CHAPTER 6
WALL CONSTRUCTION

SECTION R601
GENERAL

R601.1 Application. The provisions of this chapter shall control the design and construction of all walls and partitions for all buildings. For strawbale construction, see Appendix R.

R601.2 Requirements. Wall construction shall be capable of accommodating all loads imposed according to Section R301 and of transmitting the resulting loads to the supporting structural elements.

R601.2.1 Compressible floor-covering materials. Compressible floor-covering materials that compress more than $^1/_{32}$ inch (0.8 mm) when subjected to 50 pounds (23 kg) applied over 1 inch square (645 mm) of material and are greater than $^1/_8$ inch (3 mm) in thickness in the uncompressed state shall not extend beneath walls, partitions or columns, which are fastened to the floor.

SECTION R602
WOOD WALL FRAMING

R602.1 Identification. Load-bearing dimension lumber for studs, plates and headers shall be identified by a grade mark of a lumber grading or inspection agency that has been *approved* by an accreditation body that complies with DOC PS 20. In lieu of a grade mark, a certification of inspection issued by a lumber grading or inspection agency meeting the requirements of this section shall be accepted.

R602.1.1 End-jointed lumber. *Approved* end-jointed lumber identified by a grade mark conforming to Section R602.1 may be used interchangeably with solid-sawn members of the same species and grade.

R602.1.2 Structural glued laminated timbers. Glued laminated timbers shall be manufactured and identified as required in ANSI/AITC A190.1 and ASTM D 3737.

R602.1.3 Structural log members. Stress grading of structural log members of nonrectangular shape, as typically used in log buildings, shall be in accordance with ASTM D 3957. Such structural log members shall be identified by the grade mark of an *approved* lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade, issued by a lumber-grading or inspection agency meeting the requirements of this section, shall be permitted to be accepted.

R602.2 Grade. Studs shall be a minimum No. 3, standard or stud grade lumber.

Exception: Bearing studs not supporting floors and nonbearing studs may be utility grade lumber, provided the studs are spaced in accordance with Table R602.3(5).

R602.3 Design and construction. Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of this chapter and Figures R602.3(1) and R602.3.(2) or in accordance with AF&PA's NDS. Components of exterior walls shall be fastened in accordance with Tables R602.3(1) through R602.3(4). Structural wall sheathing shall be fastened directly to structural framing members. Exterior wall coverings shall be capable of resisting the wind pressures listed in Table R301.2(2).Wood structural panel sheathing used for exterior walls shall conform to the requirements of Table R602.3(3).

Studs shall be continuous from 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 or other methods approved by the *building official.*

Exception: Jack studs, trimmer studs and cripple studs at openings in walls that comply with Tables R502.5(1) and R502.5(2).

R602.3.1 Stud size, height and spacing. The size, height and spacing of studs shall be in accordance with Table R602.3.(5).

Exceptions:

1. Utility grade studs shall not be spaced more than 16 inches (406 mm) on center, shall not support more than a roof and ceiling, and shall not exceed 8 feet (2438 mm) in height for exterior walls and load-bearing walls or 10 feet (3048 mm) for interior nonload-bearing walls.
2. Studs more than 10 feet (3048 mm) in height which are in accordance with Table R602.3.1.

R602.3.2 Top plate. Wood stud walls shall be capped with a double top plate installed to provide overlapping at corners and intersections with bearing partitions. End joints in top plates shall be offset at least 24 inches (610 mm). Joints in plates need not occur over studs. Plates shall be not less than 2-inches (51 mm) nominal thickness and have a width at least equal to the width of the studs.

Exception: A single top plate may be installed in stud walls, provided the plate is adequately tied at joints, corners and intersecting walls by a minimum 3-inch-by-6-inch by a 0.036-inch-thick (76 mm by 152 mm by 0.914 mm) galvanized steel plate that is nailed to each wall or segment of wall by six 8d nails on each side, provided the rafters or joists are centered over the studs with a tolerance of no more than 1 inch (25 mm). The top plate may be omitted over lintels that are adequately tied to adjacent wall sections with steel plates or equivalent as previously described.

R602.3.3 Bearing studs. Where joists, trusses or rafters are spaced more than 16 inches (406 mm) on center and the bearing studs below are spaced 24 inches (610 mm) on center, such members shall bear within 5 inches (127 mm) of the studs beneath.

Exceptions:

1. The top plates are two 2-inch by 6-inch (38 mm by 140 mm) or two 3-inch by 4-inch (64 mm by 89 mm) members.
2. A third top plate is installed.
3. Solid blocking equal in size to the studs is installed to reinforce the double top plate.

R602.3.4 Bottom (sole) plate. Studs shall have full bearing on a nominal 2-by (51 mm) or larger plate or sill having a width at least equal to the width of the studs.

R602.4 Interior load-bearing walls. Interior load-bearing walls shall be constructed, framed and fireblocked as specified for exterior walls.

R602.5 Interior nonbearing walls. Interior nonbearing walls shall be permitted to be constructed with 2-inch-by-3-inch (51 mm by 76 mm) studs spaced 24 inches (610 mm) on center or, when not part of a *braced wall line*, 2-inch-by-4-inch (51 mm by 102 mm) flat studs spaced at 16 inches (406 mm) on center. Interior nonbearing walls shall be capped with at least a single top plate. Interior nonbearing walls shall be fireblocked in accordance with Section R602.8.

