



MINIMUM CONSTRUCTION SPECIFICATIONS

INFORMATION GUIDELINE

5

Jan. 2017

CITY OF ESCONDIDO • BUILDING DIVISION • 201 N. BROADWAY, ESCONDIDO, CA 92025 • (760) 839-4647

These are minimum specifications from the 2016 California Residential and California Building Code. This Guideline is intended as a guide for residential projects. These items are commonly found to be lacking on plans that are submitted for plan check. By signing page 5, these minimum specifications may be used as part of your plans. The use of this Guideline will shorten the time required to prepare your plans and will help the plan checker in reviewing your plans more efficiently. Specifications may be stapled to the first sheet of the plans or incorporated into the drawings.

A. Foundation and Underfloor

1. Concrete for footings shall have a minimum compressive strength of 2,500 psi at 28 days and shall be composed of 1 part cement, 3 parts sand, 4 parts of 1" maximum size rock, and not more than 7 1/2 gallons of water per sack of cement.
2. Concrete Slabs: Slabs on a grade shall be at least 3 1/2" thick (Sec. R506.1). with a min. 6-mil vapor barrier beneath slab.
3. Wood and Earth Separation: Foundations supporting wood shall extend at least 8" above the adjacent finish grade (Sec. R317.1). Provide 18" clearance under wood joists and 12" clearance under wood girders (Sec. R317.1).
4. Foundation Reinforcement: Foundations with stem walls shall be provided with a minimum of one No. 4 bar within 12" of the top of the wall and one No. 4 bar located 3 inches to 4 inches from the bottom of the footing. Slab on grade cast monolithically with the footing may have one No. 5 bar or two No. 4 bar in the middle third of the footing depth (R403.1.3.1).
5. Treated Wood: All foundation plates or sills and sleepers on a concrete or masonry slab, in direct contact with earth, and sills which rest on concrete or masonry exterior foundation walls and are less than 8 inches from the exposed ground, and wood joists closer than 18", or wood girders or supports closer than 12" to the ground, shall be preservative-treated wood in accordance with AWP A U1 or approved wood of natural resistance to decay (R317.1).
6. Anchor Bolts and Footing Sills: Foundation plates and sills shall have full bearing on the footing wall or slab and shall be bolted to the foundation with 1/2" steel bolts embedded at least 7" into concrete or masonry or anchor straps and spaced not more than 6' apart; not less than two bolts per piece with one bolt located within 12" of each end of each piece, not closer than 7 bolt diameters from each end (R403.1.6.) Plate washers 3" x 3" x 0.229" thick shall be used on each bolt.
7. Under-floor Ventilation: Under-floor areas shall be ventilated by openings in foundation walls. Vent openings shall have a

net area of not less than one square foot for each 150 square feet of crawl-space area. The openings shall be arranged to provide cross ventilation at each wallline containing vents, at least one vent should be located within 3' of each corner of the building (R408.2).

8. Vents shall be covered with corrosion-resistant wire mesh with the least dimension being 1/8" thick.
9. Underfloor Access: Underfloor access openings through the floor shall be a minimum of 18" X 24". Openings through a perimeter wall shall be not less than 16" X 24" (R408.4).

B. Wood Framing

1. Lumber: All joists, rafters, beams, and posts 2" to 4" thick shall be No. 2 grade Douglas Fir-Larch or better. All posts and beams 5" and thicker shall be No. 1 grade Douglas Fir-Larch or better (see item B.15. for grade requirements for studs).
2. Wall Bracing: Buildings shall be provided with exterior and interior braced wall lines. Spacing shall not exceed 25' on center in both the longitudinal and transverse directions in each story. (Sec.R602.10) See Tables R602.10.1.3.
3. Cross Bridging: Joists exceeding 2X12 shall be supported laterally by diagonal bridging, full-depth blocking or a continuous 1-inch-by-3-inch strip nailed across the bottom of the joist not exceeding 8'. (R502.7.1).
4. Provide blocking at the ends and at the supports of floor joists (Sec. R502.7).
5. Double Joists: Floor joists shall be doubled under bearing partitions running parallel with the joists. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth (Sec. R502.4).
6. Rafter purlin braces are to be not less than 45° to the horizontal. The unbraced length of purlin braces shall not exceed 8'. The maximum span of 2" x 4" purlins shall be 4 feet; 2" x 6" purlins shall be 6 feet. In no case shall purlins be smaller than the supported rafters (Sec. R802.5.1).

