CHAPTER

3 MINIMUM CONSTRUCTION REQUIREMENTS

SECTION 301—GENERAL

301.1 Scope. This chapter provides minimum requirements for materials and construction of retrofits designed in accordance with this standard.

Exception: Minimum material and construction requirements for use with a simplified engineered vulnerability-based retrofit shall be permitted to be in accordance with the *adopted code* in lieu of this chapter.

Materials and construction not addressed by these provisions shall be in accordance with the *adopted code*.

SECTION 302—EXISTING CONDITIONS

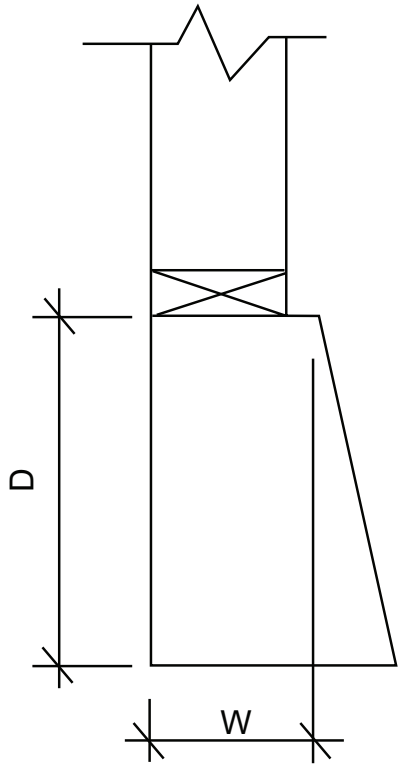
302.1 General. No retrofit work shall be directly attached to or enclose existing elements that are damaged or deteriorated to an extent that could significantly affect gravity or seismic load-carrying capacity. Any such existing elements shall be addressed prior to or at the time of retrofit construction. Damaged or deteriorated elements shall be repaired in place or supplemented with new elements. Alternatively, damaged or deteriorated elements shall be replaced.

302.2 Verification of existing foundations with hold-downs. Where new *hold-downs* are to be installed in existing foundations, the requirements of Sections 302.2.1 and 302.2.2 shall be met. Alternatively, a new foundation system shall be provided in accordance with Section 403.4 for *crawl space dwellings* or Section 503 for *living-space-over-garage dwellings*, or an engineered retrofit design shall be provided in accordance with Section 404 for *crawl space dwellings*, Section 504 for *living-space-over-garage dwellings* or Section 604 for *hillside dwellings*.

302.2.1 Existing foundation visual verification requirements. Where new *hold-downs* are to be installed, visual verification of the existing foundation system is required to be completed by the owner or *contractor* and *approved* by the *building official*.

The size of existing foundations at the location of new *hold-down* anchors shall be verified to be at least 15 inches (381 mm) deep (D) and 8 inches (203 mm) wide (W). The depth shall be measured from the bottom of the footing to the underside of the existing mudsill. The width shall be measured from the top outside face of the footing to the inside top face of the footing as indicated in Figure 302.2.1.

FIGURE 302.2.1—DIMENSIONS FOR FOUNDATION VISUAL VERIFICATION



302.2.2 Existing foundation quality requirements. Verification of the overall quality of the concrete along any wall line requiring *hold-downs* shall be made by use of a minimum of two sacrificial torque tests along each wall line where *hold-downs* are used. These tests shall consist of installing 1/2-inch (12.7 mm) or 5/8-inch (15.9 mm) diameter screw-type bolts into the existing concrete. The test anchor location and position of the test anchor shall have the same edge distance and orientation as the retro-

fit anchors and shall be located at least 1.5 times the embedment of the anchor from the retrofit anchors. Installation of anchors shall be in accordance with the manufacturer's installation instructions, verifying that a torque value per Table 302.2.2 can be achieved. Torque tests can be performed either by the owner, a *contractor*, or a special inspection company or testing agency hired by the owner and as *approved* by the *building official*.

Where new *hold-downs* are used, each *adhesive anchor* shall be torque-tested in accordance with Table 302.2.2. Torques in excess of those shown for *adhesive anchors* shall not be applied. Tests shall not be performed prior to adequate curing per manufacturer's requirements. Anchors where torque tests fail shall be replaced and reinstalled. Where torque tests continue to fail, the existing foundation system shall be replaced locally a minimum of 30 inches (0.76 m) on each side of the proposed *hold-down* anchor location.