R602.6 Drilling and notching–studs. Drilling and notching of studs shall be in accordance with the following:

1. Notching. Any stud in an exterior wall or bearing partition may be cut or notched to a depth not exceeding 25 percent of its width. Studs in nonbearing partitions may be notched to a depth not to exceed 40 percent of a single stud width.
2. Drilling. Any stud may be bored or drilled, provided that the diameter of the resulting hole is no more than 60 percent of the stud width, the edge of the hole is no more than $^5/_8$ inch (16 mm) to the edge of the stud, and the hole is not located in the same section as a cut or notch. Studs located in exterior walls or bearing partitions drilled over 40 percent and up to 60 percent shall also be doubled with no more than two successive doubled studs bored. See Figures R602.6(1) and R602.6(2).

   Exception: Use of *approved* stud shoes is permitted when they are installed in accordance with the manufacturer's recommendations.

R602.6.1 Drilling and notching of top plate. When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie not less than 0.054 inch thick (1.37 mm) (16 ga) and $1^1/_2$ inches (38 mm) wide shall be fastened across and to the plate at each side of the opening with not less than eight 10d (0.148 inch diameter) having a minimum length of $1^1/_2$ inches (38 mm) at each side or equivalent. The metal tie must extend a minimum of 6 inches past the opening. See Figure R602.6.1.

Exception: When the entire side of the wall with the notch or cut is covered by wood structural panel sheathing.

R602.7 Headers. For header spans see Tables R502.5(1) and R502.5(2).

R602.7.1 Wood structural panel box headers. Wood structural panel box headers shall be constructed in accordance with Figure R602.7.2 and Table R602.7.2.

R602.7.2 Nonbearing walls. Load-bearing headers are not required in interior or exterior nonbearing walls. A single flat 2-inch-by-4-inch (51 mm by 102 mm) member may be used as a header in interior or exterior nonbearing walls for openings up to 8 feet (2438 mm) in width if the vertical distance to the parallel nailing surface above is not more than 24 inches (610 mm). For such nonbearing headers, no cripples or blocking are required above the header.

R602.8 Fireblocking required. Fireblocking shall be provided in accordance with Section R302.11.

R602.9 Cripple walls. Foundation cripple walls shall be framed of studs not smaller than the studding above. When exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional *story*.

Cripple walls with a stud height less than 14 inches (356 mm) shall be sheathed on at least one side with a wood structural panel that is fastened to both the top and bottom plates in accordance with Table R602.3(1), or the cripple walls shall be constructed of solid blocking. Cripple walls shall be supported on continuous foundations and braced as required for lateral loads in accordance with Sections R602.10.2 and R602.10.9.

R602.10 Wall bracing. Buildings shall be braced in accordance with this section. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with Section R301.1.

Exception: Detached one- and two-family *dwellings* located in Seismic Design Category C are exempt from the seismic bracing requirements of this section. Wind speed provisions for bracing shall be applicable to detached one- and two-family *dwellings*.

TABLE R602.10
WALL BRACING METHODS[a]

LIB	Let-in bracing
DWB	Diagonal wood boards
WSP	Wood structural panels
SFB	Structural fiberboard sheathing
GB	Gypsum board
PBS	Particleboard sheathing
PCP	Portland cement plaster
HPS	Hardboard panel siding
ABW	Alternate braced wall
PFH	Intermittent portal frame
PFG	Intermittent portal frame at garage

a. See Table R602.10.2 for specific bracing methods.

TABLE R602.3(1)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING OF FASTENERS
	Roof		
1	Blocking between joists or rafters to top plate, toe nail	3-8d ($2^1/_2'' \times 0.113''$)	—
2	Ceiling joists to plate, toe nail	3-8d ($2^1/_2'' \times 0.113''$)	—
3	Ceiling joists not attached to parallel rafter, laps over partitions, face nail	3-10d	—
4	Collar tie rafter, face nail or $1^1/_4'' \times 20$ gage ridge strap	3-10d ($3'' \times 0.128''$)	—
5	Rafter to plate, toe nail	2-16d ($3^1/_2'' \times 0.135''$)	—
6	Roof rafters to ridge, valley or hip rafters: toe nail face nail	 4-16d ($3^1/_2'' \times 0.135''$) 3-16d ($3^1/_2'' \times 0.135''$)	 — —
	Wall		
7	Built-up corner studs	10d ($3'' \times 0.128''$)	24″ o.c.
8	Built-up header, two pieces with $^1/_2''$ spacer	16d ($3^1/_2'' \times 0.135''$)	16″ o.c. along each edge
9	Continued header, two pieces	16d ($3^1/_2'' \times 0.135''$)	16″ o.c. along each edge
10	Continuous header to stud, toe nail	4-8d ($2^1/_2'' \times 0.113''$)	—
11	Double studs, face nail	10d ($3'' \times 0.128''$)	24″ o.c.
12	Double top plates, face nail	10d ($3'' \times 0.128''$)	24″ o.c.
13	Double top plates, minimum 24-inch offset of end joints, face nail in lapped area	8-16d [j] ($3^1/_2'' \times 0.135''$)	—
14	Sole plate to joist, solid deck or blocking, face nail	16d ($3^1/_2'' \times 0.135''$)	16″ o.c.
15	Sole plate to joist, solid deck or blocking at braced wall panels	3-16d per 16″ ($3^1/_2'' \times 0.135''$)	—
16	Stud to sole plate, toe nail	3-8d ($2^1/_2'' \times 0.113''$) or 2-16d $3^1/_2'' \times 0.135''$)	— —
17	Top or sole plate to stud, end nail	2-16d ($3^1/_2'' \times 0.135''$)	—
18	Top plates, laps at corners and intersections, face nail	2-10d ($3'' \times 0.128''$)	—
19	1″ brace to each stud and plate, face nail	2-8d ($2^1/_2'' \times 0.113''$) 2 staples $1^3/_4''$	— —
20	$1'' \times 6''$ sheathing to each bearing, face nail	2-8d ($2^1/_2'' \times 0.113''$) 2 staples $1^3/_4''$	— —
21	$1'' \times 8''$ sheathing to each bearing, face nail	2-8d ($2^1/_2'' \times 0.113''$) 3 staples $1^3/_4''$	— —
22	Wider than $1'' \times 8''$ sheathing to each bearing, face nail	3-8d ($2^1/_2'' \times 0.113''$) 4 staples $1^3/_4''$	— —
	Floor		
23	Joist to sill or girder, toe nail	3-8d ($2^1/_2'' \times 0.113''$)	—
24	$1'' \times 6''$ subfloor or less to each joist, face nail	2-8d ($2^1/_2'' \times 0.113''$) 2 staples $1^3/_4''$	— —
25	2″ subfloor to joist or girder, blind and face nail	2-16d ($3^1/_2'' \times 0.135''$)	—
26	Rim joist to top plate, toe nail (roof applications also)	8d ($2^1/_2'' \times 0.113''$)	6″ o.c.
27	2″ planks (plank & beam – floor & roof)	2-16d ($3^1/_2'' \times 0.135''$)	at each bearing
28	Built-up girders and beams, 2-inch lumber layers	10d ($3'' \times 0.128''$)	Nail each layer as follows: 32″ o.c. at top and bottom and staggered. Two nails at ends and at each splice.

