2024 IBC – Prescriptive Structural Provisions

SHUMS CODA ASSOCIATES, INC.

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Instructor
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- Colorado Regional Manager, Education Director
- 45-years' experience in code administration
- ICBO Committees
  - Small Jurisdictions
  - Fire & Life Safety Code Development
  - Means of Egress Review
- ICC Means of Egress Code Development, Codes and Standards and Code Correlation Committees
- Author of Building Code Basics, based on 2009 & 2012 IBC, Building Code Essentials 2015, 2018 & 2021, Applying Codes to Cannabis Facilities

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What are we going to talk about today?

- Different Loads on Buildings
- Prescriptive design provisions
- Additional resources
- Foundation to the roof
  - Concrete Foundation
  - Conventional Wood Framing

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202 Definitions

- LOADS.
- Forces or other actions that result from the weight of building materials, occupants and their possessions, environmental effects, differential movement and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude, such as dead loads. All other loads are variable loads (see "Nominal loads").

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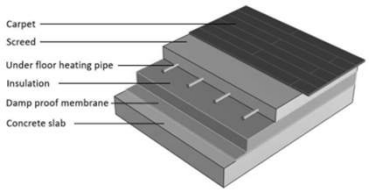
202 Definitions

- DEAD LOAD.
- The weight of materials of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding and other similarly incorporated architectural and structural items, and the weight of fixed service equipment, including cranes and material handling systems.



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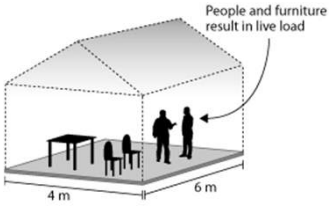
202 Definitions



- LIVE LOAD.
- A load produced by the use and occupancy of the building or other structure that does not include construction or environmental loads such as wind load, snow load, rain load, earthquake load, flood load or dead load.

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202 Definitions

- LIVE LOAD, ROOF.
- A load on a roof produced:
- 1. During maintenance by workers, equipment and materials; or
- 2. During the life of the structure by movable objects such as planters or other similar small decorative appurtenances that are not occupancy related.

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202 Definitions

- GROUND SNOW LOAD, pg.
- Design ground snow loads.
- GROUND SNOW LOAD, pg(asd).
- Allowable stress design ground snow loads

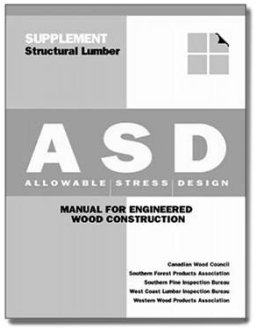
8

202 Definitions

- GROUND SNOW LOAD GEODATABASE.
- The ASCE database (version 2022-1.0) of geocoded values of risk-targeted design ground snow load values.

9

202 Definitions



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

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202 Definitions

- WIND DESIGN GEODATABASE.
- The ASCE database (version 2022-1.0) of geocoded wind speed design data. The ASCE Wind Design Geodatabase of geocoded wind speed design data is available at https://asce7hazardtool.online/.

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202 Definitions

- SHALLOW FOUNDATION.
- A shallow foundation is an individual or strip footing, a mat foundation, a slab-on-grade foundation or a similar foundation element.
- DEEP FOUNDATION.
- A deep foundation is a foundation element that does not satisfy the definition of a shallow foundation.

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202 Definitions

- LIGHT-FRAME CONSTRUCTION.
- Construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or cold-formed steel framing members.

13

Chapter 16 Structural Design

- The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof.

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1603 Construction documents

- 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 1603.1.1 through 1603.1.9 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, pg , and allowable stress design ground snow load, pg (asd).
- 3. Basic wind speed, V, mph, and allowable stress design wind speed, Vasd, as determined in accordance with Section 1609.3.1 and wind exposure.
- 4. Seismic design category and site class.
- 5. Flood design data, if located in flood hazard areas established in Section 1612.3.
- 6. Design load-bearing values of soils.
- 7. Rain load data.

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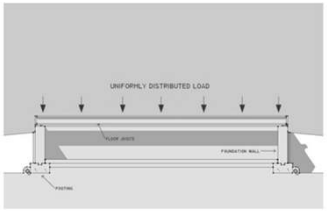
1603.1.1 Floor live load



- 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 1607.13 shall be indicated for each type of live load used in the design.

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1603.1.2 Roof live load

- The roof live load used in the design shall be indicated for roof areas.

2. DESIGN LOAD CRITERIA:
A. OCCUPANCY CATEGORY: II
B. DEAD LOAD:
- ROOF = 20 PSF
- ROOF TRUSS BOTTOM CHORD = 10 PSF

C. SNOW LOADS:
- GROUND SNOW LOAD, Pg = 43 PSF
- FLAT ROOF SNOW LOAD, Pf = 30 PSF
- SNOW EXPOSURE FACTOR, Ce = 1.0
- SNOW LOAD IMPORTANCE FACTOR, Is = 1.0
- THERMAL FACTOR, Ct = 1.0
- SNOW DRIFT LOADING = PER CODE

D. WIND LOADS:
- BASIC WIND SPEED (ULTIMATE) = 129 MPH
- WIND IMPORTANCE FACTOR, Iw = 1.0
- WIND EXPOSURE CATEGORY = B
- COMPONENTS & CLADDING, WALLS = +/-22.2 PSF
- COMPONENTS & CLADDING, ROOF = - 33.4 PSF
- COMPONENTS & CLADDING, PARAPET = - 57 PSF

E. SEISMIC LOADS:
- SEISMIC IMPORTANCE FACTOR, I = 1.0
- SITE CLASS = D
- Ss = 0.219g
- S1 = 0.059g
- Sds = 0.234g
- Sd1 = 0.095g
- SEISMIC DESIGN CATEGORY B

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1603.1.4 - Wind and tornado design data

- The following information related to wind loads and, where required by Section 1609.5, 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, tornado speed, VT, mph, and allowable stress design wind speed, Vasd, mph, as determined in accordance with Section 1609.3.1.
- 2. Risk category.
- 3. Effective plan area, Ae, 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/m2). Where design for tornado loads is required, the design pressures shown shall be the maximum of wind or tornado pressures.

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1603.1.5 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, Ie.
- 3. Spectral response acceleration parameters, SS and S1.
- 4. Site class.
- 5. Design spectral response acceleration parameters, SDS and SD1.
- 6. Seismic design category.
- 7. Basic seismic force-resisting system(s).
- 8. Design base shear(s).
- 9. Seismic response coefficient(s), CS.
- 10. Response modification coefficient(s), R.
- 11. Analysis procedure used.

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1603.1.6 Geotechnical information

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

02-FOUNDATION CONSTRUCTION

1. FOUNDATION DESIGN CRITERIA:
A. FOUNDATION DESIGN CRITERIA WAS TAKEN FROM RECOMMENDATIONS SET FORTH IN GEOTECHNICAL REPORT NO. 212020 BY CTC GEOTEK, DATED JULY 29, 2021.
B. ALLOWABLE BEARING PRESSURE = 1,250 PSF
C. MINIMUM FROST DEPTH = 3 FEET

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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.

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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.

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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.

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1603.1.9
Roof rain load data

- Design rainfall intensity, in (in/hr), and roof drain, scupper and overflow locations shall be shown regardless of whether rain loads govern the design.

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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, g, i]

CONSTRUCTION	L or L_r	S^f or W^f	$D + L^{d, e}$
Roof members:[c]			
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:[h]			
With plaster or stucco finishes	$l/360$	—	—
With other brittle finishes	$l/240$	—	—
With flexible finishes	$l/120$	—	—
Farm buildings	—	—	$l/180$
Greenhouses	—	—	$l/120$

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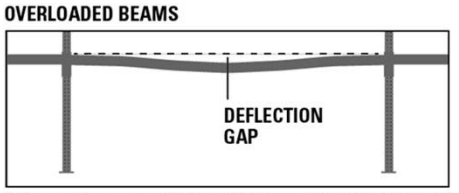
Deflection Limit

- Deflection limits are the maximum amount a structural member can deflect under a load. They are often based on the span length of the member.



Reference Standard $\frac{\text{LENGTH OF BEAM}}{180}$ = ALLOWABLE DEFLECTION

Example: $\frac{96\text{" BEAM}}{180}$ = .52" ALLOWABLE DEFLECTION

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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.

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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. • 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 *International 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, Condition 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. • 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 *International 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.

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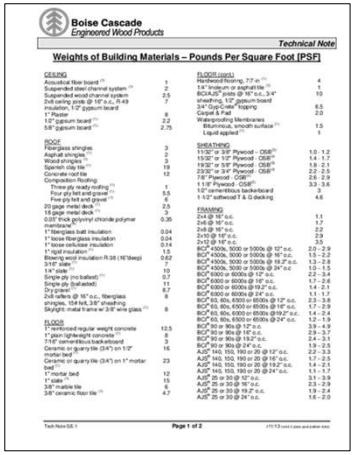
1606 Dead Loads

- Buildings, structures, and parts thereof shall be designed to resist the effects of dead loads.
- 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.



Boise Cascade
Engineered Wood Products

Technical Note

Weights of Building Materials – Pounds Per Square Foot [PSF]

CEILING		FLOOR (cont.)	
Acoustical fiber board [1]	1	Hardwood flooring, 7/7 in [1]	4
Suspended steel channel system [1]	2	1/4" linoleum or asphalt tile [1]	1
Suspended wood channel system	2.5	BCI/AJS® joists @ 16" o.c., 3/4"	1.0
2x6 ceiling joists @ 16" o.c., R-49	7	sheathing, 1/2" gypsum board	
insulation, 1/2" gypsum board		3/4" Gyp-Crete® topping	6.5
1" Plaster	8	Carpet & Pad	2.0
1/2" gypsum board [1]	2.2	Waterproofing Membranes	
5/8" gypsum board [1]	2.75	Bituminous, smooth surface [1]	1.5
		Liquid applied [1]	1
ROOF		SHEATHING	
Fiberglass shingles	3	11/32" or 3/8" Plywood - OSB [2]	1.0 - 1.2
Asphalt shingles [1]	2	15/32" or 1/2" Plywood - OSB [2]	1.4 - 1.7
Wood shingles [1]	3	19/32" or 5/8" Plywood - OSB [2]	1.8 - 2.1
Spanish clay tile [1]	19	23/32" or 3/4" Plywood - OSB [2]	2.2 - 2.5
Concrete roof tile	12	7/8" Plywood - OSB [2]	2.6 - 2.9
Composition Roofing:		1 1/8" Plywood - OSB [2]	3.3 - 3.6
Three ply ready roofing [1]	1	1/2" cementitious backerboard	3
Four ply felt and gravel [1]	5.5	1 1/2" sothwood T & G decking	4.6
Five ply felt and gravel [1]	6		
20 gage metal deck [1]	2.5	FRAMING	
18 gage metal deck [1]	3	2x4 @ 16" o.c.	1.1
0.03" thick polyvinyl chloride polymer membrane	0.35	2x6 @ 16" o.c.	1.7
1" fiberglass batt insulation	0.04	2x8 @ 16" o.c.	2.2
1" loose fiberglass insulation	0.04	2x10 @ 16" o.c.	2.9
1" loose cellulose insulation	0.15	2x12 @ 16" o.c.	3.5
1" rigid insulation	0.5	BCI® 4500s, 5000 or 5000s @ 12" o.c.	2.0 - 2.9
Blown-in cellulose insulation R-38 (16"deep)	0.62	BCI® 4500s, 5000 or 5000s @ 16" o.c.	1.5 - 2.2
3/16" slate [1]	7	BCI® 4500s, 5000 or 5000s @ 19.2" o.c.	1.3 - 2.0
1/4" slate [1]	10	BCI® 4500s, 5000 or 5000s @ 24" o.c.	1.0 - 1.5
Single ply (no ballast) [1]	0.7	BCI® 6000 or 6000s @ 12" o.c.	2.2 - 3.4
Single ply (ballasted)	11	BCI® 6000 or 6000s @ 16" o.c.	1.7 - 2.6
Dry gravel [1]	8.7	BCI® 6000 or 6000s @ 19.2" o.c.	1.4 - 2.1
2x8 rafters @ 16" o.c., fiberglass	8	BCI® 6000 or 6000s @ 24" o.c.	1.1 - 1.7
shingles, 1/4 h/d, 3/8" sheathing		BCI® 6D, 60s, 6500 or 6500s @ 12" o.c.	3.3 - 3.8
Skylight: metal frame w/ 3/8" wire glass [1]	8	BCI® 6D, 60s, 6500 or 6500s @ 16" o.c.	1.7 - 2.9
		BCI® 6D, 60s, 6000 or 6500s @19.2" o.c.	1.4 - 2.4
FLOOR		BCI® 6D, 60s, 6500 or 6500s @ 24" o.c.	1.2 - 1.9
Reinforced regular weight concrete	12.5	BCI® 90 or 90s @ 12" o.c.	3.9 - 4.9
1" sand-lightweight concrete [1]	6	BCI® 90 or 90s @ 16" o.c.	2.9 - 3.7
7/16" cementitious backerboard	3	BCI® 90 or 90s @ 19.2" o.c.	2.4 - 3.1
Ceramic or quarry tile (3/4") on 1/2" mortar bed	16	BCI® 90 or 90s @ 24" o.c.	1.9 - 2.5
Ceramic or quarry tile (3/4") on 1" mortar bed [1]	23	AJS® 140, 150, 190 or 20 @ 12" o.c.	2.2 - 3.3
1" mortar bed	12	AJS® 140, 150, 190 or 20 @ 16" o.c.	1.7 - 2.5
1" slate [1]	15	AJS® 140, 150, 190 or 20 @ 19.2" o.c.	1.4 - 2.1
3/8" marble tile	5	AJS® 140, 150, 190 or 20 @ 24" o.c.	1.1 - 1.7
3/8" ceramic floor tile [1]	4.7	AJS® 25 or 30 @ 12" o.c.	3.1 - 3.9
		AJS® 25 or 30 @ 16" o.c.	2.3 - 2.9
		AJS® 25 or 30 @ 19.2" o.c.	1.9 - 2.4
		AJS® 25 or 30 @ 24" o.c.	1.6 - 2.0

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1607.3 Uniform Live Loads

- The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall not be less than the minimum uniformly distributed live loads given in Table 1607.1.
- Live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

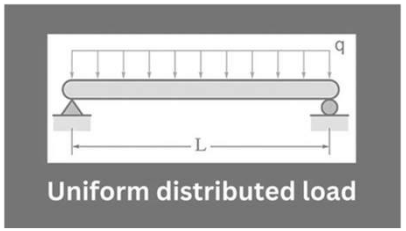

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TABLE 1607.1—MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS

	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	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	100[a] (See Section 1607.18)		
		Stadiums and arenas with fixed seats (fastened to the floor)	60[a] (See Section 1607.18)		
		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	—
13.	Fire escapes		100	—	—
		On single-family dwellings only	40		
14.	Fixed ladders		See Section 1607.10		—
15.	Garages and vehicle floors	Passenger vehicle garages	40[b]	See Section 1607.7	—
		Trucks and buses	See Section 1607.8		
		Fire trucks and emergency vehicles	See Section 1607.8		
		Forklifts and movable equipment	See Section 1607.8		
16.	Handrails, guards and grab bars		See Section 1607.9		—

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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.