7. Rafters shall be framed directly opposite each other at the ridge. Ridge boards shall not be less than 1" nominal thickness and not less in depth than the end cut of the rafters. Valley's and hips shall not be less than 2" nominal thickness and not less than the end cut of the rafter (Sec. R802.3).
8. **Rafter Ties:** Rafter ties shall be spaced not more than 4' on center where rafters and ceiling joists are not parallel. Rafter ties shall be not more than 24" on center with tile roofing. Rafter ties shall be provided as low as possible on each rafter pair (Sec. R802.3.1).
9. Provide 1/2" minimum clearance between top plates of interior partitions and bottom chords of trusses.
10. Provide double 2" x 4" top plates with the end joints offset at least 24" (Sec. R602.3.2.).
11. Nailing/Fastening shall be in compliance with Table R602.3.(1) of the CRC (see sheet 7 of this form).
12. Fire blocking shall be provided in the following locations: (Section R302.11)
 - a. In concealed spaces of stud walls and partitions including furred spaces and parallel rows of studs or staggered studs vertically at the ceiling and floor levels and horizontally at intervals not to exceed 10'.
 - b. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
 - c. In concealed spaces between stair stringers at the top and bottom of the run and between studs along and in line with the run of stairs if the walls under the stairs are unfinished.
 - d. In openings around vents, pipes, ducts, chimneys, fireplaces and similar openings which afford a passage for fire at ceiling and floor levels [with non-combustible materials].
 - e. At openings between attic spaces and chimney chases for factory-built chimneys.
13. **Fire Block Construction:** Except as provided in Sect R302.11, Item 4 fireblocking shall consist of the following materials.
 - a. 2" nominal lumber.
 - b. Two thicknesses of 1" nominal lumber with broken lap joints.
 - c. One thickness of 23/32" wood structural panels with joints backed by 23/32" wood structural panels.
 - d. One thickness of 3/4" particle board with joints backed by 3/4" particle board.
 - e. One-half inch gypsum board.
 - f. One-quarter inch cement based millboard.
 - g. Batts or blankets of mineral wool or glass fiber or other approved materials installed in such a manner as to be securely retained in place.
14. Batts or blankets of mineral or glass fiber or other approved non rigid materials shall be permitted for compliance with the 10-foot horizontal fireblocking in walls constructed using parallel rows of studs or staggered studs (Section R302.11.1.1).
15. **Studs:** In one story buildings supporting only a roof assembly, studs for exterior walls and interior bearing walls shall be not less than 2" x 4" at no more than 24" on center. When supporting a floor and roof the maximum spacing shall be 16" for 2"x4" studs. Studs for interior non-bearing partitions may be 2" x 3" at 16" on center. Studs not more than 8' long may be utility grade Douglas Fir-Larch or better when supporting not more than a roof and a ceiling and 10' for interior nonload bearing walls. Studs longer than 8' long shall be in accordance with Table R602.3(5).
16. An A.I.T.C. Certificate of Conformance for glued laminated wood members shall be given to the Building Inspector prior to framing inspection.
17. **Framing Around Openings.** Trimmer and header rafters shall be doubled, or of lumber of equivalent cross-section, when the span of the header exceeds 4'. The ends of header rafters more than 6' long shall be supported by approved rafter hangers unless bearing on a beam, partition or wall (Sec. R502.10).

C. General Material Specifications

1. **Mortar Mix:** Mortar to be used on construction of masonry walls, shall conform to ASTM C 270 Type S or M.
2. **Grout Mix:** Grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE6.
3. **Masonry:** The masonry units shall comply with ASTM C55 for concrete brick; ASTM C 73 for calcium silicate face brick; ASTM C 90 for load bearing concrete masonry units or ASTM C 74 for precast concrete and calcium silicate masonry units.
4. **Reinforcing Steel:** The reinforcing steel used in construction of reinforced masonry or concrete structures shall conform to Article 2.4 of TMS 602/ACI 530.1/ASCE6.
5. **Structural Steel:** Steel used as structural shapes such as wide flange sections, channels, plates, angles shall comply with the specified ASTM standard or specification and the provisions of Chapter 22 of the CBC.

D. Roofing and Weatherproofing

1. **All Weather-exposed surfaces** require a weather-resistive barrier to protect the interior surfaces complying with ASTM D 226, one layer No. 15 felt. See Exceptions. (Sec. R703.2).
2. **Flashing and Counterflashing.** Exterior openings exposed to the weather shall be flashed in such a manner as to make them weatherproof. All parapets shall be provided with coping of approved materials. All flashing, counterflashing and coping, when of metal, shall not be of less than No. 26 U.S. gauge corrosion-resistant metal (Sec. R 903.2.1).
3. **Waterproofing Weather-Exposed Areas.** Balconies, landings, exterior stairways and similar surfaces exposed to the weather and sealed underneath shall be waterproofed and sloped a minimum of 1/4 unit vertical in 12 units horizontal (2% slope) for drainage. At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided as required in Sec. R903.