(continued)

TABLE R602.3(1)—continued
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

ITEM	DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER[b, c, e]	SPACING OF FASTENERS	
			Edges (inches)[i]	Intermediate supports[c, e] (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing				
30	3/8″ - 1/2″	6d common (2″ × 0.113″) nail (subfloor wall) 8d common (2 1/2″ × 0.131″) nail (roof)[f]	6	12[g]
31	19/32″ - 1″	8d common nail (2 1/2″ × 0.131″)	6	12[g]
32	1 1/8″ - 1 1/4″	10d common (3″ × 0.148″) nail or 8d (2 1/2″ × 0.131″) deformed nail	6	12
Other wall sheathing[h]				
33	1/2″ structural cellulosic fiberboard sheathing	1/2″ galvanized roofing nail, 7/16″ crown 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″ crown or 1″ crown staple 16 ga., 1 1/2″ 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″ glavanized 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″ × 0.120″) nail or 8d common (2 1/2″ × 0.131″) nail	6	12
38	7/8″ - 1″	8d common (2 1/2″ × 0.131″) nail or 8d deformed (2 1/2″ × 0.120″) nail	6	12
39	1 1/8″ - 1 1/4″	10d common (3″ × 0.148″) nail or 8d 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; 1ksi = 6.895 MPa.

a. All 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. For regions having basic wind speed of 110 mph or greater, 8d deformed (2 1/2″ × 0.120) nails shall be used for attaching plywood and wood structural panel roof sheathing to framing within minimum 48-inch distance from gable end walls, if mean roof height is more than 25 feet, up to 35 feet maximum.

g. For regions having basic wind speed of less than 110 mph, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. When basic wind speed is greater than 100 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.

h. Gypsum sheathing shall conform to ASTM C 1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C 208.

i. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at all 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.

j. Interior non-braced wall lines may be nailed with a minimum 4-10d nails.

TABLE R602.3(2)
ALTERNATE ATTACHMENTS

NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION[a, b] OF FASTENER AND LENGTH (inches)	SPACING[c] OF FASTENERS	
		Edges (inches)	Intermediate supports (inches)
Wood structural panels subfloor, roof and wall sheathing to framing and particleboard wall sheathing to framing[f]			
up to 1/2	Staple 15 ga. 1 3/4	4	8
	0.097 - 0.099 Nail 2 1/4	3	6
	Staple 16 ga. 1 3/4	3	6
19/32 and 5/8	0.113 Nail 2	3	6
	Staple 15 and 16 ga. 2	4	8
	0.097 - 0.099 Nail 2 1/4	4	8
23/32 and 3/4	Staple 14 ga. 2	4	8
	Staple 15 ga. 1 3/4	3	6
	0.097 - 0.099 Nail 2 1/4	4	8
	Staple 16 ga. 2	4	8
1	Staple 14 ga. 2 1/4	4	8
	0.113 Nail 2 1/4	3	6
	Staple 15 ga. 2 1/4	4	8
	0.097 - 0.099 Nail 2 1/2	4	8
NOMINAL MATERIAL THICKNESS (inches)	**DESCRIPTION[a,b] OF FASTENER AND LENGTH (inches)**	**SPACING[c] OF FASTENERS**	
		Edges (inches)	**Body of panel[d] (inches)**
Floor underlayment; plywood-hardboard-particleboard[f]			
Plywood			
1/4 and 5/16	1 1/4 ring or screw shank nail—minimum 12 1/2 ga. (0.099″) shank diameter	3	6
	Staple 18 ga., 7/8, 3/16 crown width	2	5
11/32, 3/8, 15/32, and 1/2	1 1/4 ring or screw shank nail—minimum 12 1/2 ga. (0.099″) shank diameter	6	8[e]
19/32, 5/8, 23/32 and 3/4	1 1/2 ring or screw shank nail—minimum 12 1/2 ga. (0.099″) shank diameter	6	8
	Staple 16 ga. 1 1/2	6	8
Hardboard[f]			
0.200	1 1/2 long ring-grooved underlayment nail	6	6
	4d cement-coated sinker nail	6	6
	Staple 18 ga., 7/8 long (plastic coated)	3	6
Particleboard			
1/4	4d ring-grooved underlayment nail	3	6
	Staple 18 ga., 7/8 long, 3/16 crown	3	6
3/8	6d ring-grooved underlayment nail	6	10
	Staple 16 ga., 1 1/8 long, 3/8 crown	3	6
1/2, 5/8	6d ring-grooved underlayment nail	6	10
	Staple 16 ga., 1 5/8 long, 3/8 crown	3	6

For SI: 1 inch = 25.4 mm.

a. Nail is a general description and may be T-head, modified round head or round head.

b. Staples shall have a minimum crown width of 7/16-inch on diameter except as noted.

c. Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.

d. Fasteners shall be placed in a grid pattern throughout the body of the panel.

e. For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.

f. Hardboard underlayment shall conform to ANSI/AHA A135.4.