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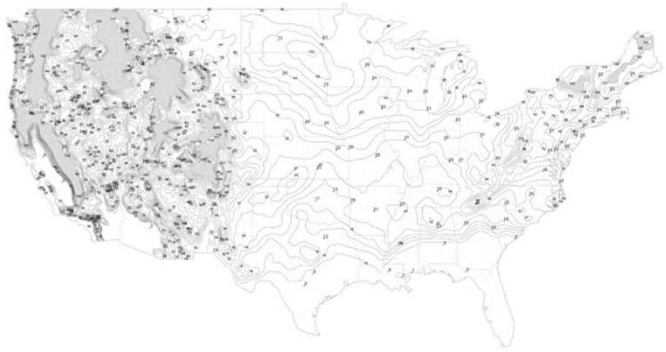
FIGURE 1608.2(2)—GROUND SNOW LOADS, p_g, FOR RISK CATEGORY II OR THE CONTERMINOUS UNITED STATES (lb/ft²)



For SI: 1 pound per square foot = 0.0479 kN/m².
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.

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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.

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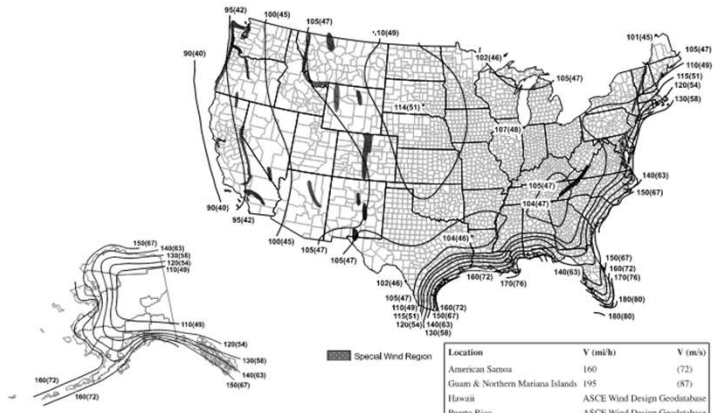
1609.3
Basic design wind speed

- 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 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.

35

FIGURE 1609.3(2)—BASIC WIND SPEEDS, *V*, FOR RISK CATEGORY II BUILDINGS AND OTHER STRUCTURES



Location	V (mi/h)	V (m/s)
American Samoa	160	(72)
Guam & Northern Mariana Islands	195	(87)
Hawaii	ASCE Wind Design Geodatabase	
Puerto Rico	ASCE Wind Design Geodatabase	
U.S. Virgin Islands	ASCE Wind Design Geodatabase	

36

Figure 1609.3(2) - Basic wind speeds, V, for risk category II buildings and other structures

- Notes:
- 1. Values are 3-second gust wind speeds in miles per hour (m/s) at 33 feet 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 3-percent probability of exceedance in 50 years (annual exceedance probability = 0.000588, MRI = 1,700 years).
- 8. The ASCE Wind Design Geodatabasecan be accessed at the ASCE 7 Hazard Tool (https://asce7hazardtool.online) or approved equivalent.

37

1609.3.1 Wind speed conversion

- Where required, the basic wind speeds of Figures 1609.3(1) through 1609.3(4) shall be converted to allowable stress design wind speeds, Vasd, using Table 1609.3.1 or Equation 16-18.
- (Equation 16-18)(Equation 16-18)
  - $Vasd = V\sqrt{0.6}$
- where:
- Vasd = Allowable stress design wind speed applicable to methods specified in Exceptions 4 and 5 of Section 1609.1.1.
- V = Basic wind speeds determined from Figures 1609.3(1) through 1609.3(4).

TABLE 1609.3.1—WIND SPEED CONVERSIONS[a,b,c]

V	100	110	120	130	140	150	160	170	180	190	200
V_{asd}	78	85	93	101	108	116	124	132	139	147	155

For SI: 1 mile per hour = 0.44 m/s.
a. Linear interpolation is permitted.
b. V_{asd} = allowable stress design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1.
c. V = basic wind speeds determined from Figures 1609.3(1) through 1609.3(4).

38

1609.4 Exposure category

- For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed.
- Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

39

1609.4.2 - Surface roughness categories

- A ground surface roughness within each 45-degree sector shall be determined for a distance upwind of the site as defined in Section 1609.4.3 from the following categories, for the purpose of assigning an exposure category as defined in Section 1609.4.3.
- Surface Roughness B. Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.
- Surface Roughness C. Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat open country, and grasslands.
- Surface Roughness D. Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats and unbroken ice.

40

1609.4.3 Exposure categories

- An exposure category shall be determined in accordance with the following:
- Exposure B. For buildings with a mean roof height of less than or equal to 30 feet, Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance of not less than 1,500 feet.
- For buildings with a mean roof height greater than 30 feet, Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance of not less than 2,600 feet or 20 times the height of the building, whichever is greater.

41

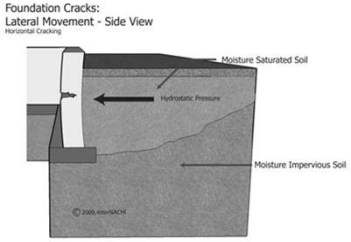
1609.4.3 Exposure categories

- Exposure C. Exposure C shall apply for all cases where Exposure B or D does not apply.
- Exposure D. Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance of not less than 5,000 feet or 20 times the height of the building, whichever is greater. Exposure D shall apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 feet or 20 times the building height, whichever is greater, from an Exposure D condition as defined in the previous sentence.

42

1610.1 Lateral pressures

- Structures below grade shall be designed to resist lateral soil loads from adjacent soil. Soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless determined otherwise by a geotechnical investigation in accordance with Section 1803.
- Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Walls that are free to move and rotate at the top, such as retaining walls, shall be permitted to be designed for active pressure.



43

TABLE 1610.1—LATERAL SOIL LOAD

DESCRIPTION OF BACKFILL MATERIAL[c]	UNIFIED SOIL CLASSIFICATION	DESIGN LATERAL SOIL LOAD[a] (pound per square foot per foot of depth)	
		Active pressure	At-rest pressure
Well-graded, clean gravels; gravel-sand mixes	GW	30	60
Poorly graded clean gravels; gravel-sand mixes	GP	30	60
Silty gravels, poorly graded gravel-sand mixes	GM	40	60
Clayey gravels, poorly graded gravel-and-clay mixes	GC	45	60
Well-graded, clean sands; gravelly sand mixes	SW	30	60
Poorly graded clean sands; sand-gravel mixes	SP	30	60
Silty sands, poorly graded sand-silt mixes	SM	45	60
Sand-silt clay mix with plastic fines	SM-SC	45	100
Clayey sands, poorly graded sand-clay mixes	SC	60	100
Inorganic silts and clayey silts	ML	45	100
Mixture of inorganic silt and clay	ML-CL	60	100
Inorganic clays of low to medium plasticity	CL	60	100
Organic silts and silt clays, low plasticity	OL	Note b	Note b
Inorganic clayey silts, elastic silts	MH	Note b	Note b
Inorganic clays of high plasticity	CH	Note b	Note b
Organic clays and silty clays	OH	Note b	Note b

For SI: 1 pound per square foot per foot of depth = 0.157 kPa/m, 1 foot = 304.8 mm.
a. Design lateral soil loads are given for moist conditions for the specified soils at their optimum densities. Actual field conditions shall govern. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.
b. Unsuitable as backfill material.
c. The definition and classification of soil materials shall be in accordance with ASTM D2487.

44

1613
Earthquake Loads

- Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable.
- The seismic design category for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

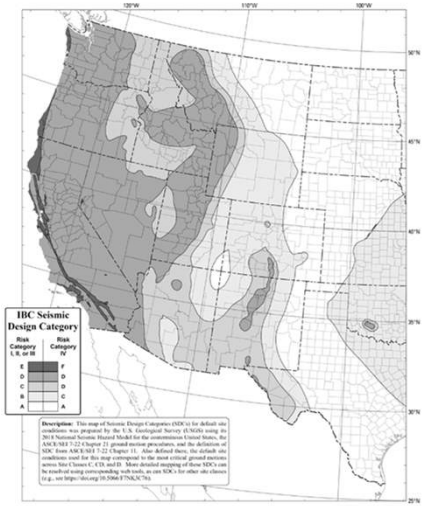
45

1613.2 - Determination of seismic design category

- Structures shall be assigned to a seismic design category based on one of the following methods unless the authority having jurisdiction or geotechnical data determines that Site Class DE, E or F soils are present at the site:
- 1. Based on the structure risk category using Figures 1613.2(1) through 1613.2(7).
- 2. Determined in accordance with ASCE 7.
- Where Site Class DE, E or F soils are present, the seismic design category shall be determined in accordance with ASCE 7.

46

FIGURE 1613.2(1)—SEISMIC DESIGN CATEGORIES FOR DEFAULT SITE CONDITIONS FOR THE CONTERMINOUS UNITED STATES (WESTERN)



47

Chapter 18
Soils and Foundations

- Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with 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.
- The quality and design of materials used structurally in excavations and foundations shall comply with the requirements specified in Chapters 16, 19, 21, 22 and 23.
- Excavations and fills shall comply with Chapter 33.

48

1803 - Geotechnical Investigations

- Geotechnical investigations shall be conducted in accordance with Section 1803.2 and reported in accordance with Section 1803.6.
- Where required by the building official or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a registered design professional.

49

1806.2 - Presumptive load-bearing values

- The load-bearing values used in design for supporting soils and rock near the surface shall not exceed the values specified in Table 1806.2 unless data to substantiate the use of higher values are submitted and approved. Where the building official has reason to doubt the classification, strength or compressibility of the soil or rock, the requirements of Section 1803.5.2 shall be satisfied.
- Presumptive load-bearing values shall apply to materials with similar physical and engineering characteristics. Mud, organic silt and organic clays (OL, OH), peat (Pt) and undocumented fill shall not be assumed to have a presumptive load-bearing capacity unless data to substantiate the use of such a value are submitted.
  - Exception: A presumptive load-bearing capacity shall be permitted to be used where the building official deems the load-bearing capacity is adequate for the support of lightweight or temporary structures.

50

TABLE 1806.2—PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction[a]	Cohesion (psf)[b]
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and gravel (GW and GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	—	130

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.
a. Coefficient to be multiplied by the dead load.
b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.

51

1807.1.6 - Prescriptive design of concrete and masonry foundation walls

- Concrete and masonry foundation walls that are laterally supported at the top and bottom shall be permitted to be designed and constructed in accordance with this section.

52

1807.1.6.1 Foundation wall thickness

- The thickness of prescriptively designed foundation walls shall be not less than the thickness of the wall supported, except that foundation walls of not less than 8-inch nominal width shall be permitted to support brick-veneered frame walls and 10-inch-wide cavity walls provided that the requirements of Section 1807.1.6.2 or 1807.1.6.3 are met.

53

1807.1.6.2 - Concrete foundation walls

- Concrete foundation walls shall comply with the following:
- 1. The thickness shall comply with the requirements of Table 1807.1.6.2.

TABLE 1807.1.6.2--CONCRETE FOUNDATION WALLS[b,c]

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT[a] (feet)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)								
		Design lateral soil load[a] (psf per foot of depth)								
		30[d]			45[d]			60		
		Minimum wall thickness (inches)								
		7.5	9.5	11.5	7.5	9.5	11.5	7.5	9.5	11.5
5	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
6	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	PC	PC	PC
7	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	#5 at 48	PC	PC
	7	PC	PC	PC	#5 at 46	PC	PC	#6 at 48	PC	PC
8	4	PC	PC	PC	PC	PC	PC	PC	PC	PC
	5	PC	PC	PC	PC	PC	PC	PC	PC	PC
	6	PC	PC	PC	PC	PC	PC	#5 at 43	PC	PC
	7	PC	PC	PC	#5 at 41	PC	PC	#6 at 43	PC	PC
	8	#5 at 47	PC	PC	#6 at 43	PC	PC	#6 at 32	#6 at 44	PC

54

1807.1.6.2 - Concrete foundation walls

- 2. The size and spacing of vertical reinforcement shown in Table 1807.1.6.2 are based on the use of reinforcement with a minimum yield strength of 60,000 pounds per square inch (psi).
- Vertical reinforcement with a minimum yield strength of 40,000 psi or 50,000 psi shall be permitted, provided that the same size bar is used and the spacing shown in the table is reduced by multiplying the spacing by 0.67 or 0.83, respectively.

55

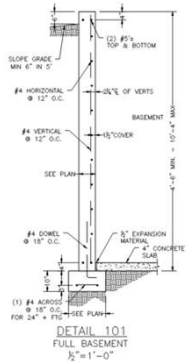
1807.1.6.2 - Concrete foundation walls

- 3. Vertical reinforcement, where required, shall be placed nearest the inside face of the wall a distance, d, from the outside face (soil face) of the wall.
- The distance, d, is equal to the wall thickness, t, minus 1.25 inches plus one-half the bar diameter, db, [d = t - (1.25 + db/2)].
- The reinforcement shall be placed within a tolerance of ± 3/8 inch where d is less than or equal to 8 inches or ± 1/2 inch where d is greater than 8 inches.