TABLE 302.2.2—FOUNDATION VERIFICATION REQUIREMENTS

DIAMETER (inches)	SCREW ANCHOR TORQUE (foot-pounds)	ADHESIVE ANCHOR TORQUE (foot-pounds)
1/2	35	15
5/8	50	20

For SI: 1 inch = 25.4 mm, 1 foot-pound = 1.4 Nm.

302.3 Shoring and bracing. Shoring and bracing shall be provided, as required, to temporarily support existing *dwelling* elements to be retained, and to safely install new work.

302.4 Access and ventilation. Existing crawl space access and ventilation openings shall be maintained.

Where the existing area and distribution of crawl space ventilation is modified by the retrofit work, it shall be demonstrated that the modified ventilation area, distribution and protective coverings meet the requirements of the *adopted code.* Where the existing crawl space access openings are modified by the retrofit work, it shall be demonstrated that modified access openings meet the requirements of the *adopted code*.

SECTION 303—MATERIALS

303.1 General. Material newly incorporated into retrofit work shall comply with Sections 303.2 through 303.13.

303.2 Sawn lumber. Sawn lumber shall be identified by a grade mark of an accredited lumber grading or inspection agency and shall have design values certified by an accreditation body that complies with Department of Commerce (DOC) Standard PS 20. In lieu of a grade mark, a certification of inspection shall be issued by a lumber grading or inspection agency. Unless otherwise noted, new framing required by this standard shall be of Douglas fir-larch or southern pine species, or a species of equal or greater specific gravity.

303.3 Preservative-treated wood. All lumber and *wood structural panels* in contact with foundations or exposed to weather shall be pressure-*preservative treated* and dried after treatment in accordance with AWPA U1 (Commodity Specification A, Use Category 4B and Section 5) and shall bear the label of an accredited agency. Where lumber and/or wood structural wall panels are cut or drilled after treatment, the cut or drilled surface shall be treated with copper naphthenate in accordance with AWPA M4.

303.4 Wood structural panel sheathing. *Wood structural panel* sheathing shall be in compliance with DOC Voluntary Product Standard PS 1 or PS 2. Sheathing shall be Exposure 1 or Exterior Exposure, manufactured with exterior glue. Panels shall be identified for grade, bond, classification and performance category by a grade mark or certificate of inspection issued by an *approved* agency. *Wood structural panels* shall be plywood with a minimum of four plies or oriented strand board (OSB).

303.5 Cold-formed steel. Sheet steel used to shape cold-formed steel framing members shall conform to ASTM A1003, Structural Grade 33, Type H, or Grade 50, Type H. Wall studs shall be C-shaped sections with a minimum thickness of 43 mil (18 gage), a minimum flange width of 1 5/8 inches (41 mm) and a minimum depth of 2 1/2 inches (64 mm).

303.6 Minimum fastening. Nails specified in this standard shall conform to ASTM F1667. Nails shall be full-length common nails unless otherwise specified. Nails specified for fastening *wood structural panel* sheathing to wood framing shall be eight-penny (8d) common nails [i.e., 2 1/2 inches (64 mm) long by 0.131 inch (3.3 mm) shank diameter by 0.281 inch (7.1 mm) head diameter], unless otherwise specified. Fastening not otherwise specified shall meet the minimum requirements of Table 303.6 or the *adopted code*. Alternate fastening shall be as *approved*.

Fasteners in contact with *preservative-treated lumber* or *wood structural panels* exposed to weather shall be Type 304 or 316 stainless steel, hot-dipped galvanized or hot-tumbled galvanized. Electrogalvanized steel nails and steel staples with any coating shall not be permitted.

Screws for steel-to-steel connections shall be No. 8 self-drilling tapping screws that conform to ATSM C1513. Screws for attaching structural sheathing to cold-formed steel wall framing shall have a minimum head diameter of 0.292 inch (7.4 mm) with countersunk heads and shall be installed with a minimum edge distance of 3/8 inch (9.5 mm). Gypsum board shall be attached to cold-formed steel with, at a minimum, No. 6 screws conforming to ASTM C954 or ASTM C1513 with a bugle-head style.