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		MAXIMUM WIND SPEED (mph)		
							Wind exposure category		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	B	C	D
6d Common (2.0″ × 0.113″)	1.5	24/0	3/8	16	6	12	110	90	85
8d Common (2.5″ × 0.131″)	1.75	24/16	7/16	16	6	12	130	110	105
				24	6	12	110	90	85

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 per 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 oc or 24 oc shall be permitted as an alternate to panels with a 24/16 span rating. Wall-16 and Plywood siding 16 oc shall be used with studs spaced a maximum of 16 inches on center.

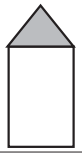
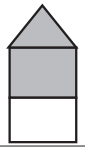
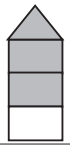
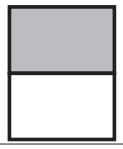
TABLE R602.3(4)
ALLOWABLE SPANS FOR PARTICLEBOARD WALL SHEATHING[a]

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 panels corners will not meet. All panel edges must be supported. Leave a $^1/_{16}$-inch gap between panels and nail no closer than $^3/_8$ inch from panel edges.

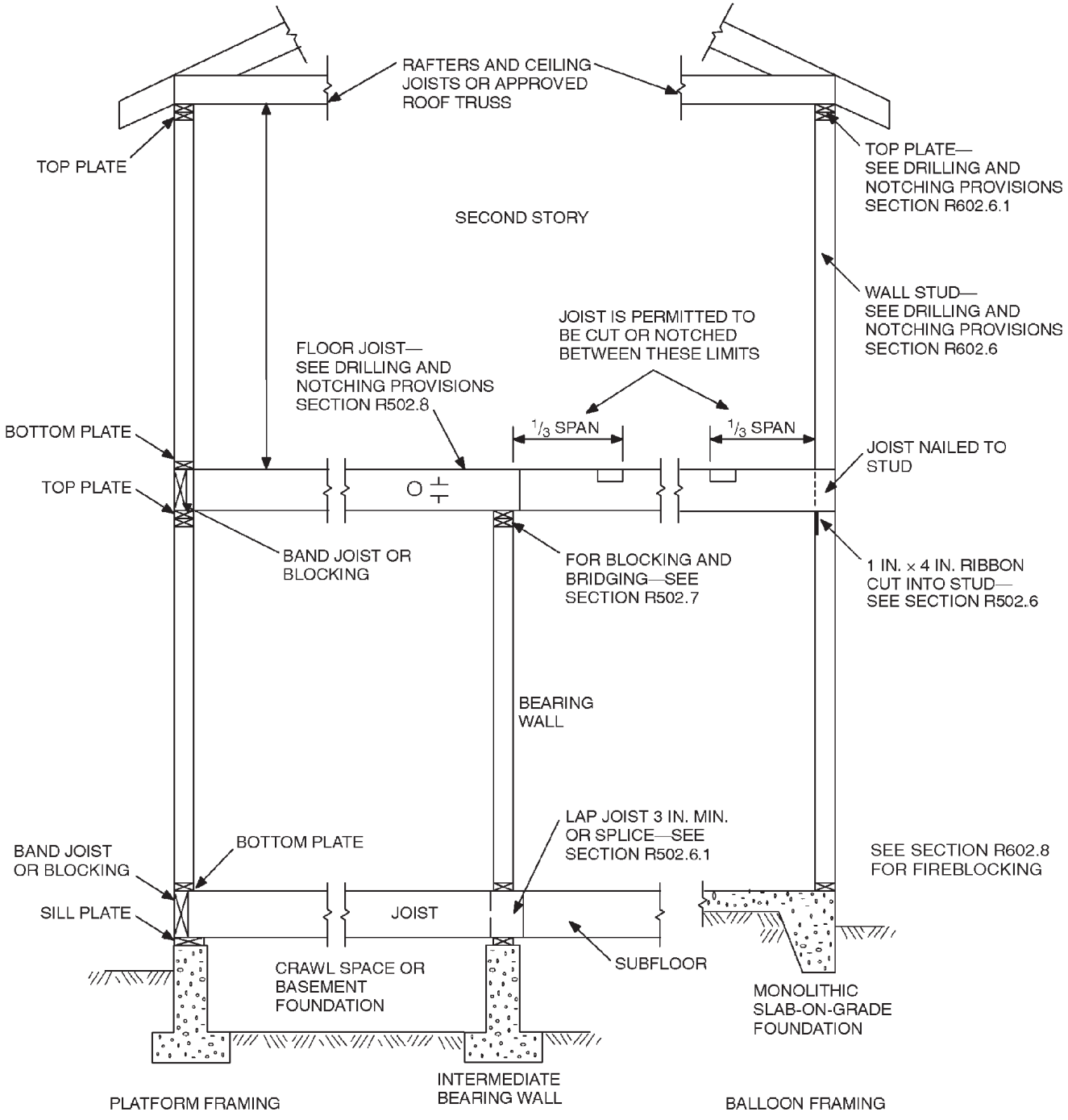
TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS[a]

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height[a] (feet)	Maximum spacing when supporting a roof-ceiling assembly only (inches)	Maximum spacing when supporting one floor, plus a roof-ceiling assembly (inches)	Maximum spacing when supporting two floors, plus a roof-ceiling assembly (inches)	Maximum spacing when supporting one floor height[a] (feet)	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, 1 square foot = 0.093 m^2.