56

1807.1.6.2 - Concrete foundation walls

- 4. In lieu of the reinforcement shown in Table 1807.1.6.2, smaller reinforcing bar sizes with closer spacings that provide an equivalent cross-sectional area of reinforcement per unit length shall be permitted.
- 5. Concrete cover for reinforcement measured from the inside face of the wall shall be not less than 3/4 inch.
- Concrete cover for reinforcement measured from the outside face of the wall shall be not less than 1 ½ inches for No. 5 bars and smaller, and not less than 2 inches for larger bars.



57

1807.1.6.2 - Concrete foundation walls

- 6. Concrete shall have a specified compressive strength, f'c, of not less than 2,500 psi.
- 7. The unfactored axial load per linear foot of wall shall not exceed 1.2 tf'c where t is the specified wall thickness in inches.

58

1807.1.6.2.1 Seismic requirements

- Based on the seismic design category assigned to the structure, concrete foundation walls designed using Table 1807.1.6.2 shall be subject to the following limitations:
- 1. Seismic Design Categories A and B. Not less than one No. 5 bar shall be provided around window, door and similar sized openings. The bar shall be anchored to develop f_y in tension at the corners of openings.
- 2. Seismic Design Categories C, D, E and F. Tables shall not be used except as allowed for plain concrete members in Section 1905.6.2.

59

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, the thickness shall be not less than 7 ½ inches, and the wall shall retain not more than 4 feet of unbalanced fill. Walls shall have reinforcement in accordance with Section 14.6.1 of ACI 318.

60

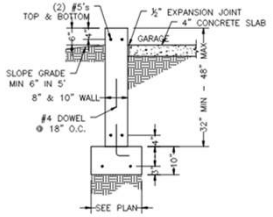
1905.6.2 - Seismic Design Categories C, D, E and F

- 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.

61

1905.6.2 - Seismic Design Categories C, D, E and F

- 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 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.



DETAIL 106
GARAGE WALL
½"=1'-0"

62

1905.6.2 - Seismic Design Categories C, D, E and F

- 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.

63

1808.8.1 - Concrete or grout strength and mix proportioning

- Concrete or grout in foundations shall have a specified compressive strength (f 'c) not less than the largest applicable value indicated in Table 1808.8.1.
- Where concrete or grout is to be pumped, the mix design including slump shall be adjusted to produce a pumpable mixture.

TABLE 1808.8.1—MINIMUM SPECIFIED COMPRESSIVE STRENGTH f'_c OF CONCRETE OR GROUT

FOUNDATION ELEMENT OR CONDITION	SPECIFIED COMPRESSIVE STRENGTH, f'_c
1. Foundations for structures assigned to Seismic Design Category A, B or C	2,500 psi
2a. Foundations for Group R or U occupancies of light-frame construction, two *stories* or less in height, assigned to Seismic Design Category D, E or F	2,500 psi
2b. Foundations for other structures assigned to Seismic Design Category D, E or F	3,000 psi
3. Precast nonprestressed driven piles	4,000 psi
4. Socketed drilled shafts	4,000 psi
5. Micropiles	4,000 psi
6. Precast prestressed driven piles	5,000 psi

For SI: 1 pound per square inch = 0.00689 MPa.

64

1808.8.2 Concrete cover

- The concrete cover provided for prestressed and nonprestressed reinforcement in foundations shall be not less than the largest applicable value specified in Table 1808.8.2.
- Longitudinal bars spaced less than 1½ inches clear distance apart shall be considered to be bundled bars for which the concrete cover provided shall be not less than that required by Section 20.5.1.3.5 of ACI 318.
- Concrete cover shall be measured from the concrete surface to the outermost surface of the steel to which the cover requirement applies.
- Where concrete is placed in a temporary or permanent casing or a mandrel, the inside face of the casing or mandrel shall be considered to be the concrete surface.

65

TABLE 1808.8.2—MINIMUM CONCRETE COVER

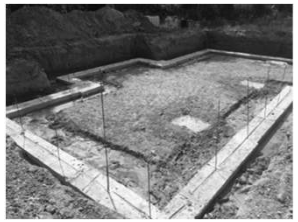
FOUNDATION ELEMENT OR CONDITION	MINIMUM COVER
1. Shallow foundations	In accordance with Section 20.5 of ACI 318
2. Precast nonprestressed deep foundation elements Exposed to seawater Not manufactured under plant conditions Manufactured under plant control conditions	3 inches 2 inches In accordance with Section 20.5.1.3.3 of ACI 318
3. Precast prestressed deep foundation elements Exposed to seawater Other	2.5 inches In accordance with Section 20.5.1.3.3 of ACI 318
4. Cast-in-place deep foundation elements not enclosed by a steel pipe, tube or permanent casing	2.5 inches
5. Cast-in-place deep foundation elements enclosed by a steel pipe, tube or permanent casing	1 inch
6. Structural steel core within a steel pipe, tube or permanent casing	2 inches
7. Cast-in-place drilled shafts enclosed by a stable rock socket	1.5 inches

For SI:1 inch = 25.4 mm.

66

1809.2 Supporting soils

- Shallow foundations shall be built on undisturbed soil, compacted fill material or controlled low-strength material (CLSM).
- Compacted fill material shall be placed in accordance with Section 1804.6. CLSM shall be placed in accordance with Section 1804.7.



67

1809.3 Stepped footings

- The top surface of footings shall be level. The bottom surface of footings shall be permitted to have a slope not exceeding 1 unit vertical in 10 units horizontal (10-percent slope).
- Footings shall be stepped where it is necessary to change the elevation of the top surface of the footing or where the surface of the ground slopes more than 1 unit vertical in 10 units horizontal (10-percent slope).

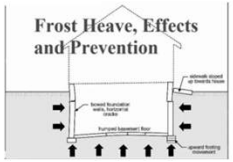
68

1809.4
Depth and width of footings

- The minimum depth of footings below the undisturbed ground surface shall be 12 inches.
- Where applicable, the requirements of Section 1809.5 shall be satisfied.
- The minimum width of footings shall be 12 inches.

69

1809.5
Frost protection



- Except where otherwise protected from frost, foundations and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:
- 1. Extending below the frost line of the locality.
- 2. Constructing in accordance with ASCE 32.
- 3. Erecting on solid rock.

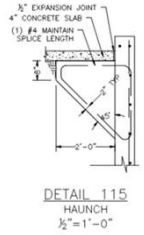
70

1809.5
Frost protection

- Exception: Free-standing buildings meeting all of the following conditions shall not be required to be protected:
  - 1. Assigned to Risk Category I.
  - 2. Area of 600 square feet or less for light-frame construction or 400 square feet or less for other than light-frame construction.
  - 3. Eave height of 10 feet or less.
- Shallow foundations shall not bear on frozen soil unless such frozen condition is of a permanent character.

71

1809.5.1 - Frost protection at required exits

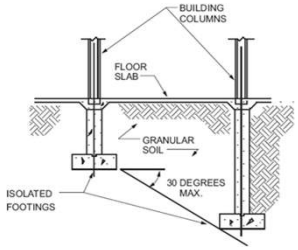


- Frost protection shall be provided at exterior landings for all required exits with outward-swinging doors.
- Frost protection shall only be required to the extent necessary to ensure the unobstructed opening of the required exit doors.

72

1809.6 Location of footings

- Footings on granular soil shall be so located that the line drawn between the lower edges of adjacent footings shall not have a slope steeper than 30 degrees with the horizontal, unless the material supporting the higher footing is braced or retained or otherwise laterally supported in an approved manner or a greater slope has been properly established by engineering analysis.



IBC Commentary

73

1809.7 - Prescriptive footings for light-frame construction

- Where a specific design is not provided, concrete or masonry-unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7.

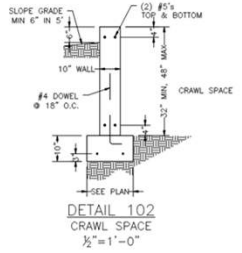
TABLE 1809.7—PRESCRIPTIVE FOOTINGS SUPPORTING WALLS OF LIGHT-FRAME CONSTRUCTION[a, b, c, d, e]

NUMBER OF FLOORS SUPPORTED BY THE FOOTING[f]	WIDTH OF FOOTING (inches)	THICKNESS OF FOOTING (inches)
1	12	6
2	15	6
3	18	8[g]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Depth of footings shall be in accordance with Section 1809.4.
b. The ground under the floor shall be permitted to be excavated to the elevation of the top of the footing.
c. Interior stud-bearing walls shall be permitted to be supported by isolated footings. The footing width and length shall be twice the width shown in this table, and footings shall be spaced not more than 6 feet on center.
d. See Section 1905 for additional requirements for concrete footings of structures assigned to Seismic Design Category C, D, E or F.
e. For thickness of foundation walls, see Section 1807.1.6.
f. Footings shall be permitted to support a roof in addition to the stipulated number of floors. Footings supporting roof only shall be as required for supporting one floor.
g. Plain concrete footings for Group R-3 occupancies shall be permitted to be 6 inches thick.

74

1809.8 Plain concrete footings



DETAIL 102
CRAWL SPACE
½"=1'-0"

- The edge thickness of plain concrete footings supporting walls of other than light-frame construction shall be not less than 8 inches where placed on soil or rock.
  - Exception: For plain concrete footings supporting Group R-3 occupancies, the edge thickness is permitted to be 6 inches, provided that the footing does not extend beyond a distance greater than the thickness of the footing on either side of the supported wall.

75

1810 Deep Foundations

- Deep foundations shall be analyzed, designed, detailed and installed in accordance with Sections 1810.1 through 1810.4.
- Deep foundations shall be designed and installed on the basis of a geotechnical investigation as set forth in Section 1803.

76

1906 - Footings for light-frame construction

- 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, provided that the footing does not extend more than 4 inches on either side of the supported wall.

77

2202 - STRUCTURAL STEEL AND COMPOSITE STRUCTURAL STEEL AND CONCRETE

- 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.

78

2206 - COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION

- 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.
  - 2. Structural walls.
  - 3. Shear walls, strap-braced walls and diaphragms that resist in-plane lateral loads.
  - 4. Trusses.

79

Chapter 23 Wood

- The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:
- 1. Allowable stress design in accordance with Sections 2304, 2305 and 2306.
- 2. Load and resistance factor design in accordance with Sections 2304, 2305 and 2307.
- 3. Conventional light-frame construction in accordance with Sections 2304 and 2308.
- 4. AWC WFCM in accordance with Section 2309.
- 5. The design and construction of log structures in accordance with the provisions of ICC 400.

80

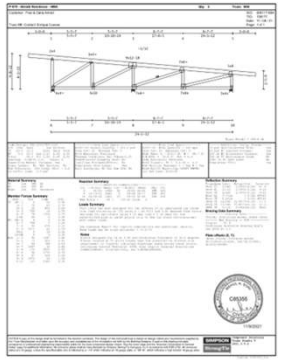
2303.4
Trusses

- Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other approved framing devices.

81

2303.4.1.1
Truss design drawings

- The written, graphic and pictorial depiction of each individual truss shall be provided to the building official for approval prior to installation.
- Truss design drawings shall be provided with the shipment of trusses delivered to the job site.



82

2303.4.1.1
Truss design drawings

- Truss design drawings shall include, at a minimum, the following information:
- 1. Slope or depth, span and spacing.
- 2. Location of all joints and support locations.
- 3. Number of plies if greater than one.
- 4. Required bearing widths.
- 5.Design loads as applicable, including:
- 5.1. Top chord live load.
- 5.2. Top chord dead load.
- 5.3. Bottom chord live load.
- 5.4. Bottom chord dead load.
- 5.5. Additional loads and locations.
- 5.6. Environmental design criteria and loads (such as wind, rain, snow, seismic).

83

2303.4.1.1
Truss design drawings

- 6. Other lateral loads, including drag strut loads.
- 7. Adjustments to wood member and metal connector plate design value for conditions of use.
- 8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable.
- 9. Joint connection type and description, such as size and thickness or gage, and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
- 10. Size, species and grade for each wood member.
- 11. Truss-to-truss connections and truss field assembly requirements.
- 12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable.
- 13. Maximum axial tension and compression forces in the truss members.
- 14. Required permanent individual truss member restraint location and the method and details of restraint and diagonal bracing to be used in accordance with Section 2303.4.1.2.

84

2304.6.1 - Wood structural panel sheathing

- Where wood structural panel sheathing is used as the exposed finish on the outside of exterior walls, it shall have an exterior exposure durability classification. Where wood structural panel sheathing is used elsewhere, but not as the exposed finish, it shall be of a type manufactured with exterior glue (Exposure 1 or Exterior).
- Wood structural panel sheathing, connections and framing spacing shall be in accordance with Table 2304.6.1 for the applicable basic wind speed and exposure category where used in enclosed buildings with a mean roof height not greater than 30 feet and a topographic factor (Kz t) of 1.0.

85

TABLE 2304.6.1—MAXIMUM BASIC WIND SPEED, *V*, PERMITTED FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES[a, b, c]

MINIMUM NAIL		MINIMUM WOOD STRUCTURAL PANEL SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	MAXIMUM WALL STUD SPACING (inches)	PANEL NAIL SPACING		MAXIMUM BASIC WIND SPEED, *V* (MPH)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind exposure category		
							B	C	D
6d common (2.0" × 0.113")	1.5	24/0	3/8	16	6	12[d]	140	115	110
		24/16	7/16	16	6	12[d]	150	125	115
						6[d]	190	160	150
8d common (2.5" × 0.131")	1.75	24/16	7/16	16	6	12[d]	170	140	135
						6[d]	190	160	150
				24	6	12[d]	140	115	110
						6[d]	140	115	110

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

a. Panel strength axis shall be parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.

b. The table is based on wind pressures acting toward and away from building surfaces in accordance with Section 30.4 of ASCE 7. Lateral requirements shall be in accordance with Section 2305 or 2308.

c. Wood structural panels with span ratings of wall-16 or wall-24 shall be permitted as an alternative to panels with a 24/0 span rating. Plywood siding rated 16 on center or 24 on center shall be permitted as an alternative to panels with a 24/16 span rating. Wall-16 and plywood siding 16 on center shall be used with studs spaced not more than 16 inches on center.

d. Where the specific gravity of the wood species used for wall framing is greater than or equal to 0.35 but less than 0.42 in accordance with AWC NDS, nail spacing in the field of the panel shall be multiplied by 0.67. Where the specific gravity of the wood species used for wall framing is less than 0.35, fastening of the wall sheathing shall be designed in accordance with AWC NDS.