TABLE 303.6—MINIMUM FASTENING REQUIREMENTS			
ITEM	**DESCRIPTION OF BUILDING ELEMENTS**	**NUMBER AND TYPE OF FASTENER[a, b, c]**	**SPACING AND LOCATION**
Roof			
1	Blocking between ceiling joists, rafters or trusses to top plate or other framing below	4-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Toe nail
	Blocking between rafters or truss not at the wall top plates, to rafter or truss	2-8d common (2 1/2″ × 0.131″); or 2-3″ × 0.131″ nails	Each end toe nail
		2-16d common (3 1/2″ × 0.162″); or 3-3″ × 0.131″ nails	End nail
	Flat blocking to truss and web filler	16d common (3 1/2″ × 0.162″); or 3″ × 0.131″ nails	6″ o.c. face nail
2	Ceiling joists to top plate	4-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions [see Section R802.5.2 and Table R802.5.2(1)]	4-10d box (3″ × 0.128″); or 3-16d common (3 1/2″ × 0.162″); or 4-3″ × 0.131″ nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) [see Section R802.5.2 and Table R802.5.2(1)]	Table R802.5.2(1)	Face nail
5	Collar tie to rafter, face nail	4-10d box (3″ × 0.128″); or 3-10d common (3″ × 0.148″); or 4-3″ × 0.131″ nails	Face nail each rafter
6	Rafter or roof truss to plate	3-16d box (3 1/2″ × 0.135″); or 3-10d common (3″ × 0.148″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss[i]
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2″ ridge beam	4-16d box (3 1/2″ × 0.135″); or 3-10d common (3″ × 0.148″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	Toe nail
		3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	End nail
Wall			
8	Stud to stud (not at braced wall panels)	16d common (3 1/2″ × 0.162″)	24″ o.c. face nail
		10d box (3″ × 0.128″); or 3″ × 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″ × 0.135″); or 3″ × 0.131″ nails	12″ o.c. face nail
		16d common (3 1/2″ × 0.162″)	16″ o.c. face nail
10	Built-up header (2″ to 2″ header with 1/2″ spacer)	16d common (3 1/2″ × 0.162″)	16″ o.c. each edge face nail
		16d box (3 1/2″ × 0.135″)	12″ o.c. each edge face nail
11	Continuous header to stud	5-8d box (2 1/2″ × 0.113″); or 4-8d common (2 1/2″ × 0.131″); or 4-10d box (3″ × 0.128″)	Toe nail

TABLE 303.6—MINIMUM FASTENING REQUIREMENTS—continued			
ITEM	**DESCRIPTION OF BUILDING ELEMENTS**	**NUMBER AND TYPE OF FASTENER[a, b, c]**	**SPACING AND LOCATION**
Wall			
12	Adjacent full-height stud to end of header	4-16d box (3 1/2″ × 0.135″); or 3-16d common (3 1/2″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″) nails	End nail
13	Top plate to top plate	16d common (3 1/2″ × 0.162″)	16″ o.c. face nail
		10d box (3″ × 0.128″); or 3″ × 0.131″ nails	12″ o.c. face nail
14	Double top plate splice	8-16d common (3 1/2″ × 0.162″); or 12-16d box (3 1/2″ × 0.135″); or 12-10d box (3″ × 0.128″); or 12-3″ × 0.131″ nails	Face nail on each side of end joint (minimum 24″ lap splice length each side of end joint)
15	Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3 1/2″ × 0.162″)	16″ o.c. face nail
		16d box (3 1/2″ × 0.135″); or 3″ × 0.131″ nails	12″ o.c. face nail
16	Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″); or 4-3″ × 0.131″ nails	16″ o.c. face nail
17	Top or bottom plate to stud	4-8d box (2 1/2″ × 0.113″); or 3-16d box (3 1/2″ × 0.135″); or 4-8d common (2 1/2″ × 0.131″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	Toe nail
		3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	End nail
18	Top plates, laps at corners and intersections	3-10d box (3″ × 0.128″); or 2-16d common (3 1/2″ × 0.162″); or 3-3″ × 0.131″ nails	Face nail
19	1″ brace to each stud and plate	3-8d box (2 1/2″ × 0.113″); or 2-8d common (2 1/2″ × 0.131″); or 2-(3″ × 0.131″); or 2-10d box (3″ × 0.128″)	Face nail
20	1″ × 6″ sheathing to each bearing	3-8d box (2 1/2″ × 0.113″); or 2-8d common (2 1/2″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2 staples, 1″ crown, 16 ga., 1 3/4″ long	Face nail
21	1″ × 8″ and wider sheathing to each bearing	3-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3 staples, 1″ crown, 16 ga., 1 3/4″ long	Face nail
		Wider than 1″ × 8″ 4-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 4 staples, 1″ crown, 16 ga., 1 3/4″ long	
Floor			
22	Joist to sill, top plate or girder	4-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Toe nail
23	Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box (2 1/2″ × 0.113″)	4″ o.c. toe nail
		8d common (2 1/2″ × 0.131″); or 10d box (3″ × 0.128″); or 3″ × 0.131″ nails	6″ o.c. toe nail