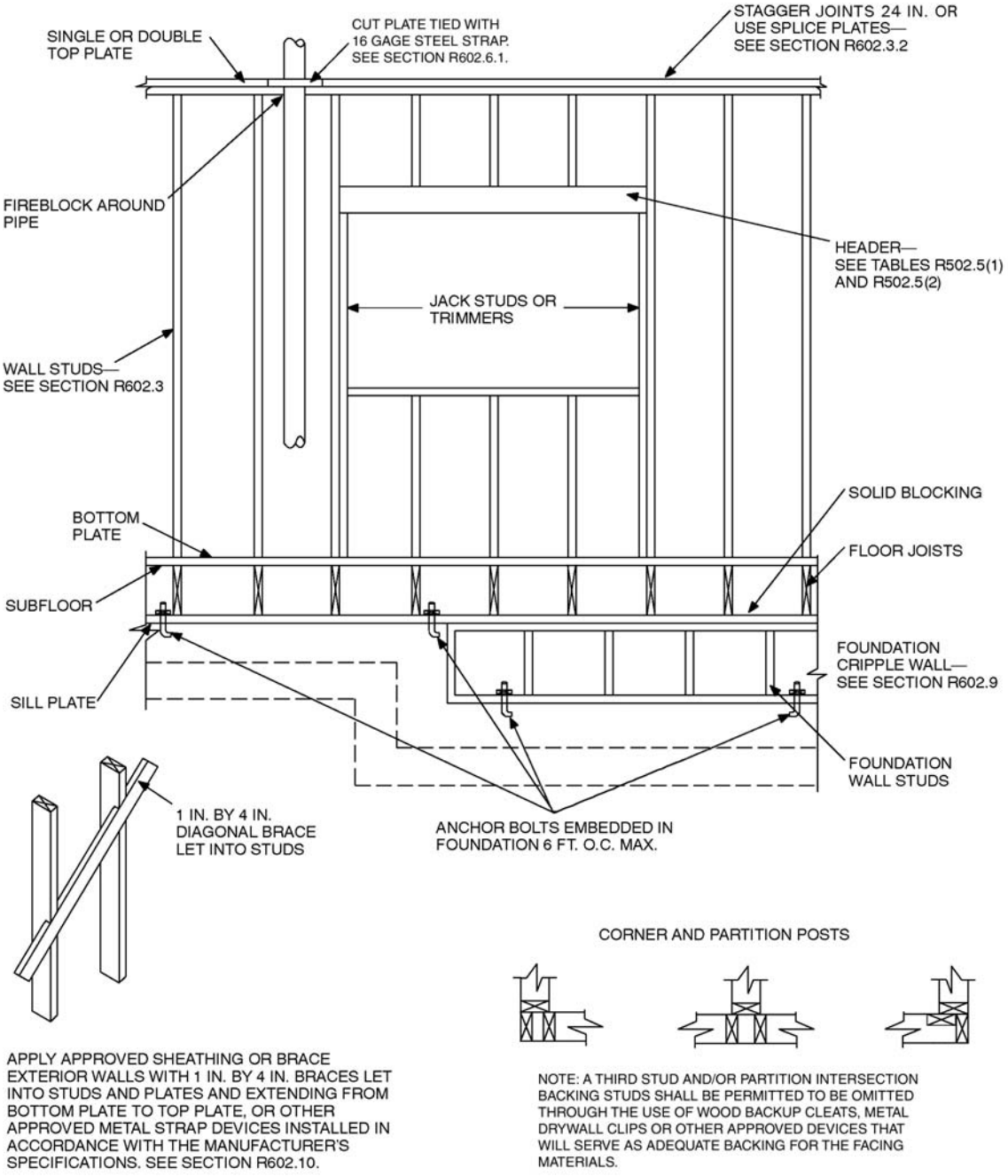
a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.

b. Shall not be used in exterior walls.



For SI: 1 inch = 25.4 mm.

FIGURE R602.3(1)
TYPICAL WALL, FLOOR AND ROOF FRAMING



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

FIGURE R602.3(2)
FRAMING DETAILS

TABLE R602.3.1
MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS OF 110 mph OR LESS IN SEISMIC DESIGN CATEGORIES A, B, C, D_1 and D_2[b, c] | |

HEIGHT (feet)	ON-CENTER SPACING (inches)			
	24	16	12	8
Supporting a roof only				
>10	2 × 4	2 × 4	2 × 4	2 × 4
12	2 × 6	2 × 4	2 × 4	2 × 4
14	2 × 6	2 × 6	2 × 6	2 × 4
16	2 × 6	2 × 6	2 × 6	2 × 4
18	NA[a]	2 × 6	2 × 6	2 × 6
20	NA[a]	NA[a]	2 × 6	2 × 6
24	NA[a]	NA[a]	NA[a]	2 × 6
Supporting one floor and a roof				
>10	2 × 6	2 × 4	2 × 4	2 × 4
12	2 × 6	2 × 6	2 × 6	2 × 4
14	2 × 6	2 × 6	2 × 6	2 × 6
16	NA[a]	2 × 6	2 × 6	2 × 6
18	NA[a]	2 × 6	2 × 6	2 × 6
20	NA[a]	NA[a]	2 × 6	2 × 6
24	NA[a]	NA[a]	NA[a]	2 × 6
Supporting two floors and a roof				
>10	2 × 6	2 × 6	2 × 4	2 × 4
12	2 × 6	2 × 6	2 × 6	2 × 6
14	2 × 6	2 × 6	2 × 6	2 × 6
16	NA[a]	NA[a]	2 × 6	2 × 6
18	NA[a]	NA[a]	2 × 6	2 × 6
20	NA[a]	NA[a]	NA[a]	2 × 6
22	NA[a]	NA[a]	NA[a]	NA[a]
24	NA[a]	NA[a]	NA[a]	NA[a]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479kPa, 1 pound per square inch = 6.895 kPa, 1 mile per hour = 0.447 m/s.