86

2304.8.1 Structural floor sheathing

- Structural floor sheathing shall be designed in accordance with the general provisions of this code.
- Floor sheathing conforming to the provisions of Table 2304.8(1), 2304.8(2), 2304.8(3) or 2304.8(4) shall be deemed to meet the requirements of this section.

87

2304.8.2 Structural roof sheathing

- Structural roof sheathing shall be designed in accordance with the general provisions of this code and the special provisions in this section.
- Roof sheathing conforming to the provisions of Table 2304.8(1), 2304.8(2), 2304.8(3) or 2304.8(5) shall be deemed to meet the requirements of this section.
- Wood structural panel roof sheathing shall be of a type manufactured with exterior glue (Exposure 1 or Exterior).

88

TABLE 2304.8(3)—ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANEL SHEATHING AND SINGLE-FLOOR GRADES CONTINUOUS OVER TWO OR MORE SPANS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS[a]

SHEATHING GRADES		ROOF[b]				FLOOR[c]
Panel span rating roof/floor span	Panel thickness (inches)	Maximum span (inches)		Load[d] (psf)		Maximum span (inches)
		With edge support[e]	Without edge support	Total load	Live load	
16/0	3/8	16	16	40	30	0
20/0	3/8	20	20	40	30	0
24/0	7/16, 7/15, 1/2	24	20[f]	40	30	0
24/16	7/15, 1/2	24	24	50	40	16
32/16	23/32, 7/15, 3/8	32	28	40	30	16[g]
40/20	19/32, 5/8, 7/16, 7/15	40	32	40	30	20[g,h]
48/24	23/32, 7/16, 3/8	48	36	45	35	24
54/32	7/16, 1	54	40	45	35	32
60/32	7/16, 1 1/8	60	48	45	35	32
SINGLE FLOOR GRADES		**ROOF[b]**				**FLOOR[c]**
Panel span rating	Panel thickness (inches)	Maximum span (inches)		Load[d] (psf)		Maximum span (inches)
		With edge support[e]	Without edge support	Total load	Live load	
16 o.c.	7/15, 15/32, 1/2	24	24	50	40	16[g]
20 o.c.	19/32, 5/8, 3/4	32	32	40	30	20[g,h]
24 o.c.	23/32, 7/8	48	36	35	25	24
32 o.c.	7/16, 1	48	40	50	40	32
48 o.c.	1 3/32, 1 1/8	60	48	50	40	48

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m².

a. Applies to panels 24 inches or wider.

b. Uniform load deflection limitations 1/180 of span under live load plus dead load, 1/240 under live load only.

c. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking unless 1/4-inch minimum thickness underlayment or 1 1/4 inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is 3/4-inch wood strip. Allowable uniform load based on deflection of 1/360 of span is 100 pounds per square foot except the span rating of 48 inches on center is based on a total load of 65 pounds per square foot.

d. Allowable load at maximum span. Where the total load includes snow, use allowable stress design snow loads.

e. Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking or other. Only lumber blocking shall satisfy blocked diaphragm requirements.

89

2304.12 - Protection against decay and termites

- Wood shall be protected from decay and termites in accordance with the applicable provisions of Sections 2304.12.1 through 2304.12.4.
- Wood used above ground in the locations specified in Sections 2304.12.1.1 through 2304.12.1.5 shall be naturally durable wood or preservative-treated wood using waterborne preservatives, in accordance with AWPA U1 for above-ground use.

90

2304.12.1.1 Joists, girders and subfloor

- Wood joists or wood structural floors that are closer than 18 inches or wood girders that are closer than 12 inches to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation shall be of naturally durable or preservative-treated wood.

91

2304.12.1.2 - Wood supported by exterior foundation walls

- Wood framing members, including wood sheathing, that are in contact with exterior foundation walls and are less than 8 inches from exposed earth shall be of naturally durable or preservative-treated wood.

92

2304.12.1.3 Exterior walls below grade

- Wood framing members and furring strips in direct contact with the interior of exterior masonry or concrete walls below grade shall be of naturally durable or preservative-treated wood.

93

2304.12.1.4 Sleepers and sills

- Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or preservative-treated wood.

94

2304.12.1.5 Wood siding

- Clearance between wood siding and earth on the exterior of a building shall be not less than 6 inches or less than 2 inches vertical from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather except where siding, sheathing and wall framing are of naturally durable or preservative-treated wood.

95

2304.12.2 Other locations

- Wood used in the locations specified in Sections 2304.12.2.1 through 2304.12.2.8 shall be naturally durable wood or preservative-treated wood in accordance with AWPA U1.
- Preservative-treated wood used in interior locations shall be protected with two coats of urethane, shellac, latex epoxy or varnish unless waterborne preservatives are used. Prior to application of the protective finish, the wood shall be dried in accordance with the manufacturer's recommendations.

96

2304.12.2.1 Girder ends

- The ends of wood girders entering exterior masonry or concrete walls shall be provided with a ½-inch airspace on top, sides and end, unless naturally durable or preservative-treated wood is used.

97

2304.12.2.2 Posts or columns

- Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or preservative-treated wood.
- Exception: Posts or columns that meet all of the following:
  - 1. Are not exposed to the weather, or are protected by a roof, eave, overhang, or other covering if exposed to the weather.
  - 2. Are supported by concrete piers or metal pedestals projected not less than 1 inch (25 mm) above the slab or deck and are separated from the concrete pier by an impervious moisture barrier.
  - 3.Are located not less than 8 inches above exposed earth.

98

2304.12.2.3 - Supporting member for permanent appurtenances

- Naturally durable or preservative-treated wood shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.
- Exception: Sawn lumber in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use durable materials where the structure is exposed to the weather.

99

2304.12.2.4 - Supporting members for permeable floors and roofs

- Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative-treated wood unless separated from such floors or roofs by an impervious moisture barrier.
- The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.

100

2304.12.2.5 - Ventilation beneath balcony or elevated walking surfaces

- Enclosed framing in exterior balconies and elevated walking surfaces that have weather-exposed surfaces shall be provided with openings that provide a net free cross-ventilation area not less than 1/150 of the area of each separate space.

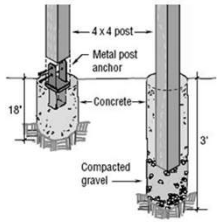
101

2304.12.2.6 - Wood in contact with the ground or fresh water

- Wood used in contact with exposed earth shall be naturally durable for both decay and termite resistance or preservative treated in accordance with AWPA U1 for soil or freshwater use.
  - Exception: Untreated wood is permitted where such wood is continuously and entirely below the ground-water level or submerged in fresh water.

102

2304.12.2.6.1 Posts or columns



- Posts and columns that are supporting permanent structures and embedded in concrete that is exposed to the weather or in direct contact with the earth shall be of preservative-treated wood.

103

2304.12.2.7 Termite protection

- In geographical areas where hazard of termite damage is known to be very heavy, wood floor framing in the locations specified in Section 2304.12.1.1 and exposed framing of exterior decks or balconies shall be of naturally durable species (termite resistant) or preservative treated in accordance with AWPA U1 for the species, product preservative and end use or provided with approved methods of termite protection.

104

2308 - CONVENTIONAL LIGHT-FRAME CONSTRUCTION

- The requirements of this section are intended for buildings of conventional light-frame construction not exceeding the story height limitations of Section 2308.2.1.
- Other construction methods are permitted to be used, provided that a satisfactory design is submitted showing compliance with other provisions of this code.
- Interior nonload-bearing partitions, ceilings and curtain walls of conventional light-frame construction are not subject to the limitations of Section 2308.2.
- Detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures shall comply with the International Residential Code.

105

2308.2.1 Stories

- Structures of conventional light-frame construction shall be limited in story height in accordance with Table 2308.2.1.

TABLE 2308.2.1—ALLOWABLE STORY HEIGHT

SEISMIC DESIGN CATEGORY	ALLOWABLE STORY ABOVE GRADE PLANE
A and B	Three stories
C	Two stories
D and E[a]	One story

For SI:1 inch = 25.4 mm.

a. For the purposes of this section, for buildings assigned to *Seismic Design Category* D or E, cripple walls shall be considered to be a *story* unless cripple walls are solid blocked and do not exceed 14 inches in height.

106

2308.2.2 - Allowable floor-to-floor height

- Maximum floor-to-floor height shall not exceed 11 feet, 7 inches.
- Exterior bearing wall and interior braced wall heights shall not exceed a stud height of 10 feet.

107

2308.2.3 Allowable loads

- Loads shall be in accordance with Chapter 16 and shall not exceed the following:
- 1. Average dead loads shall not exceed 15 psf for combined roof and ceiling, exterior walls, floors and partitions.
- Exceptions:
- 1. Subject to the limitations of Section 2308.10.10, stone or masonry veneerup to the less of 5 inches thick or 50 pounds per square foot and installed in accordance with Chapter 14 is permitted to a height of 30 feet above a noncombustible foundation, with an additional 8 feet permitted for gable ends.
- 2. Concrete or masonry fireplaces, heaters and chimneys shall be permitted in accordance with the provisions of this code.

108

2308.2.3
Allowable loads

- 2. Live loads shall not exceed 40 psf for floors.
  - Exception: Live loads for concrete slab-on-ground floors in Risk Categories I and II shall be not more than 125 psf.
- 3. Allowable stress design ground snow load, pg(asd), shall not exceed 50 psf.
- 4. Where design for tornado loads is required, tornado loads on the main windforce-resisting system and all components and cladding shall not exceed the corresponding wind loads on these same elements.

109

2308.2.4
Basic wind speed

- V shall not exceed 130 miles per hour (3-second gust).
  - Exceptions:
  - 1. V shall not exceed 140 mph (3-second gust) for buildings in Exposure Category B that are not located in a hurricane-prone region.
  - 2. Where V exceeds 130 mph (3-second gust), the provisions of either AWC WFCM or ICC 600 are permitted to be used.

110

2308.2.5
Allowable roof span

- Ceiling joist and rafter framing constructed in accordance with Section 2308.11 and trusses shall not span more than 40 feet between points of vertical support.
- A ridge board in accordance with Section 2308.11 or 2308.11.3.1 shall not be considered a vertical support.

111

2308.2.6
Risk category limitation

- The use of the provisions for conventional light-frame construction in this section shall not be permitted for Risk Category IV buildings assigned to a Seismic Design Category other than A.

112

2308.7.1
Foundation plates or sills

- Foundation plates or sills resting on concrete or masonry foundations shall comply with Section 2304.3.1.
- Foundation plates or sills shall be bolted or anchored to the foundation with not less than ½-inch-diameter steel bolts or approved anchors spaced to provide equivalent anchorage as the steel bolts.
- Bolts shall be embedded not less than 7 inches into concrete or masonry.
- The bolts shall be located in the middle third of the width of the plate.

113

2308.7.1
Foundation plates or sills

- Bolts shall be spaced not more than 6 feet on center and there shall be not less than two bolts or anchor straps per piece with one bolt or anchor strap located not more than 12 inches or less than 4 inches from each end of each piece. B
- Bolts in sill plates of braced wall lines in structures over two stories above grade shall be spaced not more than 4 feet on center.
- A properly sized nut and washer shall be tightened on each bolt to the plate.

114

2308.7.1.1 - Braced wall line sill plate anchorage in Seismic Design Category D

- Sill plates along braced wall lines in buildings assigned to Seismic Design Category D shall be anchored with not less than ½-inch diameter anchor bolts with steel plate washers between the foundation sill plate and the nut, or approved anchor straps load-rated in accordance with Section 2304.10.4 and spaced to provide equivalent anchorage.

115

2308.7.1.1 - Braced wall line sill plate anchorage in Seismic Design Category D

- Plate washers shall be not less than 0.229 inch by 3 inches by 3 inches in size.
- The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16 inch larger than the bolt diameter and a slot length not to exceed 1¾ inches, provided that a standard cut washer is placed between the plate washer and the nut.

116

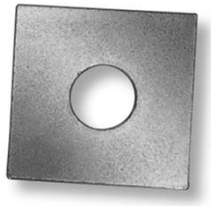
2308.7.1.2 - Braced wall line sill plate anchorage in Seismic Design Category E

- Sill plates along braced wall lines in buildings assigned to Seismic Design Category E shall be anchored with not less than 5/8-inch diameter anchor bolts with steel plate washers between the foundation sill plate and the nut, or approved anchor straps load-rated in accordance with Section 2304.10.4 and spaced to provide equivalent anchorage.

117

2308.7.1.2 - Braced wall line sill plate anchorage in Seismic Design Category E

- Plate washers shall be not less than 0.229 inch by 3 inches by 3 inches in size.
- The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16 inch larger than the bolt diameter and a slot length not to exceed 1¾ inches, provided that a standard cut washer is placed between the plate washer and the nut.



118

2308.8 Floor framing

119

2308.8.1 Girders

- Girders for single-story construction or girders supporting loads from a single floor shall be not less than 4 inches by 6 inches for spans 6 feet or less, provided that girders are spaced not more than 8 feet on center.
- Other girders shall be designed to support the loads specified in this code.
- Girder end joints shall occur over supports.

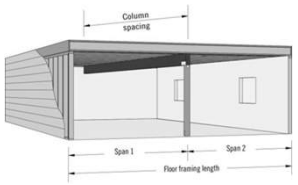
120

2308.8.1 Girders

- Where a girder is spliced over a support, an adequate tie shall be provided.
- The ends of beams or girders supported on masonry or concrete shall not have less than 3 inches of bearing.