TABLE 303.6—MINIMUM FASTENING REQUIREMENTS—continued

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION	
	Floor			
24	1″ × 6″ subfloor or less to each joist	3-8d box (2 1/2″ × 0.113″); or 2-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 2 staples, 1″ crown, 16 ga., 1 3/4″ long	Face nail	
25	2″ subfloor to joist or girder	3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″)	Blind and face nail	
26	2″ planks (plank & beam—floor & roof)	3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″)	At each bearing, face nail	
27	Band or rim joist to joist	3-16d common (3 1/2″ × 0.162″); or 4-10 box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ × 14 ga. staples, 7/16 ″ crown	End nail	
28	Built-up girders and beams, 2-inch lumber layers	20d common (4″ × 0.192″); or	Nail each layer as follows: 32″ o.c. at top and bottom and staggered.	
		10d box (3″ × 0.128″); or 3″ × 0.131″ nails	24″ o.c. face nail at top and bottom staggered on opposite sides	
		And: 2-20d common (4″ × 0.192″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Face nail at ends and at each splice	
29	Ledger strip supporting joists or rafters	4-16d box (3 1/2″ × 0.135″); or 3-16d common (3 1/2″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	At each joist or rafter, face nail	
30	Bridging or blocking to joist, rafter or truss	2-10d box (3″ × 0.128″); or 2-8d common (2 1/2″ × 0.131″); or 2-3″ × 0.131″ nails	Each end, toe nail	
ITEM	**DESCRIPTION OF BUILDING ELEMENTS**	**NUMBER AND TYPE OF FASTENER[a, b, c]**	**SPACING AND LOCATION**	
	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]			
31	3/8″ – 1/2″	6d common or deformed (2″ × 0.113″ × 0.266″ head); or 2 3/8″ × 0.113″ × 0.266″ head nail (subfloor, wall)	6	12
		8d common (2 1/2″ × 0.131″ × 0.281″ head) nail (roof); or RSRS-01 (2 3/8″ × 0.113″ × 0.281″ head) nail (roof)[b]	6[f]	6[f]
32	19/32″ – 3/4″	8d common (2 1/2″ × 0.131″) nail (subfloor, wall)	6	12
		8d common (2 1/2″ × 0.131″ × 0.281″ head) nail (roof); or RSRS-01; (2 3/8″ × 0.113″ × 0.281″ head) nail (roof)[b]	6[f]	6[f]
		Deformed 2 3/8″ × 0.113 × 0.266″ head (wall or subfloor)	6	12
33	7/8″ – 1 1/4″	10d common (3″ × 0.148″) nail; or (2 1/2″ × 0.131 × 0.281″ head) deformed nail	6	12
	Other wall sheathing[g]			
34	1/2″ structural cellulosic fiberboard sheathing	1 1/2″ × 0.120″ galvanized roofing nail, 7/16″ head diameter; or 1 1/4″ long 16 ga. staple with 7/16″ or 1″ crown	3	6