4. Dampproofing Foundation Walls. Foundation walls enclosing a basement below finished grade shall be dampproofed outside by approved methods and materials (Sec. R406.1).
5. Window Wells: shall be a minimum of 9 square feet with a minimum horizontal projection and width of 36 inches. The area of the window well shall allow the emergency escape and rescue opening to be fully opened.
6. Roof Covering: Asphalt shingle, wood shingle or shake, tile and mineral surfaced, built-up roofing shall be installed per applicable requirements of CRC Chapter 9.
7. Wood Shingle and Wood Shake Roofs: Wood roof covering material shall be pressure treated for fire retardancy meeting a minimum of Class C rating.
8. Unless roofs are sloped to drain over roof edges or are designed to support accumulated water, roof drains shall be installed at each low point of the roof. Roof drains shall be adequate in size to convey the water tributary to the roof drains. Where roof drains are required, overflow drains having the same size as the roof drains shall be installed with the inlet flow line located 2" above the low point of the roof, or overflow scuppers having three times the size of the roof drains may be installed in adjacent parapet walls with the inlet flow line located 2" above the low point of the adjacent roof and having a minimum opening height of 4". Overflow drains shall be connected to drain lines independent from the roof drains. Roof drains and overflow drains, when concealed within the construction of the building, shall be installed in accordance with the California Plumbing Code.
9. Attic ventilating area shall be not less than 1/150 of the area of the space ventilated, except that the area may be 1/300 provided at least 40 percent and not more than 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3' above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents. The openings shall be covered with corrosion-resistant metal mesh with mesh openings of 1/4" in dimension (Sec. R806.1). Provide 1" of air space between insulation and the roof sheathing at eave or cornice vents.
10. Weep Screed: ASTM C 926. A weep screed with a minimum 3½" vertical attaching flange shall be provided at or below the foundation plate line for all exterior stud walls finished on the exterior with stucco. The screed shall be placed a minimum of 4" above earth or 2" above paved areas (Sec. R703.7.2.1).
11. Two layers of Grade D paper are required over wood base sheathing when stucco is used. (Sec. R703.7.3).

E. General

1. Attic Access: Attic areas shall be accessible by an opening no less than 22" x 30". With a furnace in the attic the opening shall be large enough to remove the largest piece of equipment. The attic access location shall be in a hallway or other readily accessible location (Sec R807.1). 30" minimum unobstructed headroom in the attic space shall be provided at or above the access opening.
2. Shower Enclosures: Shower walls must be finished to a height of 70" above the drain inlet with smooth, hard, non-absorbent surfaces. Glazing used in walls, doors and panels of shower and bathtub enclosures shall be fully tempered, laminated safety glass or approved plastic (Sec. 2406.3). Thresholds to be of sufficient width to accommodate a minimum 22" Door (CPC 408.5).

3. Electric Meter Enclosure: Contact San Diego Gas & Electric Company, Customer Extension Planning Department, for meter location. All wiring must comply with the currently adopted edition of the National Electric Code.
4. Fire Warning Systems:
 - 4.1. GENERAL. Dwelling units, congregate residences and hotel or lodging house guest rooms that are used for sleeping purposes shall be provided with smoke alarms. Smoke alarms shall be installed in accordance with the approved manufacturer's instructions.
 - 4.2. ADDITIONS, ALTERATIONS OR REPAIRS. Where a addition, alteration or repair requiring a permit occur, or when one or more sleeping rooms are added or created in existing Group R Occupancies, smoke alarms shall be installed in accordance with Sec.R314.
 - 4.3. POWER SOURCE. In new construction, required smoke alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source and shall be equipped with a battery backup. The smoke alarm shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke alarms may be solely battery operated when installed in existing buildings; or in buildings without commercial power; or in buildings which undergo non-structural alterations or repairs. (Sec. R314.4.).
 - 4.4. LOCATION WITHIN DWELLING UNITS. In dwelling units, a smoke alarm shall be installed in each sleeping room and on the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms. When the dwelling unit has more than one story and in dwellings with basements, a smoke alarm shall be installed on each story and in the basement. In dwelling units where a story or basement is split into two or more levels, the smoke alarm shall be installed on the upper level, except when an intervening door is placed between the levels a smoke alarm shall be installed on each level. When sleeping rooms are on an upper level, the smoke alarm shall be placed at the ceiling of the upper level in close proximity to the stairway. Smoke alarms shall sound an alarm audible in all sleeping areas of the dwelling unit in which they are located (Sec.R314.3).
5. Emergency Escape or Rescue: Basements, habitable attics and every sleeping room shall have at least one operable emergency escape and rescue opening. The opening shall be operable from the inside to provide a full clear opening without the use of separate tools. All egress or rescue windows for sleeping rooms shall have a minimum net clear opening of 5.7 square feet, grade floor openings may be 5.0 square feet. The minimum net clear opening height dimension shall be 24". The minimum net clear opening width dimension shall be 20". Where windows are provided as a means of egress or rescue they shall have a finished sill height not more than 44" above the floor (Sec. R310).