121

2308.8.1.1 Allowable girder spans



- The allowable spans of girders that are fabricated of dimension lumber shall not exceed the values set forth in Table 2308.8.1.1(1) or 2308.8.1.1(2).

122

TABLE 2308.8.1.1(1)—HEADER AND GIRDER SPANS[a, b] FOR EXTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	ALLOWABLE STRESS DESIGN GROUND SNOW LOAD, P_{ground}, (psf)[c]																	
		30						50						70					
		Building width[c] (feet)																	
		12		24		36		12		24		36		12		24		36	
		Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]
Roof and ceiling	1-2 × 6	4-0	1	3-1	2	2-7	2	3-5	1	2-8	2	2-3	2	3-0	2	2-4	2	2-0	2
	1-2 × 8	5-1	2	3-11	2	3-3	2	4-4	2	3-4	2	2-10	2	3-10	2	3-0	2	2-6	3
	1-2 × 10	6-0	2	4-8	2	3-11	2	5-2	2	4-0	2	3-4	3	4-7	2	3-6	3	3-0	3
	1-2 × 12	7-1	2	5-5	2	4-7	3	6-1	2	4-8	3	3-11	3	5-5	2	4-2	3	3-6	3
	2-2 × 4	4-0	1	3-1	1	2-7	1	3-5	1	2-7	1	2-2	1	3-0	1	2-4	1	2-0	1
	2-2 × 6	6-0	1	4-7	1	3-10	1	5-1	1	3-11	1	3-3	2	4-6	1	3-6	2	2-11	2
	2-2 × 8	7-7	1	5-9	1	4-10	2	6-5	1	5-0	2	4-2	2	5-9	1	4-5	2	3-9	2
	2-2 × 10	9-0	1	6-10	2	5-9	2	7-8	2	5-11	2	4-11	2	6-9	2	5-3	2	4-5	2
	2-2 × 12	10-7	2	8-1	2	6-10	2	9-0	2	6-11	2	5-10	2	8-0	2	6-2	2	5-2	3
	3-2 × 8	9-5	1	7-3	1	6-1	1	8-1	1	6-3	1	5-3	2	7-2	1	5-6	2	4-8	2
	3-2 × 10	11-3	1	8-7	1	7-3	2	9-7	1	7-4	2	6-2	2	8-6	1	6-7	2	5-6	2
	3-2 × 12	13-2	1	10-1	2	8-6	2	11-3	2	8-8	2	7-4	2	10-0	2	7-9	2	6-6	2
	4-2 × 8	10-11	1	8-4	1	7-0	1	9-4	1	7-2	1	6-0	1	8-3	1	6-4	1	5-4	2
	4-2 × 10	12-11	1	9-11	1	8-4	1	11-1	1	8-6	1	7-2	2	9-10	1	7-7	2	6-4	2
	4-2 × 12	15-3	1	11-8	1	9-10	2	13-0	1	10-0	2	8-5	2	11-7	1	8-11	2	7-6	2

123

TABLE 2308.8.1.1(2)—HEADER AND GIRDER SPANS[a, b] FOR INTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING WIDTH[c] (feet)					
		12		24		36	
		Span[e]	NJ[d]	Span[e]	NJ[d]	Span[e]	NJ[d]
One floor only	2-2 × 4	4-1	1	2-10	1	2-4	1
	2-2 × 6	6-1	1	4-4	1	3-6	1
	2-2 × 8	7-9	1	5-5	1	4-5	2
	2-2 × 10	9-2	1	6-6	2	5-3	2
	2-2 × 12	10-9	1	7-7	2	6-3	2
	3-2 × 8	9-8	1	6-10	1	5-7	1
	3-2 × 10	11-5	1	8-1	1	6-7	2
	3-2 × 12	13-6	1	9-6	2	7-9	2
	4-2 × 8	11-2	1	7-11	1	6-5	1
	4-2 × 10	13-3	1	9-4	1	7-8	1
	4-2 × 12	15-7	1	11-0	1	9-0	2
Two floors	2-2 × 4	2-7	1	1-11	1	1-7	1
	2-2 × 6	3-11	1	2-11	2	2-5	2
	2-2 × 8	5-0	1	3-8	2	3-1	2
	2-2 × 10	5-11	2	4-4	2	3-7	2
	2-2 × 12	6-11	2	5-2	2	4-3	3
	3-2 × 8	6-3	1	4-7	2	3-10	2
	3-2 × 10	7-5	1	5-6	2	4-6	2
	3-2 × 12	8-8	2	6-5	2	5-4	2
	4-2 × 8	7-2	1	5-4	1	4-5	2
	4-2 × 10	8-6	1	6-4	2	5-3	2
	4-2 × 12	10-1	1	7-5	2	6-2	2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Spans are given in feet and inches.
b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas fir-larch, hem-fir, Southern pine and spruce-pine fir.
c. *Building* width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an *approved* framing anchor attached to the full-height wall stud and to the header.
e. Spans are calculated assuming the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), tabulated spans for headers consisting of 2 × 8, 2 × 10, or 2 × 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.

124

2308.8.2.1 Floor joist span

- Spans for floor joists shall be in accordance with Table 2308.8.2.1(1), Table 2308.8.2.1(2) or the AWC STJR.

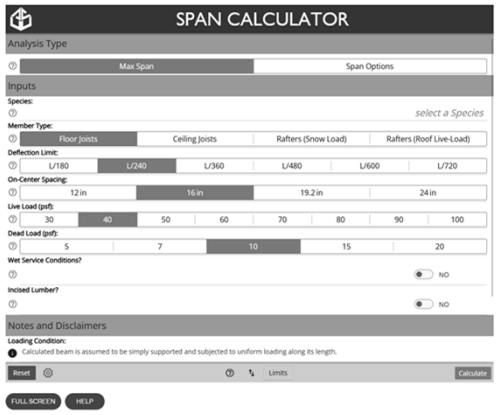
125

TABLE 2308.8.2.1(2)—FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES
(Residential living areas, live load = 40 psf, L/Δ = 360)

JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2 × 6	2 × 8	2 × 10	2 × 12	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum floor joist spans							
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	9-8	12-10	16-4	19-10	9-8	12-10	16-4	19-2
	Douglas Fir-Larch	#1	9-4	12-4	15-0	17-5	8-10	11-3	13-8	15-11
	Douglas Fir-Larch	#2	9-1	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Douglas Fir-Larch	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Hem-Fir	SS	9-2	12-1	15-5	18-9	9-2	12-1	15-5	18-9
	Hem-Fir	#1	9-0	11-10	14-8	17-0	8-8	10-11	13-4	15-6
	Hem-Fir	#2	8-7	11-3	13-10	16-1	8-2	10-4	12-8	14-8
	Hem-Fir	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Southern Pine	SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Southern Pine	#1	9-2	12-1	14-8	17-5	9-0	11-5	13-5	15-11
	Southern Pine	#2	8-6	10-10	12-10	15-1	7-9	9-10	11-8	13-9
	Southern Pine	#3	6-5	8-2	9-10	11-8	5-11	7-5	9-0	10-8
	Spruce-Pine-Fir	SS	9-0	11-10	15-1	18-4	9-0	11-10	15-1	17-9
	Spruce-Pine-Fir	#	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-Pine-Fir	#2	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-Pine-Fir	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3

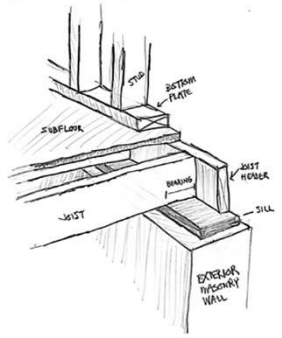
126

American Wood Council Span Calculator



127

2308.8.2.2 Bearing

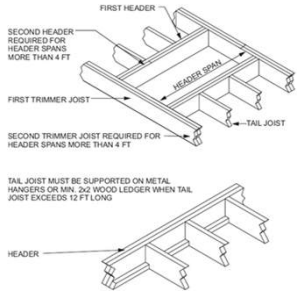


- The ends of each joist shall have not less than 1½ inches of bearing on wood or metal, or not less than 3 inches on masonry, except where supported on a 1-inch by 4-inch ribbon strip and nailed to the adjoining stud.

128

2308.8.4
Framing around openings

- Trimmer and header joists shall be doubled, or of lumber of equivalent cross section, where the span of the header exceeds 4 feet.
- The ends of header joists more than 6 feet (in length shall be supported by framing anchors or joist hangers unless bearing on a beam, partition or wall.
- Tail joists over 12 feet in length shall be supported at the header by framing anchors or on ledger strips not less than 2 inches by 2 inches.



2021 Commentary
Figure 2308.4.4

129

2308.8.4.1 - Openings in floor diaphragms in Seismic Design Categories B, C, D and E

- Openings in horizontal diaphragms in Seismic Design Categories B, C, D and E with a dimension that is greater than 4 feet shall be constructed with metal ties and blocking in accordance with this section and Figure 2308.8.4.1(1).

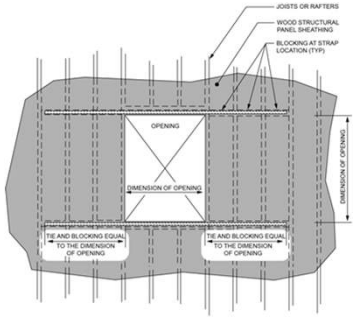
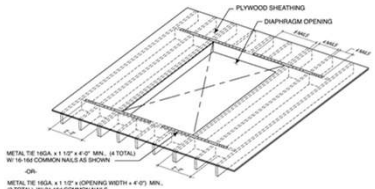


Figure 2308.8.4.1(1)

130

2308.8.4.1 - Openings in floor diaphragms in Seismic Design Categories B, C, D and E

- Metal ties shall be not less than 0.058 inch (16 galvanized gage)] in thickness by 1½ inches in width and shall have a yield stress not less than 33,000 psi.
- Blocking shall extend not less than the dimension of the opening in the direction of the tie and blocking.
- Ties shall be attached to blocking in accordance with the manufacturer's instructions but with not less than eight 16d common nails on each side of the header-joist intersection.



131

2308.8.4.1 - Openings in floor diaphragms in Seismic Design Categories B, C, D and E

- Openings in floor diaphragms in Seismic Design Categories D and E shall not have any dimension exceeding 50 percent of the distance between braced wall lines or an area greater than 25 percent of the area between orthogonal pairs of braced wall lines [see Figure 2308.8.4.1(2)];
- or the portion of the structure containing the opening shall be designed in accordance with accepted engineering practice to resist the forces specified in Chapter 16, to the extent such irregular opening affects the performance of the conventional framing system.

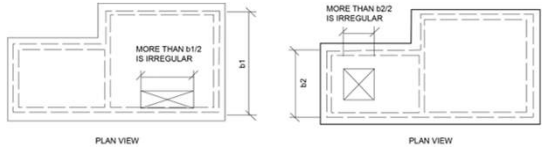


Figure 2308.8.4.1(2)

132

2308.8.4.2 - Vertical offsets in floor diaphragms in Seismic Design Categories D and E

- In Seismic Design Categories D and E, portions of a floor level shall not be vertically offset such that the framing members on either side of the offset cannot be lapped or tied together in an approved manner in accordance with Figure 2308.8.4.2 unless the portion of the structure containing the irregular offset is designed in accordance with accepted engineering practice.
  - Exception: Framing supported directly by foundations need not be lapped or tied directly together.

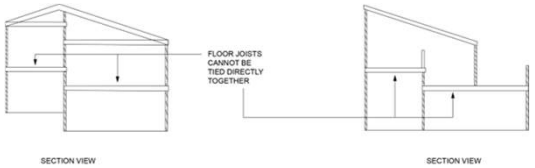
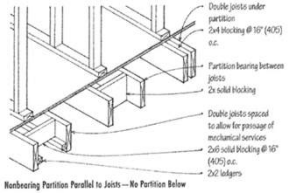


Figure 2308.8.4.2

133

2308.8.5 - Joists supporting bearing partitions



- Bearing partitions parallel to joists shall be supported on beams, girders, doubled joists, walls or other bearing partitions.
- Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth unless such joists are of sufficient size to carry the additional load.

134

2308.8.6 Lateral support

- Floor and ceiling framing with a nominal depth-to-thickness ratio not less than 5 to 1 shall have one edge held in line for the entire span.
- Where the nominal depth-to-thickness ratio of the framing member exceeds 6 to 1, there shall be one line of bridging for each 8 feet of span, unless both edges of the member are held in line.

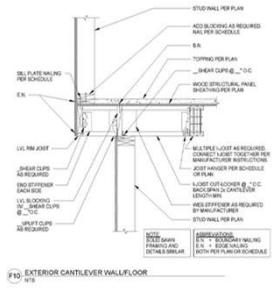
135

2308.8.6 Lateral support

- The bridging shall consist of not less than 1-inch by 3-inch lumber, double nailed at each end, or equivalent metal bracing of equal rigidity, full-depth solid blocking or other approved means.
- A line of bridging shall be required at supports where equivalent lateral support is not otherwise provided.

136

2308.8.9 - Floor framing supporting braced wall panels



F10 EXTERIOR CANTILEVER WALL/FLOOR
NTS

- Where braced wall panels are supported by cantilevered floors or are set back from the floor joist support, the floor framing shall comply with Section 2308.10.7.

137

2308.8.10 - Anchorage of exterior means of egress components in Seismic Design Categories D and E

- Exterior egress balconies, exterior stairways and ramps and similar means of egress components in structures assigned to Seismic Design Category D or E shall be positively anchored to the primary structure at not more than 8 feet on center or shall be designed for lateral forces.
- Such attachment shall not be accomplished by use of toenails or nails subject to withdrawal.

138

2308.8.3 Engineered wood products

- Engineered wood products shall be installed in accordance with manufacturer's recommendations.
- Cuts, notches and holes bored in trusses, structural composite lumber, structural glued-laminated members or I-joists are not permitted except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

139

140

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141

2308.9
Wall construction

- Walls of conventional light-frame construction shall be in accordance with this section.

