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Conventional Light-Frame Construction, 2007 CBC, Section 2308

1. Construction Documents, CBC 1603.1, exception: **Construction documents shall indicate the following structural design information**: Floor and roof live load; ground snow load, Pg (if applicable); basic wind speed in mph (3-second gust) and wind exposure; seismic design category and site class; flood design data, if located in flood hazard areas as established in CBC Section 1612.3.
2. Deferred Submittals: All requested deferred submittals shall be listed on the cover sheet of the drawings.
3. Foundation and Soils Investigation, CBC 1802.2, 1802.2.6 and 1802.2.7: A foundation and soils investigation report is required for projects located in Seismic Design Category C, D, E and F. The report shall have information to address the minimum requirements stated in Section 1802.6.
**The Building Official need not require a foundation or soils investigation for small room additions, patio covers and similar small projects where satisfactory data from site/adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in Section 1802.1 through 1802.2.6. CBC 1802.2, exception.*
4. Determination of Seismic Design Category (SDC): CBC 1613.5.6. The SDC factor depends on the seismicity at the site, occupancy and soil. The previous (1997 UBC) seismic zones 3 and 4 are now Seismic Design Category D, E or F. Most of the residential projects in California will fall into Seismic Design Category D or E.
5. Remark: Conventional Construction, Section 2308, is primarily based on the NEHRP provisions. As an alternate, AF&PA "2001 Wood Frame Construction Manual" may be used.

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1. Limitations for using Conventional Light-Frame Construction under the CBC, Section 2308.2 and 2308.12 (*If the limitations are exceeded, engineering design will be required for the entire structure or for the portion that is not in compliance with conventional framing- CBC 2308.1.1)*:

Max. two stories for structures in Seismic Design Category D or E.

In Seismic Design Category D or E, cripple stud walls shall be considered a story *(solid blocked cripple walls not exceeding 14 inches are not considered a story).*

Bearing walls floor-to-floor height shall not exceed 10 feet and a height of floor framing not to exceed 16 inches.

Wind speeds shall not exceed 100 mph *(110 mph (3-second gust) for building in Exposure Category B).*

Roof trusses and rafters shall not span more than 40 ft. between bearing points.

Ground snow loads shall not exceed 50 psf.

Concrete and masonry walls shall not extend above the basement. There are some exceptions for Masonry Veneer per Section 2308.12.2.

2. Buildings in Seismic Design Category D, E or F:

Building in Seismic Category D or E shall comply with Section 2308.12. Irregular

structures in Seismic Category D or E shall not use conventional light-frame construction (i.e. they must be engineered). CBC 2308.12.6.

Steel plate washers (3 inch x 3 inch x 0.229 inch square) at sill plate anchor bolts are required per Section 2308.12.8.

3. Braced wall lines:
Buildings shall be provided with exterior and interior braced wall lines per Sections 2308.9.3 and 2308.12.3. The spacing of the braced wall lines shall not exceed 25 ft for structures in Seismic Category D or E in both longitudinal and transverse direction in each story.

CBC Section 2308.9.3 Bracing
All exterior walls and main cross-stud partitions must be effectively and thoroughly braced to resist wind and seismic forces by one of the following methods:
1. Wood boards of 5/8-inch net minimum thickness applied diagonally on studs spaced not over 24 inches on center.
2. Wood Structural Panel Sheathing with a thickness not less than 5/16 inch for 16-inch stud spacing and not less than 3/8 inch for 24-inch stud spacing in accordance with CBC Tables 2308.9.3(2) and 2308.9.3(3).
3. Fiberboard sheathing panels not less than ½ inch thick applied vertically or horizontally on studs spaced not over 16 inches o.c. where installed with fasteners in accordance with Section 2306.4.4 and Table 2308.9.3(4).
4. Gypsum board (sheathing ½ inch thick by 4 feet wide, wallboard or veneer base) on studs spaced not over 24 inches on center and nailed at 7 inches on center with nails as required by CBC Tables 2306.4.5.
5. Particleboard wall sheathing panels must be in accordance with CBC Table 2308.9.3(5).
6. Portland cement plaster on studs spaced 16 inches on center installed in accordance with CBC Section 2510.
7. Hardboard panel siding when installed in accordance with CBC Section 2303.1.6 and CBC Table 2308.9.3(6).

For all methods, the braced panel must be at least 48 inches (4 ft) in width, covering three stud spaces where studs are spaced 16 inches apart and covering two stud spaces where studs are spaced 24 inches apart. For method 4, each braced wall panel must be at least 96 inches (8 ft) in length when applied to one face of a braced wall panel and 48 inches (4 ft) when applied to both faces. All vertical joints of panel sheathing must occur over studs. Horizontal joints must occur over blocking equal in size to the studding except where waived by the installation requirements for the specific sheathing materials. Braced wall panel sole plates must be nailed to the floor framing, and top plates must be connected to the framing above in accordance with CBC Section 2308.3.2. Where joists are perpendicular to braced wall lines above, blocking must be provided under and in line with the braced wall panels. The location, type and amount of bracing must comply with CBC Table 2308.9.3(1).