TABLE 303.6—MINIMUM FASTENING REQUIREMENTS—continued				
ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION	
Other wall sheathing[g]				
35	25/32″ structural cellulosic fiberboard sheathing	1 3/4″ × 0.120″ galvanized roofing nail, 7/16″ head diameter; or 1 1/4″ long 16 ga. staple with 7/16″ or 1″ crown	3	6
36	1/2″ gypsum sheathingd	1 1/2″ × 0.120″ galvanized roofing nail, 7/16″ head diameter; or 16 ga. staple galvanized, 1 1/2″ long, 7/16″ or 1″ crown; or 1 1/4″ screws, Type W or S	7	7
37	5/8″ gypsum sheathingd	1 3/4″ × 0.120″ galvanized roofing nail, 7/16″ head diameter; or 16 ga. staple galvanized, 1 5/8″ long, 7/16″ or 1″ crown; or 1 5/8″ screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing				
38	3/4″ and less	Deformed (2″ × 0.113″) or Deformed (2″ × 0.120″) nail; or 8d common (2 1/2″ × 0.131″) nail	6	12
39	7/8″ – 1"	8d common (2 1/2″ × 0.131″) nail; or Deformed (2 1/2″ × 0.131″); or Deformed (2 1/2″ × 0.120″) nail	6	12
40	1 1/8″ – 1 1/4″	10d common (3″ × 0.148″) nail; or Deformed (2 1/2″× 0.131″); or Deformed (2 1/2″ × 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.

a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections are carbon steel and 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. Connections using nails and staples of other materials, such as stainless steel, shall be designed by accepted engineering practice or approved under Section R104.2.2.

b. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

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. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 4 inches on center where the ultimate design wind speed is greater than 130 mph in Exposure B or greater than 110 mph in Exposure C. Fastener spacing applies where roof framing specific gravity is 0.42 or larger. Where roof framing specific gravity is greater than or equal to 0.35 but less than 0.42 in accordance with AWC NDS, fastening of roof sheathing shall be with RSRS-03 (2 1/2″ × 0.131″ × 0.281″ head) nails.

g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with ASTM C1280 or 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.

303.7 Connectors. *Connectors* shall be custom or preengineered premanufactured devices, *approved* by the *building official* and installed in accordance with the manufacturer's instructions. *Connectors* protected from weather shall be provided with a minimum of G90 zinc coating in accordance with ASTM A653. *Connectors* exposed to weather or in contact with preservative-treated wood shall be provided with a minimum hot-dipped galvanized coating or G185 coating in accordance with ASTM A653, and fasteners conforming to ASTM A153.

303.8 Concrete. Concrete shall have a minimum specified compression strength, f'_c, of not less than 2,500 psi (17.2 MPa) at 28 days. Materials used to produce concrete and testing thereof shall comply with the applicable standards listed in Chapters 19 and 20 of ACI 318 or Chapter 4 of ACI 332.

303.9 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM A615, A706 or A996. ASTM A996 bars produced from rail steel shall be Type R. The minimum yield strength of reinforcing shall be 40,000 psi (275.8 MPa) (Grade 40). Reinforcement shall be secured in the proper location in the forms with tie wire or other support system to prevent displacement during concrete placement operations.

Reinforcing steel to be welded shall conform to ASTM A706.

303.10 Structural steel. Structural steel sections shall comply with the requirements of ASTM A36, A572 or A992 for steel plates and sections. Structural steel HSS sections shall comply with ASTM A500, Grade B, F_y = 46 kips per square inch (ksi) (317.2 MPa). Identification of structural steel shall comply with the requirements of AISC 360.

Sheet steel for brick *chimney* adaptor cones shall conform to ASTM A1003, Structural Grade 33, Type H, or Grade 50, Type H. Welding shall conform to AWS D1.3.

303.11 Bolts and threaded rods. Bolts shall conform to ASTM A307. Threaded rods shall conform to ASTM A36. Except where otherwise specifically required, a cut washer between the bolt head or nut and wood member shall be provided. Bolts, nuts and washers exposed to weather or in contact with preservative-treated wood shall be hot-dipped galvanized.

303.12 Post-installed anchors. *Post-installed anchors* used for *hold-down* anchors or anchor bolts shall be *approved* by the *building official* and installed in accordance with the manufacturer's instructions. *Adhesive anchors* shall be used for *hold-down* anchors. Anchor bolts may be *adhesive anchors* or concrete screws, provided the foundation into which the anchor is being installed is in conformance with the manufacturer's installation requirements.