Escape and rescue windows with a finished sill height below the adjacent ground level shall have a window well in compliance with the following:

 - The clear horizontal dimensions shall allow the window to be fully opened and provide a minimum accessible net clear opening of 9 SF, with a minimum dimension of 36".
 - Window wells with a vertical depth greater than 44" shall be equipped with an approved permanently affixed ladder or steps that are accessible with the window in the fully open position. The ladder or steps shall not encroach into the required dimensions of the window well by more than 6".

Rungs shall have a clear inside width of 12", shall project at least 3" from the wall and shall not exceed 18" o.c. The ladder or steps shall not be obstructed by the emergency escape and rescue opening.

6. Glass and Glazing: Glass and glazing shall satisfy the provision of CRC Section R308.4. Federal specifications may take precedence. See your glazing contractor.
7. Compaction reports are required for all fill soils over 12" deep.
8. If there are cuts more than two feet, or fills more than one foot in height, or if more than 200 cubic yards of earth is moved, a grading permit is required.
9. Natural drainage patterns shall not be altered in such a way as to concentrate or alter the point of discharge for drainage flows.
10. All piping passing through masonry or concrete walls shall be sleeved in an approved manner 312.10 CPC.
11. ABS DWV systems are limited to 2-stories in height of residential construction.
12. The discharge line from an ejector pump or other mechanical device shall be equipped with an accessible backwater valve or swing check valve and gate or ball valve. Refer to Section 710.4 CPC for valve location.
13. Drainage piping serving fixtures located on floors below the elevation of the next upstream manhole cover of the public or private sewer serving such drainage piping shall be protected from backflow of sewage by installing an approved backwater valve. Fixtures above such elevation shall not discharge through the backwater valve.
15. Permanent vacuum breakers must be installed on all hose bibbs.
16. In showers and tub-shower combinations, control valves must be pressure balanced or thermostatic mixing valves.
17. Ducts for domestic kitchen range ventilation shall be of metal and have smooth interior surfaces.
18. Ducts for domestic kitchen downdraft grill-range ventilation installed under a concrete slab may be of approved schedule 40 PVC when installed per the requirements listed in Section 504.3 CMC and the manufacturer's specifications.
19. Domestic clothes dryer vents shall be a minimum of 4" diameter, must terminate outside the building and be equipped with a backdraft damper. Duct must be of metal with smooth interior surfaces. Screws or other fasteners that will obstruct the flow of air are prohibited. 504.4 CMC.
20. Termination of environmental exhaust air shall not be closer than 3'-0" to a property line or opening into the building.
- 20.1 Rooms containing a bathtub, shower, spa and similar bathing fixtures shall be mechanically ventilated per the California Mechanical Code. CRC Section R303.3.1
21. Fan assisted appliances must be vented in accordance with the manufacturer's installation instructions and the CMC. Categories II, III and IV must be vented per the manufacturer's installation instructions.
22. Warm-air furnaces installed in bedrooms and/or bathrooms shall comply with Chapter 9 CMC.
23. Domestic free-standing or built-in ranges shall have a vertical clearance above the cooktop of not less than 30" to unprotected combustible material. Sec.921.4.2 CMC.
24. All 125-volt single phase, 15 and 20 amp branch circuits installed in bedrooms, dining rooms, family rooms, living rooms, dens, libraries, parlors, sun rooms, recreation rooms, halways, closets or similar rooms or areas shall be protected by an arc-fault-circuit-interrupter(s), (AFCI).
25. All tables not referenced above but shown on pages 7-10 are hereby incorporated in the approved plans.
26. Guards/Guardrails: Guards shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are more than 30" measured vertically to the floor or grade below at any point within 36" horizontally to the edge of the open side. (Sec R312).