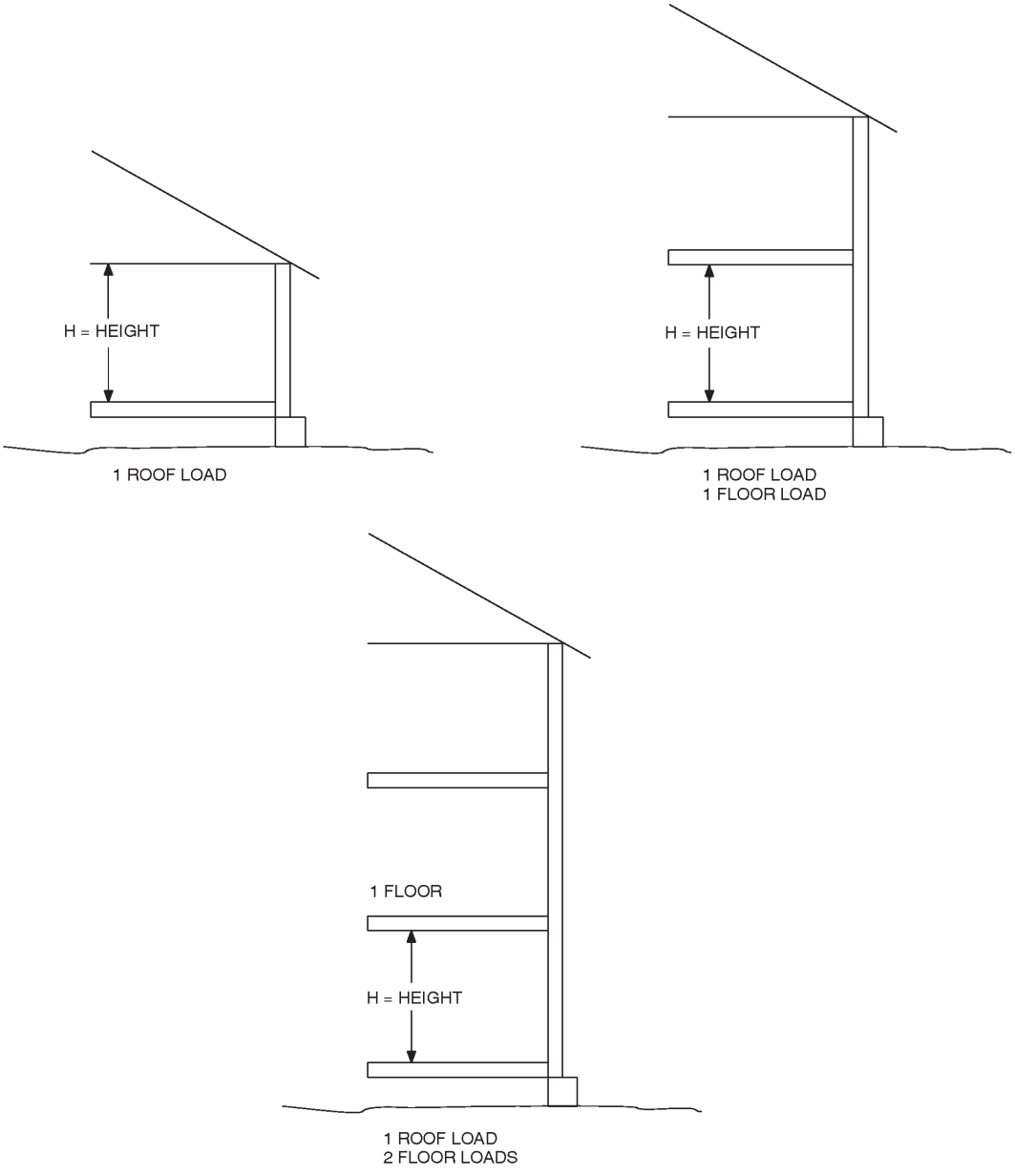
a. Design required.