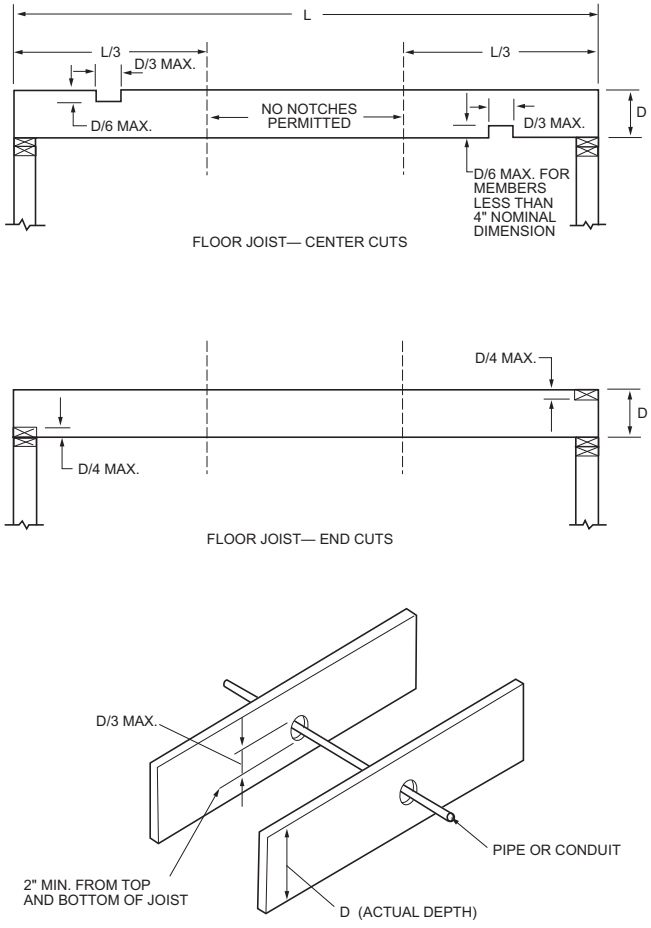
303.13 Alternative lateral force-resisting systems. *Alternative lateral force-resisting systems* shall meet the requirements of ASTM D7989 and shall be *approved*. *Alternative lateral force-resisting systems* shall be installed in accordance with the manufacturer's installation requirements and the provisions of this standard.