EXCEPTION: For occupancies in R-3, and within individual dwelling units in occupancies in Group R-2, guards whose top rail also serves as a (stairway) handrail shall have a height of not less than 34" nor more than 38" measured vertically from the leading edge of the stair tread nosing.

Open guardrails shall have intermediate rails or an ornamental pattern such that a sphere 4" in diameter cannot pass through (Sec. R312.1.3).

EXCEPTIONS: The triangular openings formed by the riser, tread and bottom element of a guardrail at the open side of a stairway may be of such size that a sphere 6" in diameter cannot pass through (Sec.R 312.1.3 Exc. 1).
27. Within individual dwelling units and sleeping units in Group R-2 and R-3 occupancies, openings for required guards on sides of stair treads shall not allow a sphere of 4 3/8" inches to pass through. (Sec. R312.3 Exc. 2).

28. The minimum capacity for water heaters shall be in accordance with the **first hour rating** listed in Table 5-1 CPC.

Table 5-1¹

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
First Hour Rating², Gallons	42	54	54	54	67	67	80	67	80	80	80

Notes:

¹The first hour rating is found on the “Energy Guide” label.

²Non-storage and solar water heaters shall be sized to meet the appropriate first hour rating as shown in the table.

29. Structures built within Fire Hazard (Severity) Zones require additional fire-preventative, ignition-resistant measures. Please verify specific requirements with Fire Prevention, 839-5400. All construction methods and details shall be shown on the plans. Wildland-Urban Interface Code; Chapter 7A, CBC; Local amendments.

I acknowledge by my signature below that these minimum construction specifications are part of the approved plans and that the construction will comply with these specifications or any more restrictive specifications shown on the approved plans.

SIGNATURE OF APPLICANT OR DESIGNER

DATE

TABLE R503.2.1.1(1)
ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANELS FOR ROOF AND
SUBFLOOR SHEATHING AND COMBINATION SUBFLOOR UNDERLAYMENT^{a, b, c}

SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inch)	ALLOWABLE LIVE LOAD (psf) ^{b,1}		MAXIMUM SPAN (inches)		LOAD (pounds per square foot, at maximum span)		MAXIMUM SPAN (inches)
		SPAN @ 16" o.c.	SPAN @ 24" o.c.	With edge support ^d	Without edge support	Total load	Live load	
Sheathing ^e		Roof ^f				Subfloor ⁱ		
16/0	$\frac{3}{8}$	30	—	16	16	40	30	0
20/0	$\frac{3}{8}$	50	—	20	20	40	30	0
24/0	$\frac{3}{8}$	100	30	24	20 ^g	40	30	0
24/16	$\frac{7}{16}$	100	40	24	24	50	40	16
32/16	$\frac{15}{32}, \frac{1}{2}$	180	70	32	28	40	30	16 ^h
40/20	$\frac{19}{32}, \frac{5}{8}$	305	130	40	32	40	30	20 ^{h, i}
48/24	$\frac{23}{32}, \frac{3}{4}$	—	175	48	36	45	35	24
60/32	$\frac{7}{8}$	—	305	60	48	45	35	32
Underlayment, C-C plugged, single floor ^e		Roof ^f				Combination subfloor underlayment ^e		
16 o.c.	$\frac{19}{32}, \frac{5}{8}$	100	40	24	24	50	40	16 ⁱ
20 o.c.	$\frac{19}{32}, \frac{5}{8}$	150	60	32	32	40	30	20 ^{h, j}
24 o.c.	$\frac{23}{32}, \frac{3}{4}$	240	100	48	36	35	25	24
32 o.c.	$\frac{7}{8}$	—	185	48	40	50	40	32
48 o.c.	$1\frac{3}{32}, 1\frac{1}{8}$	—	290	60	48	50	40	48