4. Braced wall panel connections: Shall be per Section 2308.3.2. **Wall bracing in Seismic Category D and E shall comply with Table 2308.12.4** *(Table attached below).*

5. Sill anchorage: Shall be per Section 2308.3.3. Anchors shall be spaced at 4 ft. on center maximum. 5/8” bolts are required in Seismic Design Category E. CBC 2308.12.9. Anchor bolts shall have 3”x3”x0.229” plate washers (in Seismic Design Category D or E). CBC 2308.12.8.

6. Braced wall line support, CBC 2308.3.4. Braced wall lines shall be supported by continuous footings. For structures with max. plan dimension not over 50 ft., continuous footings are required only at exterior walls.

7. Bracing, CBC 2308.9.3. Refer to Fig. 2308.9.3 for location, type and amount of required bracing. Braced panels shall start not more than 8 ft., for structures in Seismic Category D or E, from each end of a braced wall line. Max. offset of panels in the same braced wall line shall be 4 ft.

8. Footings supporting walls, Table 1805.4.2.

2-story, slab on grade: Minimum width= 15", thickness= 6", depth=18".

2-story, raised floor: Minimum width= 18, thickness= 6", depth=24".

****Max. two stories for structures in Seismic Design Category D or E using Conventional Framing.*

9. Footings reinforcement, CBC 1908.1.15. Footings at stud bearing walls shall have longitudinal reinforcement in accordance with CBC 1908.1.15 (c). Minimum 2 #4 rebar at the top and bottom of the footings. Where slab on ground is cast monolithically with the footing, 2 #5 bar is permitted to be located at either the top of the slab or bottom of the footing.

Conventional Construction Requirements for Seismic Design Category D and E Braced Walls

TABLE 2308.12.4
WALL BRACING IN SEISMIC DESIGN CATEGORIES D AND E
(Minimum Length of Wall Bracing per each 25 Linear Feet of Braced Wall Line[a])

CONDITION	SHEATHING TYPE[b]	$S_{DS} < 0.50$	$0.50 \le S_{DS} < 0.75$	$0.75 \le S_{DS} \le 1.00$	$S_{DS} > 1.00$
One story	G-P[c]	10 feet 8 inches	14 feet 8 inches	18 feet 8 inches	25 feet 0 inches
	S-W	5 feet 4 inches	8 feet 0 inches	9 feet 4 inches	12 feet 0 inches
Story below top story [HCD 1]	*G-P[c,d]*	*18 feet 8 inches[d]*	*NP*	*NP*	*NP*
	S-W[d]	*10 feet 8 inches[d]*	*13 feet 4 inches[d]*	*17 feet 4 inches[d]*	*21 feet 4 inches[d]*
Bottom story of three stories [HCD 1]	*G-P*	*Conventional construction not permitted; conformance with Section 2301.2, Item 1or 2 is required.*			
	S-W				

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Minimum length of panel bracing of one face of the wall for S-W sheathing or both faces of the wall for G-P sheathing; h/w ratio shall not exceed 2:1. For S-W panel bracing of the same material on two faces of the wall, the minimum length is permitted to be one-half the tabulated value but the h/w ratio shall not exceed 2:1 and design for uplift is required.

b. G-P = gypsum board, fiberboard, particleboard, lath and plaster or gypsum sheathing boards; S-W = wood structural panels and diagonal wood sheathing. *NP = not permitted.*

c. Nailing as specified below shall occur at all panel edges at studs, at top and bottom plates and, where occurring, at blocking:
For $^1/_2$-inch gypsum board, 5d (0.113 inch diameter) cooler nails at 7 inches on center;
For $^5/_8$-inch gypsum board, No. 11 gage (0.120 inch diameter) at 7 inches on center;
For gypsum sheathing board, $1^3/_4$ inches long by $^7/_{16}$-inch head, diamond point galvanized nails at 4 inches on center;
For gypsum lath, No. 13 gage (0.092 inch) by $1^1/_8$ inches long, $^{19}/_{64}$-inch head, plasterboard at 5 inches on center;
For Portland cement plaster, No. 11 gage (0.120 inch) by $1^1/_2$ inches long, $^7/_{16}$- inch head at 6 inches on center;
For fiberboard and particleboard, No. 11 gage (0.120 inch) by $1^1/_2$ inches long, $^7/_{16}$-inch head, galvanized nails at 3 inches on center.

d. ***[HCD 1]*** *Applies to detached one- and two- family dwellings only.*

This diagram of a home shows wall bracing requirements