SECTION 304—INSTALLATION

304.1 General. All new retrofit construction shall be in accordance with Sections 304.2 through 304.9.

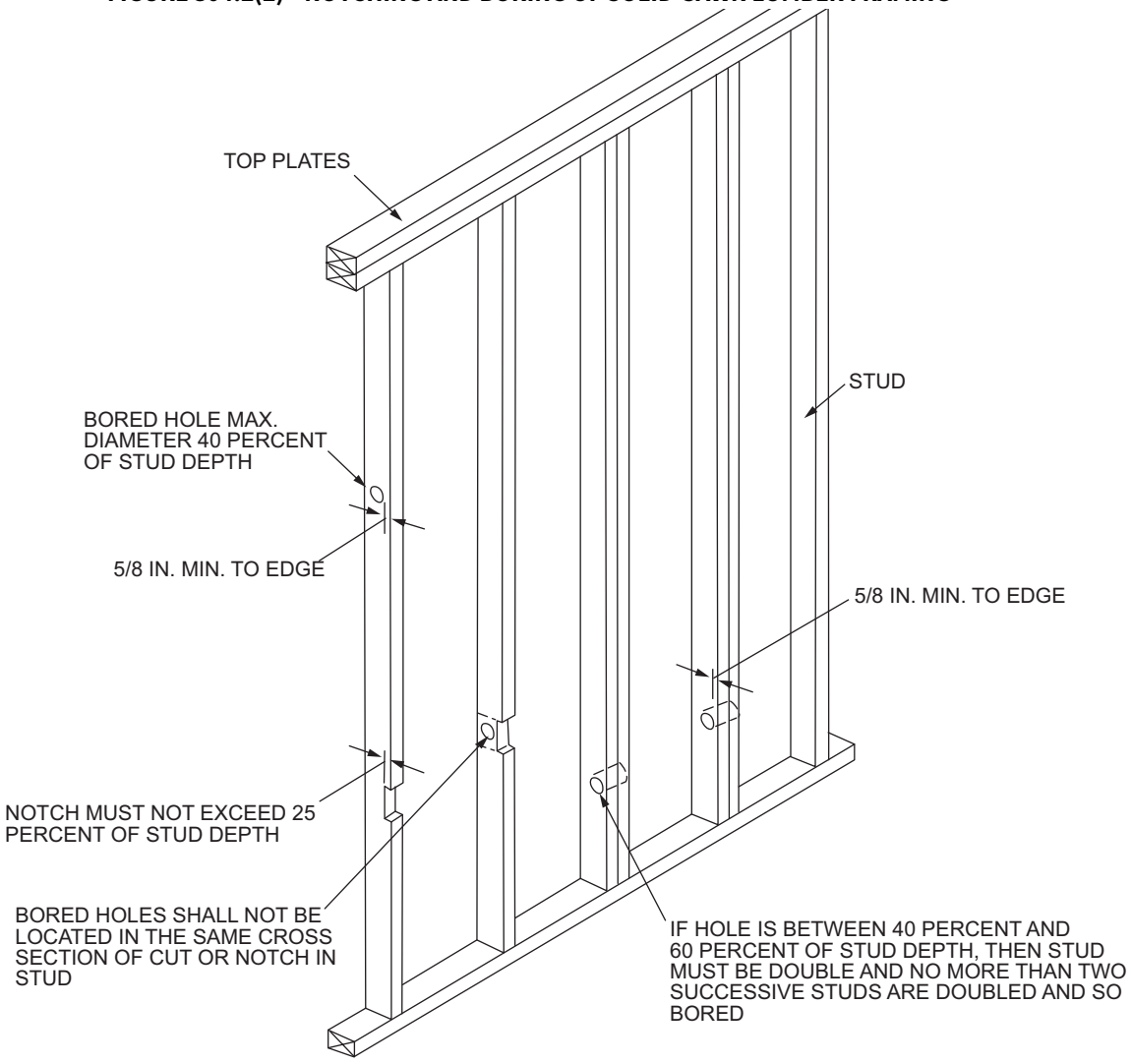
304.2 Notching and boring. Solid sawn lumber framing and sheathing shall not be notched or bored, except as specifically shown in the retrofit design, per Figures 304.2(1) and 304.2(2) or as *approved.* Notches or holes in engineered wood products shall be as *approved* by the *registered design professional* or *building official*.

FIGURE 304.2(1)—NOTCHING AND BORING OF SOLID-SAWN LUMBER FRAMING



For SI: 1 inch = 25.4 mm.

FIGURE 304.2(2)—NOTCHING AND BORING OF SOLID-SAWN LUMBER FRAMING



For SI: 1 inch = 25.4 mm.
Note: Condition for exterior and bearing walls.

304.3 Anchorage to existing concrete. Anchors installed in existing concrete shall comply with all edge and end distances, as specified in this standard and the retrofit plans. Existing reinforcing steel shall not be drilled through. If reinforcing steel is hit during drilling, the hole shall be relocated a minimum of 1 inch (25 mm) clear of the initial hole, and the initial hole shall be filled with nonshrink grout.

304.4 Anchor bolt installation. New anchor bolts shall be provided at each perimeter wall *foundation sill plate*. Anchor bolts shall be spaced between 8 inches (203 mm) and 12 inches (304 mm) from each end of each section of *foundation sill plate* and at the on-center spacing required by the retrofit provisions of this standard. Where existing sections of *foundation sill plate* are 24 inches (610 mm) or less in length, one anchor bolt shall be provided near the center of the *sill plate* length. Foundation retrofit anchors shall be provided where the configuration does not permit the installation of new anchor bolts. Spacing from end of *foundation sill plate* and on-center spacing shall be as required for anchor bolts.

