.

TABLE H116.1—REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ASTM D635—18	*Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position*	H107.1.1
CEC—*25*	*California Electrical Code*	H106.1, H106.2
NFPA 701—23	*Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*	H106.1.1

J108.2 Top of slope. The setback at the top of a cut slope shall be not less than that shown in Figure J108.1, or than is required to accommodate any required interceptor drains, whichever is greater.

J108.3 Slope protection. Where required to protect adjacent properties at the toe of a slope from adverse effects of the grading, additional protection, approved by the building official, shall be included. Examples of such protection include but are not be limited to:

1. Setbacks greater than those required by Figure J108.1.
2. Provisions for retaining walls or similar construction.
3. Erosion protection of the fill slopes.
4. Provision for the control of surface waters.

SECTION J109—DRAINAGE AND TERRACING

J109.1 General. Unless otherwise recommended by a registered design professional, drainage facilities and terracing shall be provided in accordance with the requirements of this section.

Exception: Drainage facilities and terracing need not be provided where the ground slope is not steeper than one unit vertical in three units horizontal (33-percent slope).

J109.2 Terraces. Terraces not less than 6 feet (1829 mm) in width shall be established at not more than 30-foot (9144 mm) vertical intervals on all cut or fill slopes to control surface drainage and debris. Suitable access shall be provided to allow for cleaning and maintenance.

Where more than two terraces are required, one terrace, located at approximately mid-height, shall be not less than 12 feet (3658 mm) in width.

Swales or ditches shall be provided on terraces. They shall have a minimum gradient of one unit vertical in 20 units horizontal (5-percent slope) and shall be paved with concrete not less than 3 inches (76 mm) in thickness, or with other materials suitable to the application. They shall have a depth not less than 12 inches (305 mm) and a width not less than 5 feet (1524 mm).

A single run of swale or ditch shall not collect runoff from a tributary area exceeding 13,500 square feet (1256 m^2) (projected) without discharging into a down drain.

J109.3 Interceptor drains. Interceptor drains shall be installed along the top of cut slopes receiving drainage from a tributary width greater than 40 feet (12 192 mm), measured horizontally. They shall have a minimum depth of 1 foot (305 mm) and a minimum width of 3 feet (915 mm). The slope shall be approved by the building official, but shall be not less than one unit vertical in 50 units horizontal (2-percent slope). The drain shall be paved with concrete not less than 3 inches (76 mm) in thickness, or by other materials suitable to the application. Discharge from the drain shall be accomplished in a manner to prevent erosion and shall be approved by the building official.

J109.4 Drainage across property lines. Drainage across property lines shall not exceed that which existed prior to grading. Excess or concentrated drainage shall be contained on site or directed to an approved drainage facility. Erosion of the ground in the area of discharge shall be prevented by installation of nonerosive down drains or other devices.

SECTION J110—EROSION CONTROL

J110.1 General. The faces of cut and fill slopes shall be prepared and maintained to control erosion. This control shall be permitted to consist of effective planting.

Exception: Erosion control measures need not be provided on cut slopes not subject to erosion due to the erosion-resistant character of the materials.

Erosion control for the slopes shall be installed as soon as practicable and prior to calling for final inspection.

J110.2 Other devices. Where necessary, check dams, cribbing, riprap or other devices or methods shall be employed to control erosion and provide safety.

SECTION J111—REFERENCED STANDARDS

J111.1 General. See Table J111.1 for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix that reference the standard.

TABLE J111.1—REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ASTM D1557—12(2021)	*Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort* [56,000 ft-lbf/ft^3(2,700 kN-m/m^3)].	J107.5
ASCE/SEI 7—22	*Minimum Design Loads and Associated Criteria for Buildings and Other Structures*	J104.4

INDEX

HISTORY NOTE APPENDIX

2025 California Building Code
California Code of Regulations, Title 24, Part 2 Volume 2

HISTORY:

For prior code history, see the History Note Appendix to the *California Building Code,* 2022 Triennial Edition, effective January 1, 2023.

1. (BSC 05/24, DSA-SS 05/24, DSA-AC 01/24, HCD 05/24, HCD 1-AC 01/24, SFM 04/24, DCA 01/24, OSHPD 04/24 and OSHPD 05/24)—Adoption by reference of the 2024 *International Building Code* with necessary amendments to become the 2025 *California Building Code*, and repeal of the 2021 edition of the *International Building Code*. Approved by the California Building Standards Commission on February 26, 2025, filed with Secretary of State on March 7, 2025, and effective on January 1, 2026.
2. Erratum to address miscellaneous corrections in Matrix Adoption Tables and throughout Chapters 16, 16A, 17, 17A, 19, 19A, 21, 21A, 22, 22A, 23, 24, 30, 31, 33, 35, Appendices D, H and J, effective January 1, 2026.