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

- The allowable total loads were determined using a dead load of 10 psf. If the dead load exceeds 10 psf, then the live load shall be reduced accordingly.
- Panels continuous over two or more spans with long dimension (strength axis) perpendicular to supports. Spans shall be limited to values shown because of possible effect of concentrated loads.
- Applies to panels 24 inches or wider.
- Lumber blocking, panel edge clips (one midway between each support, except two equally spaced between supports where span is 48 inches), tongue-and-groove panel edges, or other approved type of edge support.
- Includes Structural I panels in these grades.
- Uniform load deflection limitation: $\frac{1}{180}$ of span under live load plus dead load, $\frac{1}{240}$ of span under live load only.
- Maximum span 24 inches for $\frac{15}{32}$ - and $\frac{1}{2}$ -inch panels.
- Maximum span 24 inches where $\frac{3}{4}$ -inch wood finish flooring is installed at right angles to joists.
- Maximum span 24 inches where 1.5 inches of lightweight concrete or approved cellular concrete is placed over the subfloor.
- Unsupported edges shall have tongue-and-groove joints or shall be supported with blocking unless minimum nominal $\frac{1}{4}$ -inch-thick wood panel-type underlayment, fiber-cement underlayment with end and edge joints offset not less than 2 inches or $1\frac{1}{2}$ inches of lightweight concrete or approved cellular concrete is placed over the subfloor, or $\frac{3}{4}$ -inch wood finish flooring is installed at right angles to the supports. Fiber-cement underlayment shall comply with ASTM C1288 or ISO 8336 Category C. Allowable uniform live load at maximum span, based on deflection of $\frac{1}{360}$ of span, is 100 psf.
- Unsupported edges shall have tongue-and-groove joints or shall be supported by blocking unless nominal $\frac{1}{4}$ -inch-thick wood panel-type underlayment, fiber-cement underlayment with end and edge joints offset not less than 2 inches or $\frac{3}{4}$ -inch wood finish flooring is installed at right angles to the supports. Fiber-cement underlayment shall comply with ASTM C1288 or ISO 8336 Category C. Allowable uniform live load at maximum span, based on deflection of $\frac{1}{360}$ of span, is 100 psf, except panels with a span rating of 48 on center are limited to 65 psf total uniform load at maximum span.
- Allowable live load values at spans of 16 inches on center and 24 inches on center taken from reference standard APA E30, APA Engineered Wood Construction Guide. Refer to reference standard for allowable spans not listed in the table.

TABLE R602.3(1)
FASTENING SCHEDULE

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING AND LOCATION
Roof			
1	Blocking between ceiling joists or rafters to top plate	4-8d box (2 1/2" x 0.113") or 3-8d common (2 1/2" x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	Toe nail
2	Ceiling joists to top plate	4-8d box (2 1/2" x 0.113"); or 3-8d common (2 1/2" x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions [see Sections R802.3.1, R802.3.2 and Table R802.5.1(9)]	4-10d box (3" x 0.128"); or 3-16d common (3 1/2" x 0.162"); or 4-3" x 0.131" nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) [see Sections R802.3.1 and R802.3.2 and Table R802.5.1(9)]	Table R802.5.1(9)	Face nail
5	Collar tie to rafter, face nail or 1 1/4" x 20 ga. ridge strap to rafter	4-10d box (3" x 0.128"); or 3-10d common (3" x 0.148"); or 4-3" x 0.131" nails	Face nail each rafter
6	Rafter or roof truss to plate	3-16d box nails (3 1/2" x 0.135"); or 3-10d common nails (3" x 0.148"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss ¹
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2" ridge beam	4-16d (3 1/2" x 0.135"); or 3-10d common (3 1/2" x 0.148"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails	Toe nail
		3-16d box 3 1/2" x 0.135"); or 2-16d common (3 1/2" x 0.162"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	End nail
Wall			
8	Stud to stud (not at braced wall panels)	16d common (3 1/2" x 0.162")	24" o.c. face nail
		10d box (3" x 0.128"); or 3" x 0.131" nails	16" o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d box (3 1/2" x 0.135"); or 3" x 0.131" nails	12" o.c. face nail
		16d common (3 1/2" x 0.162")	16" o.c. face nail
10	Built-up header (2" to 2" header with 1/2" spacer)	16d common (3 1/2" x 0.162")	16" o.c. each edge face nail
		16d box (3 1/2" x 0.135")	12" o.c. each edge face nail
11	Continuous header to stud	5-8d box (2 1/2" x 0.113"); or 4-8d common (2 1/2" x 0.131"); or 4-10d box (3" x 0.128")	Toe nail
12	Top plate to top plate	16d common (3 1/2" x 0.162")	16" o.c. face nail
		10d box (3" x 0.128"); or 3" x 0.131" nails	12" o.c. face nail
13	Double top plate splice for SDCs A-D ₂ with seismic braced wall line spacing < 25'	8-16d common (3 1/2" x 0.162"); or 12-16d box (3 1/2" x 0.135"); or 12-10d box (3" x 0.128"); or 12-3" x 0.131" nails	Face nail on each side of end joint (minimum 24" lap splice length each side of end joint)
	Double top plate splice SDCs D ₀ , D ₁ , or D ₂ ; and braced wall line spacing ≥ 25'	12-16d (3 1/2" x 0.135")	