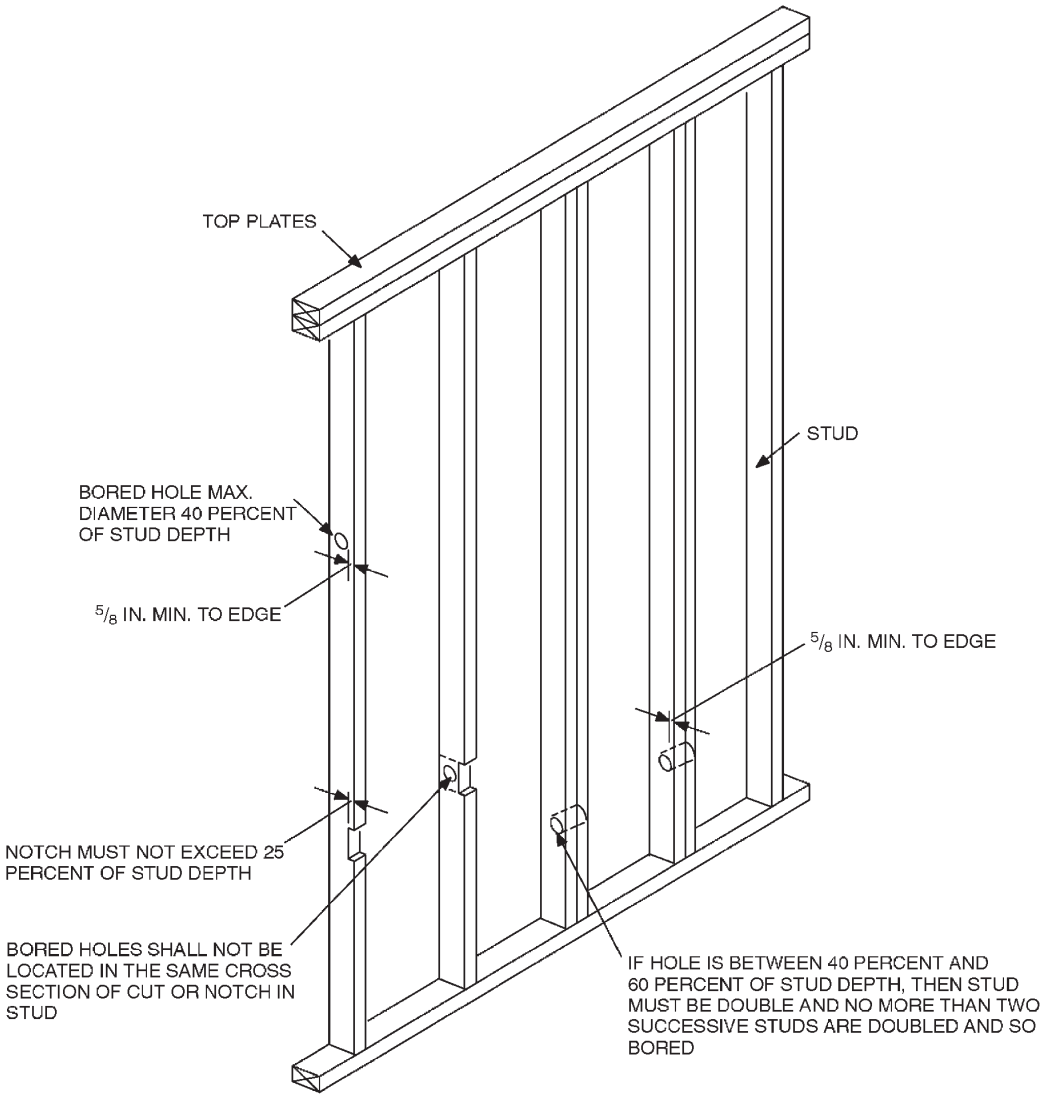
b. Applicability of this table assumes the following: Snow load not exceeding 25 psf, f_b not less than 1310 psi determined by multiplying the AF&PA NDS tabular base design value by the repetitive use factor, and by the size factor for all species except southern pine, E not less than 1.6×10^6 psi, tributary dimensions for floors and roofs not exceeding 6 feet, maximum span for floors and roof not exceeding 12 feet, eaves not over 2 feet in dimension and exterior sheathing. Where the conditions are not within these parameters, design is required.

c. Utility, standard, stud and No. 3 grade lumber of any species are not permitted.

(continued)

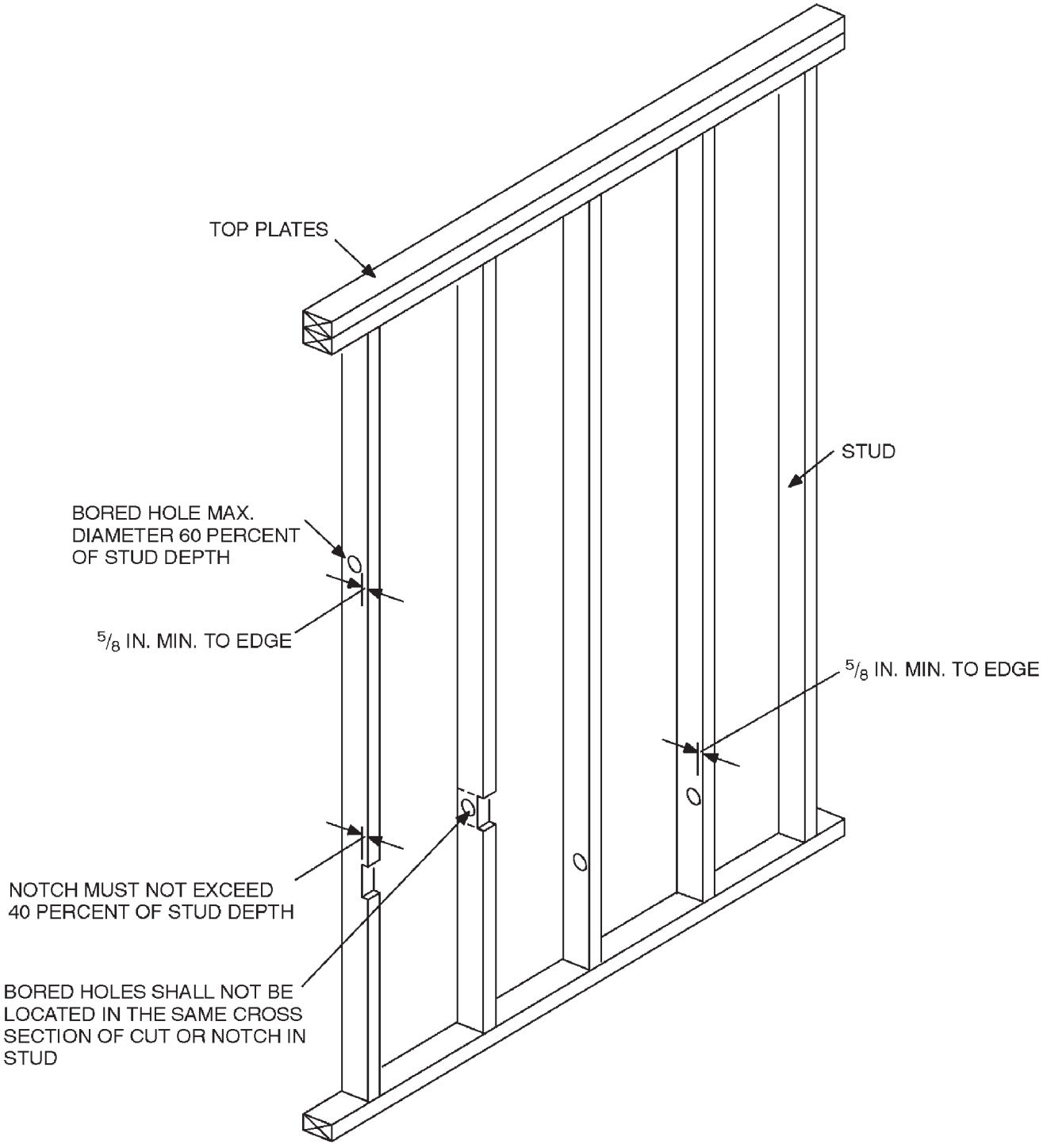
TABLE R602.3.1—continued
MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS OF 100 mph OR LESS IN SEISMIC DESIGN CATEGORIES A, B, C, D_1 and D_2