Steel plate washers, not less than 0.229 inch by 3 inches by 3 inches (5.8 mm × 76 mm × 76 mm), shall be provided on each anchor bolt. The edge of the plate washer shall be placed within 1/2 inch (12.7 mm) of the face of the *wood structural panel* wall sheathing where the wall is sheathed, and within 1/2 inch (12.7 mm) of the inside face of the exterior finish where the wall is not sheathed with *wood structural panel* sheathing.

304.5 Wood structural panel sheathing. *Wood structural panel* sheathing shall be installed with 1/8-inch (3.2 mm) gaps at edges and ends of panels. *Wood structural panel* sheathing edge nailing, of the nail type and size specified in the retrofit design, shall be provided at each edge of each *wood structural panel*. A distance of not less than 3/8 inch (9.5 mm) shall be provided from center of nail to edge of *wood structural panel* sheathing. Provide two new 2× fastened together per applicable details, 3× or 4× stud framing where vertical edges of *wood structural panels* abut. Provide 3× or 4× minimum blocking at all other abutting *wood structural panel* edges. No piece of newly installed *wood structural panel* sheathing shall be less than 24 inches by 24 inches (610 mm × 610 mm), except that the panel dimension shall match the *cripple wall height* when the *cripple wall height* is less than 2 feet (610 mm).

Sheathing nail heads shall be driven flush with the face of the dwelling sheathing. Where sheathing nails are overdriven to the extent that the nail head fractures the sheathing face, one additional nail shall be provided for each two overdriven nails. Added nails shall be spaced between the existing nails.

304.6 Fasteners. Fasteners shall be installed in a manner so as not to cause splitting of the framing members. Where required to avoid splitting, nail holes shall be predrilled to 75 percent of the nail shank diameter. All holes for bolts shall be predrilled to 1/16 inch (1.6 mm) over bolt shank diameter.

304.7 Connectors. *Connectors* shall be of the type and size specified in this standard and shall be installed using the number and type of fasteners specified in the manufacturer's installation instructions. *Connectors* shall be distributed as specified by the applicable retrofit schedule or detail.

304.8 Structural steel. The fabrication, corrosion protection, and erection of structural steel shall be in accordance with AISC 360. Welding of structural steel shall be in accordance with AWS D1.1.

304.9 Reinforcing steel. All straight bars shall be terminated with standard hooks unless otherwise noted. At foundation corners, each straight bar shall be extended all the way across the foundation to the minimum clear distance from the far edge and terminated with a 90-degree (1.6 rad) hook with a 12-inch (304 mm) extension (tail).

Welding of reinforcing steel shall be in accordance with AWS D1.4.

Steel reinforcement in concrete cast against the earth shall have a minimum cover of 3 inches (76 mm). Minimum cover for concrete cast in removable forms that will be exposed to the earth or weather shall be 1 1/2 inches (38 mm) for No. 5 bars or smaller, and 2 inches (50 mm) for No. 6 bars and larger.

Where lap splices occur, lap spices shall be provided in accordance with Table 304.9.

TABLE 304.9—REINFORCING STEEL MINIMUM LAP SPLICE LENGTH

CONDITION	NO. 4 (inches)	NO. 5 (inches)
Horizontal bars with more than 12 inches concrete below	32	42
Other bars	24	32

For SI: 1 inch = 25.4 mm.

SECTION 305—SPECIAL INSPECTIONS

305.1 Special inspections. Special inspection by a third-party inspector *approved* by the *building official* shall be provided in accordance with the *adopted code*.

Exception: For *crawl space dwellings*, *living-space-over-garage dwellings*, *chimneys* and *masonry fireplace surrounds*, special inspection by a third-party inspector need not be provided for the following, except as specifically required by the *building official*:

1. Concrete or reinforcing steel for foundations, provided a building department inspection is performed prior to placement of concrete. Design is based on an ultimate concrete strength of 2,500 psi (17.2 MPa) or less.
2. Installation of cast-in-place or *post-installed anchors* for anchor bolts.
3. Installation of *adhesive anchors* for *hold-down* devices, provided that each anchor is torque-tested to 15 foot-pounds (20.3 Nm) for 1/2-inch (12.7 mm) diameter anchors and 20 foot-pounds (27.1 Nm) for 5/8-inch (15.9 mm) diameter anchors with no movement of anchor.
4. Nailing of *wood structural panel* shear walls, provided a building department inspection is performed.