(continued)

WALL CONSTRUCTION

TABLE R602.3(1)—continued
FASTENING SCHEDULE

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a,b,c}	SPACING AND LOCATION
14	Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3½" × 0.162")	16" o.c. face nail
		16d box (3½" × 0.135"); or 3" × 0.131" nails	12" o.c. face nail
15	Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162"); or 4-3" × 0.131" nails	3 each 16" o.c. face nail 2 each 16" o.c. face nail 4 each 16" o.c. face nail
16	Top or bottom plate to stud	4-8d box (2½" × 0.113"); or 3-16d box (3½" × 0.135"); or 4-8d common (2½" × 0.131"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	Toe nail
		3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	End nail
17	Top plates, laps at corners and intersections	3-10d box (3" × 0.128"); or 2-16d common (3½" × 0.162"); or 3-3" × 0.131" nails	Face nail
18	1" brace to each stud and plate	3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 2-10d box (3" × 0.128"); or 2 staples 1¾"	Face nail
19	1" × 6" sheathing to each bearing	3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 2-10d box (3" × 0.128"); or 2 staples, 1" crown, 16 ga., 1¾" long	Face nail
20	1" × 8" and wider sheathing to each bearing	3-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3 staples, 1" crown, 16 ga., 1¾" long	Face nail
		Wider than 1" × 8" 4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 4 staples, 1" crown, 16 ga., 1¾" long	
Floor			
21	Joist to sill, top plate or girder	4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Toe nail
22	Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box (2½" × 0.113")	4" o.c. toe nail
		8d common (2½" × 0.131"); or 10d box (3" × 0.128"); or 3" × 0.131" nails	6" o.c. toe nail
23	1" × 6" subfloor or less to each joist	3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 2 staples, 1" crown, 16 ga., 1¾" long	Face nail

(continued)

**TABLE 602.3(1)
FASTENING SCHEDULE—continued**

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a,b,c}	SPACING AND LOCATION	
Floor				
24	2" subfloor to joist or girder	3-16d box (3 1/2" x 0.135"); or 2-16d common (3 1/2" x 0.162")	Blind and face nail	
25	2" planks (plank & beam—floor & roof)	3-16d box (3 1/2" x 0.135"); or 2-16d common (3 1/2" x 0.162")	At each bearing, face nail	
26	Band or rim joist to joist	3-16d common (3 1/2" x 0.162") 4-10 box (3" x 0.128"), or 4-3" x 0.131" nails; or 4-3" x 14 ga. staples, 7/16" crown	End nail	
27	Built-up girders and beams, 2-inch lumber layers	20d common (4" x 0.192"); or 10d box (3" x 0.128"); or 3" x 0.131" nails	Nail each layer as follows: 32" o.c. at top and bottom and staggered.	
		And: 2-20d common (4" x 0.192"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	24" o.c. face nail at top and bottom staggered on opposite sides	
28	Ledger strip supporting joists or rafters	4-16d box (3 1/2" x 0.135"); or 3-16d common (3 1/2" x 0.162"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails	At each joist or rafter, face nail	
29	Bridging to joist	2-10d (3" x 0.128")	Each end, toe nail	
ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a,b,c}	SPACING OF FASTENERS	
			Edges (inches) ^a	Intermediate supports ^{b,c} (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				
30	3/8" - 1/2"	6d common (2" x 0.113") nail (subfloor, wall) ^f 8d common (2 1/2" x 0.131") nail (roof)	6	12 ^f
31	19/32" - 1"	8d common nail (2 1/2" x 0.131")	6	12 ^f
32	1 1/8" - 1 1/4"	10d common (3" x 0.148") nail; or 8d (2 1/2" x 0.131") deformed nail	6	12
Other wall sheathing^g				
33	1/2" structural cellulosic fiberboard sheathing	1 1/2" galvanized roofing nail, 7/16" head diameter, or 1" crown staple 16 ga., 1 1/4" long	3	6
34	25/32" structural cellulosic fiberboard sheathing	1 3/4" galvanized roofing nail, 7/16" head diameter, or 1" crown staple 16 ga., 1 1/4" long	3	6
35	1/2" gypsum sheathing ^d	1 1/2" galvanized roofing nail; staple galvanized, 1 1/2" long; 1 1/4" screws, Type W or S	7	7
36	5/8" gypsum sheathing ^d	1 3/4" galvanized roofing nail; staple galvanized, 1 5/8" long; 1 5/8" screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing				
37	3/4" and less	6d deformed (2" x 0.120") nail; or 8d common (2 1/2" x 0.131") nail	6	12
38	7/8" - 1"	8d common (2 1/2" x 0.131") nail; or 8d deformed (2 1/2" x 0.120") nail	6	12
39	1 1/8" - 1 1/4"	10d common (3" x 0.148") nail; or 8d deformed (2 1/2" x 0.120") nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