142

2308.9.1
Stud size, height and spacing

- The size, height and spacing of studs shall be in accordance with Table 2308.9.1.
- Studs shall be continuous from a support at the sole plate to a support at the top plate to resist loads perpendicular to the wall.
- The support shall be a foundation or floor, ceiling or roof diaphragm or shall be designed in accordance with accepted engineering practice.
  - Exception: Jack studs, trimmer studs and cripple studs at openings in walls that comply with Table 2308.8.1.1(1) or 2308.8.1.1(2).

143

TABLE 2308.9.1—SIZE, HEIGHT AND SPACING OF WOOD STUDS[c]

STUD SIZE (inches)	BEARING WALLS				NONBEARING WALLS	
	Laterally unsupported stud height[a] (feet)	Supporting roof and ceiling only	Supporting one floor, roof and ceiling	Supporting two floors, roof and ceiling	Laterally unsupported stud height[a] (feet)	Spacing (inches)
		Spacing (inches)				
2 × 3[b]	—	—	—	—	10	16
2 × 4	10	24	16	—	14	24
3 × 4	10	24	24	16	14	24
2 × 5	10	24	24	—	16	24
2 × 6	10	24	24	16	20	24

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by an analysis.
b. Shall not be used in exterior walls.
c. Utility-grade studs shall not be spaced more than 16 inches on center or support more than a roof and ceiling, or exceed 8 feet in height for exterior walls and *load-bearing* walls or 10 feet for interior nonload-bearing walls.

144

2308.9.2 Framing details

- Studs shall be placed with their wide dimension perpendicular to the wall.
- Not less than three studs shall be installed at each corner of an exterior wall.
  - Exceptions:
  - 1. In interior nonbearing walls and partitions, studs are permitted to be set with the long dimension parallel to the wall.
  - 2. At corners, two studs are permitted, provided that wood spacers or backup cleats of 3/8-inch-thick (9.5 mm) wood structural panel, 3/8-inch Type M "Exterior Glue" particleboard, 1-inch-thick lumber or other approved devices that will serve as an adequate backing for the attachment of facing materials are used.
  - Where fire-resistance ratings or shear values are involved, wood spacers, backup cleats or other devices shall not be used unless specifically approved for such use.

145

2308.9.3.1 Bottom plate or sill

- Studs shall have full bearing on a plate or sill. Plates or sills shall be not less than 2 inches nominal in thickness and have a width not less than the width of the wall studs.

146

2308.9.3.2 Top plates

- Bearing and exterior wall studs shall be capped with double top plates installed to provide overlapping at corners and at intersections with other partitions.
- End joints in double top plates shall be offset not less than 48 inches and shall be nailed in accordance with Table 2304.10.2.
- Plates shall be a nominal 2 inches in depth and have a width not less than the width of the studs.

147

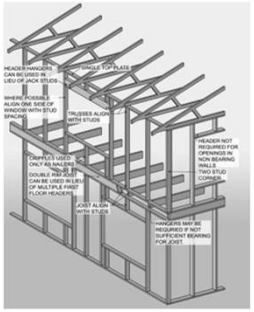
2308.9.3.2 Top plates

- Exception:
- A single top plate is permitted, provided that the plate is adequately tied at corners and intersecting walls by not less than the equivalent of 3-inch by 6-inch by 0.036-inch-thick galvanized steel plate that is nailed to each wall or segment of wall by six 8d box nails or equivalent on each side of the joint.
- For the butt-joint splice between adjacent single top plates, not less than the equivalent of a 3-inch by 12-inch galvanized steel plate that is nailed to each wall or segment of wall by 12 8d box nails on each side of the joint shall be required, provided that the rafters, joists or trusses are centered over the studs with a tolerance of not more than 1 inch.
- The top plate shall not be required over headers that are in the same plane and in line with the upper surface of the adjacent top plates and are tied to adjacent wall sections as required for the butt joint splice between adjacent single top plates.

148

2308.9.3.2 Top plates

- Where bearing studs are spaced at 24-inch intervals, top plates are less than two 2-inch by 6-inch or two 3-inch by 4-inch members and the floor joists, floor trusses or roof trusses that they support are spaced at more than 16-inch intervals, such joists or trusses shall bear within 5 inches of the studs beneath or a third plate shall be installed.



149

2308.9.4 - Nonload-bearing walls and partitions

- In nonload-bearing walls and partitions, that are not part of a braced wall panel, studs shall be spaced not more than 24 inches on center.
- In interior nonload-bearing walls and partitions, studs are permitted to be set with the long dimension parallel to the wall.
- Where studs are set with the long dimensions parallel to the wall, use of utility grade lumber or studs exceeding 10 feet is not permitted.

150

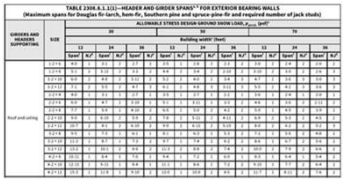
2308.9.4 - Nonload-bearing walls and partitions

- Interior nonload-bearing partitions shall be capped with not less than a single top plate installed to provide overlapping at corners and at intersections with other walls and partitions.
- The plate shall be continuously tied at joints by solid blocking not less than 16 inches in length and equal in size to the plate or by 1/2-inch by 11/2-inch metal ties with spliced sections fastened with two 16d nails on each side of the joint.

151

2308.9.5.1 - Openings in exterior bearing walls

- Headers shall be provided over each opening in exterior bearing walls.
- The size and spans in Table 2308.8.1.1(1) are permitted to be used for one- and two-family dwellings.
- Headers for other buildings shall be designed in accordance with Section 2302.1, Item 1 or 2.
- Headers of two or more pieces of nominal 2-inch framing lumber set on edge shall be permitted in accordance with Table 2308.8.1.1(1) and nailed together in accordance with Table 2304.10.2 or of solid lumber of equivalent size.

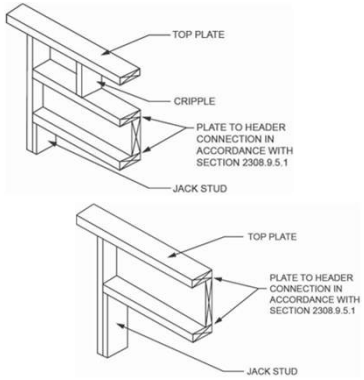


2302.1
1. Allowable stress design in accordance with Sections 2304, 2305 and 2306.
2. Load and resistance factor design in accordance with Sections 2304, 2305 and 2307.

152

2308.9.5.1 - Openings in exterior bearing walls

- Single-member headers of nominal 2-inch thickness shall be framed with a single flat 2-inch-nominal member or wall plate not less in width than the wall studs on the top and bottom of the header in accordance with Figures 2308.9.5.1(1) and 2308.9.5.1(2) and face nailed to the top and bottom of the header with 10d box nails spaced 12 inches on center.



153

2308.9.5.1 - Openings in exterior bearing walls

- Wall studs shall support the ends of the header in accordance with Table 2308.8.1.1(1).
- Each end of a lintel or header shall have a bearing length of not less than 1½ inches for the full width of the lintel.

154

2308.9.5.2 Openings in interior bearing partitions

- Headers shall be provided over each opening in interior bearing partitions as required in Section 2308.9.5.1. The spans in Table 2308.8.1.1(2) are permitted to be used.
- Wall studs shall support the ends of the header in accordance with Table 2308.8.1.1(1) or 2308.8.1.1(2), as applicable.

155

2308.9.5.3 Openings in interior nonbearing partitions

- Openings in nonbearing partitions are permitted to be framed with single studs and headers.
- Each end of a lintel or header shall have a bearing length of not less than 1½ inches for the full width of the lintel.

156

2308.9.6 Cripple walls

- Foundation cripple walls shall be framed of studs that are not less than the size of the studs above. Exterior cripple wall studs shall be not less than 14 inches in length, or shall be framed of solid blocking.
- Where exceeding 4 feet in height, such walls shall be framed of studs having the size required for an additional story.
- ee Section 2308.10.6 for cripple wall bracing.

157

2308.9.9 Exterior wall sheathing

- Except where stucco construction that complies with Section 2510 is installed, the outside of exterior walls, including gables, of enclosed buildings shall be sheathed with one of the materials of the nominal thickness specified in Table 2308.9.9 with fasteners in accordance with the requirements of Section 2304.10 or fasteners designed in accordance with accepted engineering practice.
- Alternatively, sheathing materials and fasteners complying with Section 2304.6 shall be permitted.

TABLE 2308.9.9—MINIMUM THICKNESS OF WALL SHEATHING

SHEATHING TYPE	MINIMUM THICKNESS	MAXIMUM WALL STUD SPACING
Diagonal wood boards	5/8 inch	24 inches on center
Structural fiberboard	1/2 inch	16 inches on center
Wood structural panel	In accordance with Tables 2308.10.3(2) and 2308.10.3(3)	—
M-S "Exterior Glue" and M-2 "Exterior Glue" particleboard	In accordance with Section 2306.3 and Table 2308.10.3(4)	—
Gypsum sheathing	1/2 inch	16 inches on center
Reinforced cement mortar	1 inch	24 inches on center
Hardboard panel siding	In accordance with Table 2308.10.3(5)	—
For SI: 1 inch = 25.4 mm.		

158

2308.10.1 Braced wall lines

- For the purpose of determining the amount and location of bracing required along each story level of a building, braced wall lines shall be designated as straight lines through the building plan in both the longitudinal and transverse direction and placed in accordance with Table 2308.10.1 and Figure 2308.10.1.
- Braced wall line spacing shall not exceed the distance specified in Table 2308.10.1.
- In structures assigned to Seismic Design Category D or E, braced wall lines shall intersect perpendicularly to each other.

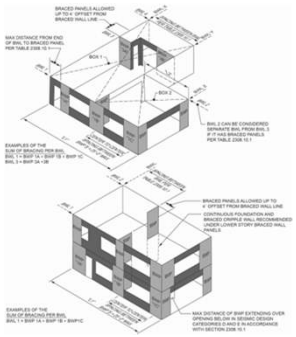


Figure 2308.10.1

159

TABLE 2308.10.1—WALL BRACING REQUIREMENTS[a]

SEISMIC DESIGN CATEGORY	STORY CONDITION (SEE SECTION 2308.2)	MAXIMUM SPACING OF BRACED WALL LINES	BRACED PANEL LOCATION, SPACING (O.C.) AND MINIMUM PERCENTAGE (X)			MAXIMUM DISTANCE OF BRACED WALL PANELS FROM EACH END OF BRACED WALL LINE
			Bracing method[b]			
			LIB	DWB, WSP	SFB, PBS, PCP, HPS, GB[c, d]	
A and B		35' - 0"	Each end and ≤ 25' - 0" o.c.	Each end and ≤ 25' - 0" o.c.	Each end and ≤ 25' - 0" o.c.	12' - 6"
		35' - 0"	Each end and ≤ 25' - 0" o.c.	Each end and ≤ 25' - 0" o.c.	Each end and ≤ 25' - 0" o.c.	12' - 6"
		35' - 0"	NP	Each end and ≤ 25' - 0" o.c.	Each end and ≤ 25' - 0" o.c.	12' - 6"
C		35' - 0"	NP	Each end and ≤ 25' - 0" o.c.	Each end and ≤ 25' - 0" o.c.	12' - 6"
		35' - 0"	NP	Each end and ≤ 25' - 0" o.c. (minimum 25% of wall length)[e]	Each end and ≤ 25' - 0" o.c. (minimum 25% of wall length)[e]	12' - 6"
D and E		25' - 0"	NP	S_{DS} < 0.50: Each end and ≤ 25' - 0" o.c. (minimum 21% of wall length)[e]	S_{DS} < 0.50: Each end and ≤ 25' - 0" o.c. (minimum 43% of wall length)[e]	8' - 0"
				0.5 ≤ S_{DS} < 0.75: Each end and ≤ 25' - 0" o.c. (minimum 32% of wall length)[e]	0.5 ≤ S_{DS} < 0.75: Each end and ≤ 25' - 0" o.c. (minimum 59% of wall length)[e]	
				0.75 ≤ S_{DS} ≤ 1.00: Each end and ≤ 25' - 0" o.c. (minimum 37% of wall length)[e]	0.75 ≤ S_{DS} ≤ 1.00: Each end and ≤ 25' - 0" o.c. (minimum 75% of wall length)	
				S_{DS} > 1.00: Each end and ≤ 25' - 0" o.c. (minimum 48% of wall length)[e]	S_{DS} > 1.00: Each end and ≤ 25' - 0" o.c. (minimum 100% of wall length)[e]	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
NP = Not Permitted.
a. This table specifies minimum requirements for braced wall panels along interior or exterior braced wall lines.
b. See Section 2308.10.3 for full description of bracing methods.
c. For Method GB, gypsum wallboard applied to framing supports that are spaced at 16 inches on center.
d. The required lengths shall be doubled for gypsum board applied to only one face of a braced wall panel.
e. Percentage shown represents the minimum amount of bracing required along the building length (or wall length if the structure has an irregular shape).

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2308.10.2 Braced wall panels

- Braced wall panels shall be placed along braced wall lines in accordance with Table 2308.10.1 and Figure 2308.10.1 and as specified in Table 2308.10.3(1).
- A braced wall panel shall be located at each end of the braced wall line and at the corners of intersecting braced wall lines or shall begin within the maximum distance from the end of the braced wall line in accordance with Table 2308.10.1.
- Braced wall panels in a braced wall line shall not be offset from each other by more than 4 feet. Braced wall panels shall be clearly indicated on the plans.

161

2308.10.3 Braced wall panel methods

- Construction of braced wall panels shall be by one or a combination of the methods in Table 2308.10.3(1).
- Braced wall panel length shall be in accordance with Section 2308.10.4 or 2308.10.5.

162

TABLE 2308.10.3(1)—BRACING METHODS

METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA*	
			Fasteners	Spacing
LIB[b] Let-in-bracing	1" × 4" wood or approved metal straps attached at 45° to 60° angles to studs at maximum of 16" o.c.	5	Table 2304.10.2	Wood: per stud plus top and bottom plates
			Metal strap: installed in accordance with manufacturer's recommendations	Metal strap: installed in accordance with manufacturer's recommendations
DWB Diagonal wood boards	5/8" thick (1" nominal) × 6" minimum width to studs at maximum of 24" o.c.		Table 2304.10.2	Per stud
WSP Wood structural panel	7/16" in accordance with Table 2308.10.3(2) or 2308.10.3(3)		Table 2304.10.2	6" edges 12" field
SFB Structural fiber-board sheathing	1/2" in accordance with Table 2304.10.2 to studs at maximum 16" o.c.		Table 2304.10.2	3" edges 6" field
GB Gypsum board (Double sided)	1/2" or 5/8" by not less than 4' wide to studs at maximum of 24" o.c.		Section 2506.2 for exterior and interior sheathing: 5d cooler nails (1 3/4" × 0.086") or 1 1/4" screws (Type W or S) for 1/2" gypsum board or 1 1/4" screws (Type W or S) for 5/8" gypsum board	For all braced wall panel locations: 7" o.c. along panel edges (including top and bottom plates) and 7" o.c. in the field
PBS Particleboard sheathing	1/2" or 5/8" in accordance with Table 2304.10.3(4) to studs at maximum of 16" o.c.		6d common (2" long × 0.113" dia.) nails for 1/2" thick sheathing or 8d common (2 1/2" long × 0.131" dia.) nails for 5/8" thick sheathing	3" edges 6" field
PCP Portland cement plaster	Section 2510 to studs at maximum of 16" o.c.		1 1/2" long, 11 gage, 0.120" dia., 7/16" dia. head nails or 1/2" long, 16 gage staples	6" o.c. on all framing members
HPS Hardboard panel siding	7/16" in accordance with Table 2308.10.3(5)		Table 2304.10.2	4" edges 8" field
ABW Alternate braced wall	1/2"		Figure 2308.10.5.1 and Section 2308.10.5.1	Figure 2308.10.5.1

163

2308.10.4 - Braced wall panel construction

- For Methods DWB, WSP, SFB, PBS, PCP and HPS, each panel must be not less than 48 inches in length, covering three stud spaces where studs are spaced 16 inches on center and covering two stud spaces where studs are spaced 24 inches on center.
- Braced wall panels less than 48 inches in length shall not contribute toward the amount of required bracing.
- Braced wall panels that are longer than the required length shall be credited for their actual length.
- For Method GB, each panel must be not less than 96 inches in length where applied to one side of the studs or 48 inches in length where applied to both sides.

164

2308.10.4 - Braced wall panel construction

- Vertical joints of panel sheathing shall occur over studs and adjacent panel joints shall be nailed to common framing members.
- Horizontal joints shall occur over blocking or other framing equal in size to the studs except where waived by the installation requirements for the specific sheathing materials.
- Sole plates shall be nailed to the floor framing in accordance with Section 2308.10.7 and top plates shall be connected to the framing above in accordance with Section 2308.10.7.2.
- Where joists are perpendicular to braced wall lines above, blocking shall be provided under and in line with the braced wall panels.

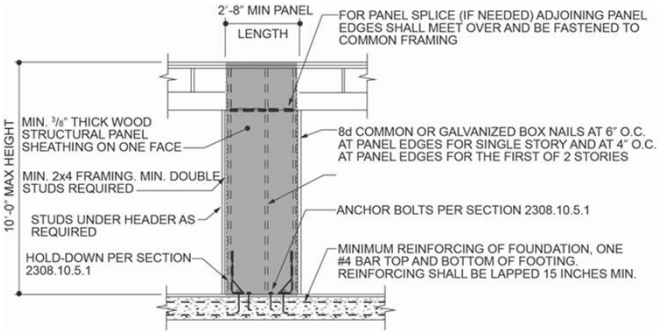
165

2308.10.5 Alternative bracing

- An alternate braced wall (ABW) or a portal frame with hold-downs (PFH) described in this section is permitted to substitute for a 48-inch braced wall panel of Method DWB, WSP, SFB, PBS, PCP or HPS. For Method GB, each 96-inch section (applied to one face) or 48-inch section (applied to both faces) or portion thereof required by Table 2308.10.1 is permitted to be replaced by one panel constructed in accordance with Method ABW or PFH.

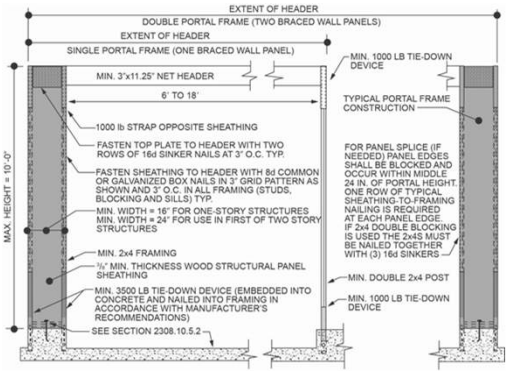
166

2308.10.5.1 - Alternate braced wall (ABW)



167

2308.10.5.2 - Portal frame with hold-downs (PFH)



168

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 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 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.

169

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, 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.

170

2308.10.8.1 Foundation requirements

- Braced wall lines shall be supported by continuous foundations.
  - Exception: For structures with a maximum plan dimension not more than 50 feet, continuous foundations are required at exterior walls only.

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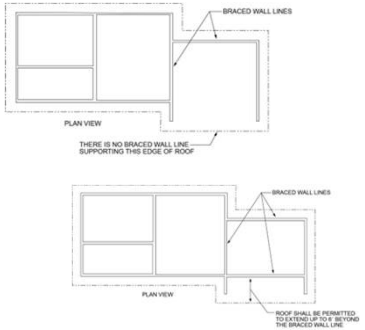
2308.10.8.1 Foundation requirements

- For structures in Seismic Design Categories D and E, exterior braced wall panels shall be in the same plane vertically with the foundation or the portion of the structure containing the offset shall be designed in accordance with accepted engineering practice and Section 2308.3.
  - Exceptions!

172

2308.10.8.2 - Floor and roof diaphragm support in Seismic Design Categories D and E

- In structures assigned to Seismic Design Categories D or E, floor and roof diaphragms shall be laterally supported by braced wall lines on all edges and connected in accordance with Section 2308.10.7 [see Figure 2308.10.8.2(1)].
  - Exception: Portions of roofs or floors that do not support braced wall panels above are permitted to extend up to 6 feet (1829 mm) beyond a braced wall line [see Figure 2308.10.8.2(2)] provided that the framing members are connected to the braced wall line below in accordance with Section 2308.10.7.



173

2308.10.8.3 - Stepped footings in Seismic Design Categories B, C, D and E

- In Seismic Design Categories B, C, D and E, where the height of a required braced wall panel extending from foundation to floor above varies more than 4 feet, the following construction shall be used:
- 1. Where the bottom of the footing is stepped and the lowest floor framing rests directly on a sill bolted to the footings, the sill shall be anchored as required in Section 2308.7.

174

2308.10.8.3 - Stepped footings in Seismic Design Categories B, C, D and E

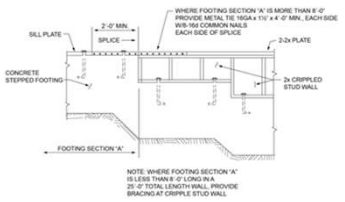
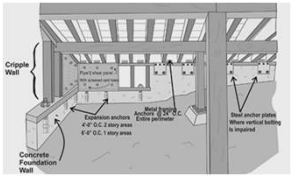


Figure 2308.10.8.3

- 2. Where the lowest floor framing rests directly on a sill bolted to a footing not less than 8 feet in length along a line of bracing, the line shall be considered to be braced.
- The double plate of the cripple stud wall beyond the segment of footing extending to the lowest framed floor shall be spliced to the sill plate with metal ties, one on each side of the sill and plate.
- The metal ties shall be not less than 0.058 inch (16 galvanized gage)] by 1½ inches in width by 48 inches with eight 16d common nails on each side of the splice location (see Figure 2308.10.8.3).
- The metal tie shall have a yield stress not less than 33,000 pounds per square inch (psi).

175

2308.10.8.3 - Stepped footings in Seismic Design Categories B, C, D and E



- 3. Where cripple walls occur between the top of the footing and the lowest floor framing, the bracing requirements for a story shall apply.

176

2308.11
Roof and ceiling framing

- The framing details required in this section apply to roofs having a slope of not less than three units vertical in 12 units horizontal.
- Where the roof slope is less than three units vertical in 12 units horizontal, members supporting rafters and ceiling joists such as ridge board, hips and valleys shall be designed as beams.

177

2308.11.1
Ceiling joist spans

- Spans for ceiling joists shall be in accordance with Table 2308.11.1(1) or 2308.11.1(2).
- For other grades and species, and other loading conditions, refer to the AWC STJR.

178

TABLE 2308.11.1(1)—CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics without storage, live load = 10 psf, L/Δ = 240)—continued

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 5 psf			
			2 × 4	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
16	Douglas Fir-Larch	SS	11-11	18-9	24-8	Note a
	Douglas Fir-Larch	#1	11-6	18-1	23-10	Note a
	Douglas Fir-Larch	#2	11-3	17-8	23-0	Note a
	Douglas Fir-Larch	#3	9-5	13-9	17-5	21-3
	Hem-Fir	SS	11-3	17-8	23-4	Note a
	Hem-Fir	#1	11-0	17-4	22-10	Note a
	Hem-Fir	#2	10-6	16-6	21-9	Note a
	Hem-Fir	#3	9-5	13-9	17-5	21-3
	Southern Pine	SS	11-9	18-5	24-3	Note a
	Southern Pine	#1	11-3	17-8	23-4	Note a
	Southern Pine	#2	10-9	16-11	21-7	25-7
	Southern Pine	#3	8-9	12-11	16-3	19-9
	Spruce-Pine-Fir	SS	11-0	17-4	22-10	Note a
	Spruce-Pine-Fir	#1	10-9	16-11	22-4	Note a
	Spruce-Pine-Fir	#2	10-9	16-11	22-4	Note a
	Spruce-Pine-Fir	#3	9-5	13-9	17-5	21-3

179

2308.11.2
Rafter spans

- Spans for rafters shall be in accordance with Table 2308.11.2(1), 2308.11.2(2), 2308.11.2(3), 2308.11.2(4), 2308.11.2(5) or 2308.11.2(6). For other grades and species and other loading conditions, refer to the AWC STJR.
- The span of each rafter shall be measured along the horizontal projection of the rafter.

180

TABLE 2308.11.2(4)—RAFTER SPANS FOR COMMON LUMBER SPECIES
(Allowable stress design ground snow load, $p_{g(snd)}$ = 50 psf, ceiling not attached to rafters, L/Δ = 180)—continued

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2—continued	Southern Pine	SS	7-1	11-2	14-8	18-3	21-7	7-1	11-2	14-2	16-11	20-0
	Southern Pine	#1	6-6	9-8	12-3	14-4	17-1	6-0	9-0	11-4	13-4	15-9
	Southern Pine	#2	5-7	8-4	10-7	12-6	14-9	5-2	7-9	9-9	11-7	13-8
	Southern Pine	#3	4-3	6-4	8-0	9-8	11-5	4-0	5-10	7-4	8-11	10-7
	Spruce-Pine-Fir	SS	6-8	10-6	13-5	16-5	19-1	6-8	9-10	12-5	15-3	17-8
	Spruce-Pine-Fir	#1	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-Pine-Fir	#2	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-Pine-Fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.
a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the adjustment factors in Table 2308.11.2(7).
b. Span exceeds 26 feet in length.

181

Footnote a

- Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the adjustment factors in Table 2308.11.2(7).

TABLE 2308.11.2(7)—RAFTER SPAN ADJUSTMENT FACTOR

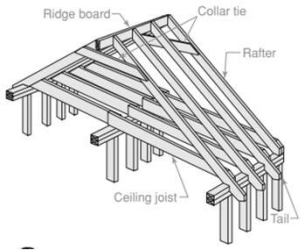
H_c/H_a[a]	RAFTER SPAN ADJUSTMENT FACTOR
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

a. H_c = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls; H_a = Height of roof ridge measured vertically above the top of the rafter support walls.

182

2308.11.3 - Ceiling joist and rafter framing

- Rafters shall be framed directly opposite each other at the ridge.
- There shall be a ridge board not less than 1-inch nominal thickness at ridges and not less in depth than the cut end of the rafter.
- At valleys and hips, there shall be a single valley or hip rafter not less than 2-inch nominal thickness and not less in depth than the cut end of the rafter.



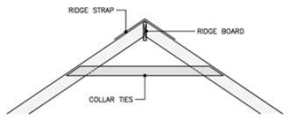
183

2308.11.3.1 - Ceiling joist and rafter connections

- Ceiling joists and rafters shall be nailed to each other and the assembly shall be nailed to the top wall plate in accordance with Tables 2304.10.2 and 2308.11.4.
- Ceiling joists shall be continuous or securely joined where they meet over interior partitions and be fastened to adjacent rafters in accordance with Tables 2304.10.2 and 2308.11.3.1 to provide a continuous rafter tie across the building where such joists are parallel to the rafters.
- Ceiling joists shall have a bearing surface of not less than 1½ inches on the top plate at each end.

184

2308.11.3.1 - Ceiling joist and rafter connections



- Where ceiling joists are not parallel to rafters, an equivalent rafter tie shall be installed in a manner to provide a continuous tie across the building, at a spacing of not more than 4 feet on center.
- The connections shall be in accordance with Tables 2308.11.3.1 and 2304.10.2, or connections of equivalent capacities shall be provided.
- Where ceiling joists or rafter ties are not provided at the top of the rafter support walls, the ridge formed by these rafters shall be supported by a girder conforming to Sections 2308.3 and 2308.4. Rafter ties shall be spaced not more than 4 feet on center.

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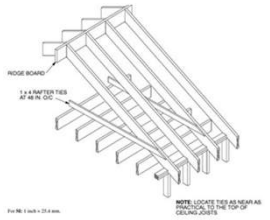
2308.11.3.1 - Ceiling joist and rafter connections



- Rafter tie connections shall be based on the equivalent rafter spacing in Table 2308.11.3.1.
- Rafter-to-ceiling joist connections and rafter tie connections shall be of sufficient size and number to prevent splitting from nailing.
- Roof framing member connection to braced wall lines shall be in accordance with Section 2308.10.7.2.