(continued)

WALL CONSTRUCTION

**TABLE R602.3(1)—continued
FASTENING SCHEDULE**

- a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.
- b. Staples are 16 gage wire and have a minimum $7/16$ -inch on diameter crown width.
- c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
- d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.
- e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).
- f. Where the ultimate design wind speed is 130 mph or less, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. Where the ultimate design wind speed is greater than 130 mph, nails for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.
- g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C208.
- h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.
- i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.

**TABLE R602.3.2
SINGLE TOP-PLATE SPLICE CONNECTION DETAILS**

CONDITION	TOP-PLATE SPLICE LOCATION			
	Corners and intersecting walls		Butt joints in straight walls	
	Splice plate size	Minimum nails each side of joint	Splice plate size	Minimum nails each side of joint
Structures in SDC A-C; and in SDC D ₀ , D ₁ and D ₂ with braced wall line spacing less than 25 feet	3" × 6" × 0.036" galvanized steel plate or equivalent	(6) 8d box (2 1/2" × 0.113") nails	3' × 12" × 0.036" galvanized steel plate or equivalent	(12) 8d box (2 1/2" × 0.113") nails
Structures in SDC D ₀ , D ₁ and D ₂ , with braced wall line spacing greater than or equal to 25 feet	3" × 8" by 0.036" galvanized steel plate or equivalent	(9) 8d box (2 1/2" × 0.113") nails	3' × 16" × 0.036" galvanized steel plate or equivalent	(18) 8d box (2 1/2" × 0.113") nails

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

WALL CONSTRUCTION

TABLE R602.3(3)
REQUIREMENTS 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		ULTIMATE DESIGN WIND SPEED V _{ult} (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	140	115	110
8d Common (2.5" × 0.131")	1.75	24/16	7/16	16	6	12	170	140	135
				24	6	12	140	115	110

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

- a. Panel strength axis 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. Table is based on wind pressures acting toward and away from building surfaces in accordance with Section R301.2. Lateral bracing requirements shall be in accordance with Section R602.10.
- c. Wood structural panels with span ratings of Wall-16 or Wall-24 shall be permitted as an alternate to panels with a 24/0 span rating. Plywood siding rated 16 o.c. or 24 o.c. shall be permitted as an alternate to panels with a 24/16 span rating. Wall-16 and Plywood siding 16 o.c. shall be used with studs spaced not more than 16 inches on center.

TABLE R602.3(4)
ALLOWABLE SPANS FOR PARTICLEBOARD WALL SHEATHING^a

THICKNESS (inch)	GRADE	STUD SPACING (Inches)	
		When siding is nailed to studs	When siding is nailed to sheathing
3/8	M-1 Exterior glue	16	—
1/2	M-2 Exterior glue	16	16

For SI: 1 inch = 25.4 mm.

- a. Wall sheathing not exposed to the weather. If the panels are applied horizontally, the end joints of the panel shall be offset so that four panel corners will not meet. All panel edges must be supported. Leave a 1/16-inch gap between panels and nail not less than 3/8 inch from panel edges.

TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS^a

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height ^a (feet)	Maximum spacing when supporting a roof-ceiling assembly or a habitable attic assembly, only (inches)	Maximum spacing when supporting one floor, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing when supporting two floors, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing when supporting one floor height ^a (inches)	Laterally unsupported stud height ^a (feet)	Maximum spacing (inches)
2 × 3 ^b	—	—	—	—	—	10	16
2 × 4	10	24 ^c	16 ^c	—	24	14	24
3 × 4	10	24	24	16	24	14	24
2 × 5	10	24	24	—	24	16	24
2 × 6	10	24	24	16	24	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. Bearing walls shall be sheathed on not less than one side or bridging shall be installed not greater than 4 feet apart measured vertically from either end of the stud. Increases in unsupported height are permitted where in compliance with Exception 2 of Section R602.3.1 or designed in accordance with accepted engineering practice.
- b. Shall not be used in exterior walls.
- c. A habitable attic assembly supported by 2 × 4 studs is limited to a roof span of 32 feet. Where the roof span exceeds 32 feet, the wall studs shall be increased to 2 × 6 or the studs shall be designed in accordance with accepted engineering practice.