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TABLE 2308.11.3.1—RAFTER TIE CONNECTIONS[1]

RAFTER SLOPE	TIE SPACING (inches)	LIVE LOAD ONLY[2]			ALLOWABLE STRESS DESIGN GROUND SNOW LOAD, $p_{g(ind)}$ (pounds per square foot)					
					30 pounds per square foot			50 pounds per square foot		
		Roof span (feet)								
		12	24	36	12	24	36	12	24	36
		Required number of 16d common ($3^1/_2$" x 0.162") nails per connection[a, b, c, d, e, f, h]								
3:12	12	3	5	8	3	6	9	5	9	13
	16	4	7	10	4	8	12	6	12	17
	19.2	4	8	12	5	10	14	7	14	21
	24	5	10	15	6	12	18	9	17	26
	32	7	13	20	8	16	24	12	23	34
	48	10	20	29	12	24	35	17	34	51
4:12	12	3	4	6	3	5	7	4	7	10
	16	3	5	8	3	6	9	5	9	13
	19.2	3	6	9	4	7	11	6	11	16
	24	4	8	11	5	9	13	7	13	19
	32	5	10	15	6	12	18	9	17	26
	48	8	15	22	9	18	26	13	26	38
5:12	12	3	3	5	3	4	6	3	6	8
	16	3	4	6	3	5	7	4	7	11
	19.2	3	5	7	3	6	9	5	9	13
	24	3	6	9	4	7	11	6	11	16

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Table 2308.11.3.1 Footnotes

- a. 10d common nails shall be permitted to be substituted for 16d common nails where the required number of nails is taken as 1.2 times the required number of 16d common nails, rounded up to the next full nail.
- b. Rafter tie heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.
- c. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements are permitted to be reduced proportionally to the reduction in span.
- d. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.
- e. Connected members shall be of sufficient size to prevent splitting due to nailing.

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Table 2308.11.3.1 Footnotes

- f. For allowable stress design snow loads less than 30 pounds per square foot, the required number of nails is permitted to be reduced by multiplying by the ratio of actual snow load plus 10 divided by 40, but not less than the number required for no snow load.
- g. Applies to roof live load of 20 psf or less.
- h. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the adjustment factors in Table 2308.11.3.1(1).
- i. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load and roof live load.

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TABLE 2308.11.3.1(1)—HEEL JOINT CONNECTION ADJUSTMENT FACTORS

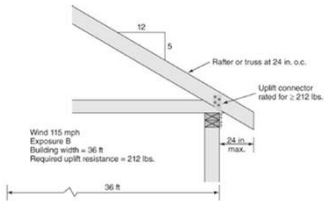
H_c/H_a[a, b]	HEEL JOINT CONNECTION ADJUSTMENT FACTOR
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

a. H_c = Height of ceiling joists or rafter ties measured vertically from the top of the rafter support walls to the bottom of the ceiling joists or rafter ties; H_a = Height of roof ridge measured vertically from the top of the rafter support walls to the bottom of the roof ridge.
b. Where H_c/H_a exceeds 1/3, connections shall be designed in accordance with accepted engineering practice.

190

2308.11.4 Wind uplift

- The roof construction shall have rafter and truss ties to the wall below. Resultant uplift loads shall be transferred to the foundation using a continuous load path. The rafter or truss to wall connection shall comply with Tables 2304.10.2 and 2308.11.4.
  - Exception: The truss to wall connection shall be determined from the uplift forces as specified on the truss design drawings or as shown on the construction documents.



191

TABLE 2308.11.4—REQUIRED RATING OF APPROVED UPLIFT CONNECTORS (pounds)[a, b, c, e, f, g, h, i]

BASIC WINDSPEED, V^i, (mph)	ROOF SPAN (feet)						
	12	20	24	28	32	36	40
EXPOSURE B							
90	-64	-85	-96	-107	-117	-128	-139
100	-102	-139	-158	-177	-195	-214	-233
110	-144	-199	-226	-254	-282	-310	-338
120	-190	-265	-302	-339	-377	-414	-452
130	-240	-335	-382	-431	-479	-528	-576
140	-294	-411	-470	-530	-590	-650	-710
EXPOSURE C							
90	-126	-175	-199	-223	-247	-272	-296
100	-179	-250	-285	-320	-356	-391	-426
110	-238	-332	-380	-428	-476	-525	-573
120	-302	-424	-485	-547	-608	-669	-731
130	-371	-521	-597	-674	-751	-828	-904
140	-446	-628	-719	-812	-904	-997	-1090
EXPOSURE D							
90	-166	-232	-265	-298	-311	-364	-396
100	-229	-321	-367	-413	-459	-505	-551
110	-298	-418	-478	-539	-601	-662	-723
120	-373	-526	-603	-679	-756	-833	-910
130	-455	-641	-734	-829	-924	-1020	-1114
140	-544	-767	-878	-992	-1106	-1220	-1333

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 1.61 km/hr, 1 pound = 0.454 Kg, 1 pound/foot = 14.5939 N/m.
a. The uplift connection requirements are based on a 33-foot mean roof height.
b. The uplift connection requirements are based on the framing being spaced 24 inches on center. Multiply by 0.67 for framing spaced 16 inches on center and multiply by 0.5 for framing spaced 12 inches on center.
c. The uplift connection requirements include an allowance for 10 pounds of dead load.
d. The uplift connection requirements include for the effects of 24-inch overhangs.
e. The uplift connection requirements are based on wind loading on end zones as defined in Figure 28.3-1 of ASCE 7. Connection loads for connections located a distance of 20 percent of the least horizontal dimension of the building from the corner of the building are permitted to be reduced by multiplying the table connection value by 0.75.
f. For wall-to-wall and wall-to-foundation connections, the capacity of the uplift connector is permitted to be reduced by 100 pounds for each full wall above. (For example, if a 500-pound rated connector is used on the roof framing, a 400-pound rated connector is permitted at the next floor level down).
g. Interpolation is permitted for intermediate values of V and roof spans.
h. The rated capacity of approved tie-down devices is permitted to include up to a 60-percent increase for wind effects where allowed by material specifications. The required rating of approved uplift connectors is based on allowable stress design loads.
i. V shall be determined in accordance with Section 1609.3.

192

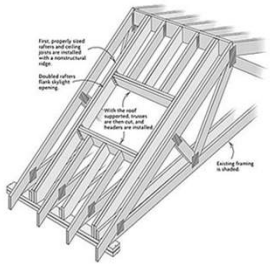
2308.11.5
Framing around openings

- Trimmer and header rafters shall be doubled, or of lumber of equivalent cross section, where the span of the header exceeds 4 feet.
- The ends of header rafters that are more than 6 feet in length shall be supported by framing anchors or rafter hangers unless bearing on a beam, partition or wall.

193

2308.11.5.1 - Openings in roof diaphragms in Seismic Design Categories B, C, D and E.

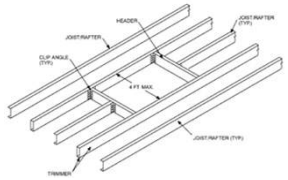
- In buildings classified as Seismic Design Category B, C, D or E, openings in horizontal diaphragms with a dimension that is greater than 4 feet shall be constructed with metal ties and blocking in accordance with this section and Figure 2308.8.4.1(1).
- Metal ties shall be not less than 0.058 inch (16 galvanized gage) in thickness by 1½ inches in width and shall have a yield stress not less than 33,000 psi.



194

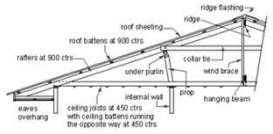
2308.11.5.1 - Openings in roof diaphragms in Seismic Design Categories B, C, D and E.

- Blocking shall extend not less than the dimension of the opening in the direction of the tie and blocking.
- Ties shall be attached to blocking in accordance with the manufacturer's instructions but with not less than eight 16d common nails on each side of the header-joist intersection.



195

2308.11.6
Purlins



- Purlins to support roof loads are permitted to be installed to reduce the span of rafters within allowable limits and shall be supported by struts to bearing walls.
- The maximum span of 2-inch by 4-inch purlins shall be 4 feet.
- The maximum span of the 2-inch by 6-inch purlin shall be 6 feet, but the purlin shall not be smaller than the supported rafter. Struts shall be not less than 2-inch by 4-inch members.
- The unbraced length of struts shall not exceed 8 feet, and the slope of the struts shall be not less than 45 degrees from the horizontal.

196

2308.11.8 Engineered wood products

- Prefabricated wood I-joists, structural glued-laminated timber and structural composite lumber shall not be notched or drilled except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

197

2308.11.9 Roof sheathing

- Roof sheathing shall be in accordance with Tables 2304.8(3) and 2304.8(5) for wood structural panels, and Tables 2304.8(1) and 2304.8(2) for lumber and shall comply with Section 2304.8.2.

198

2308.11.12 Wood trusses

- Wood trusses shall be designed in accordance with Section 2303.4. Connection to braced wall lines shall be in accordance with Section 2308.10.7.2.

199

Approved Agency 1703.1

- An approved agency shall provide all information as necessary for the building official to determine that the agency meets the applicable requirements specified in Sections 1703.1.1 through 1703.1.3.

200

1701.1
Special Inspections scope

- The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered.
- Materials of construction and tests shall conform to the applicable standards listed in the IBC.

201

1703.1.1I
Independence

Terracon
Consulting Engineers & Scientists

IMR TEST LABS

- An approved agency shall be objective, competent and independent from the contractor responsible for the work being inspected.
- The agency shall also disclose to the building official and the registered design professional in responsible charge possible conflicts of interest so that objectivity can be confirmed.

202

1704.2
Special Inspections

- Where application is made to the building official for construction as specified in Section 105, the owner or the owner's authorized agent, other than the contractor, shall employ one or more approved agencies to provide special inspections and tests during construction on the types of work specified in Section 1705 and identify the approved agencies to the building official.
- These special inspections and tests are in addition to the inspections by the building official that are identified in Section 110.

203

1704.2
Special Inspections Exceptions

- 1. Special inspections and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official.

204

1704.2
Special Inspections Exceptions

- 2. Unless otherwise required by the building official, special inspections and tests are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.

205

1704.2
Special Inspections Exceptions

- 3. Special inspections and tests are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.1.2 or the conventional light-frame construction provisions of Section 2308.

206

1704.2.3 - Statement Of Special Inspections

- The applicant shall submit a statement of special inspections in accordance with Section 107.1 as a condition for permit issuance.
- This statement shall be in accordance with Section 1704.3.

207

1704.2.3 Exception - Statement Of Special Inspections

- A statement of special inspections is not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.1.2 or the conventional light-frame construction provisions of Section 2308.

208

1704.2
Special Inspections Exceptions

- 4. The contractor is permitted to employ the approved agencies where the contractor is also the owner.

209

Special Inspections

- Section 1704
  - Approved Agency
  - Follow-up inspections
  - Reporting requirements

210

Special Inspections

- Steel
  - 1705.2
    - Exceptions
      - Periodic inspections permitted for smaller projects
    - Welds
    - Bolts
    - Material

211

Special Inspections

- Concrete
  - 1705.3
    - Exceptions
    - 3 stories or less w/conditions
    - Nonstructural slabs
    - Prescriptive foundations
    - Patios, driveways & sidewalks
  - Table 1705.3
    - Once a day
    - Not less than once for each 150 cubic yards of concrete,
    - Not less than once for each 5,000 square feet of surface area for slabs or walls.

212

Special Inspections

- Masonry
  - 1705.4
  - Exceptions
    - Empirically designed masonry, glass unit masonry, or masonry veneer part of nonessential buildings
    - Masonry foundation walls

213

Special Inspections

- Wood Structures
  - 1705.5
    - Fabrication process of wood structural elements and assemblies

214

Special Inspections

- Soils
  - 1705.6
    - existing site soil conditions, fill placement and load-bearing requirements

215

Special Inspections

- Driven Deep Foundations
  - 1705.7
    - when pile foundations are being installed and during tests

216

Special Inspections

- Cast-in-Place Deep Foundations
  - 1705.8
  - Performed during installation and testing of cast-in-place deep foundation elements

217

Special Inspections

- Helical Pile Foundations
  - 1705.9
    - Performed continuously during installation of helical pile foundations

218

Special Inspections

- Fabricated items
  - 1705.10
  - Performed in accordance with Section 1704.2.5.

219

Special Inspections

- Wind Resistance
  - 1705.11
    - In wind Exposure Category B, where Vasd is 120 miles per hour or greater.
    - In wind Exposure Category C or D, where Vasd is 110 mph or greater.

220

Special Inspections

- Seismic Resistance
  - 1705.12
    - Seismic Design Category C, D, E or F

221

Special Inspections

- Testing for seismic resistance
  - 1705.13
    - Seismic force-resisting systems
    - Structural steel elements
    - Nonstructural components
    - Designated seismic systems
    - Seismic isolation systems

222

Special Inspections

- Spray fireproofing
  - 1705.14
    - Surface Condition
    - Application
    - Thickness
    - Density
    - Bond Strength

223

Special Inspections

- Mastic and intumescent fire-resistant coatings
  - 1705.15
  - Performed in accordance with AWCI 12-B.

224

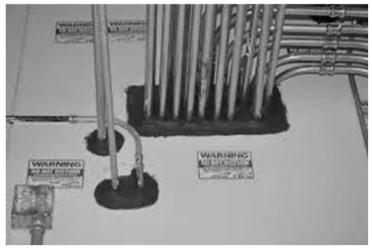
Special Inspections

- Exterior insulation and finish systems (EIFS)
  - 1705.16
    - Exceptions
    - Over weather barrier
    - Over masonry or concrete

225

Special Inspections

- Fire-resistant penetrations and joints
  - 1705.17
    - In high-rise buildings, buildings assigned to Risk Category III or IV, and Group R with occupant load greater than 200.



226

Special Inspections

- Smoke Control
  - 1705.18
  - During erection of ductwork
  - Prior to occupancy

227

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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