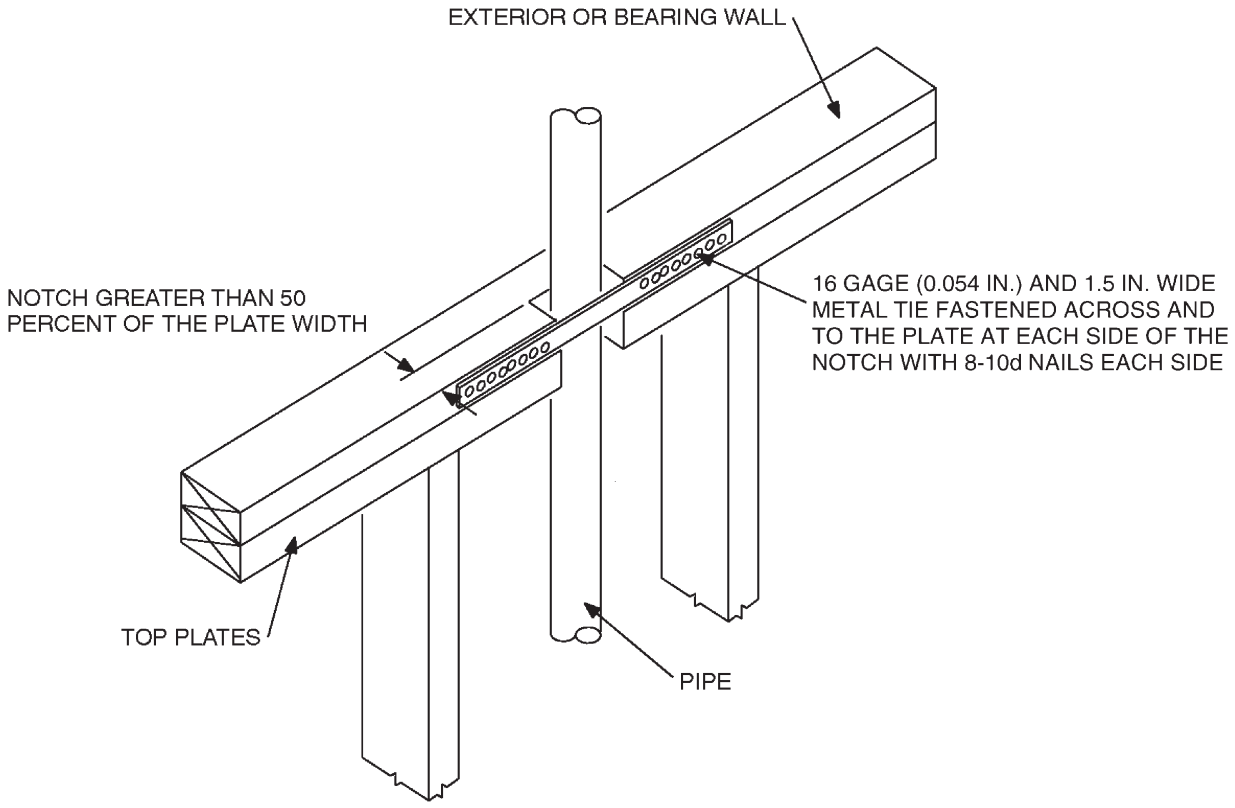
For SI: 1 inch = 25.4 mm.
NOTE: Condition for exterior and bearing walls.

FIGURE R602.6(1)
NOTCHING AND BORED HOLE LIMITATIONS FOR EXTERIOR WALLS AND BEARING WALLS



For SI: 1 inch = 25.4 mm.

FIGURE R602.6(2)
NOTCHING AND BORED HOLE LIMITATIONS FOR INTERIOR NONBEARING WALLS



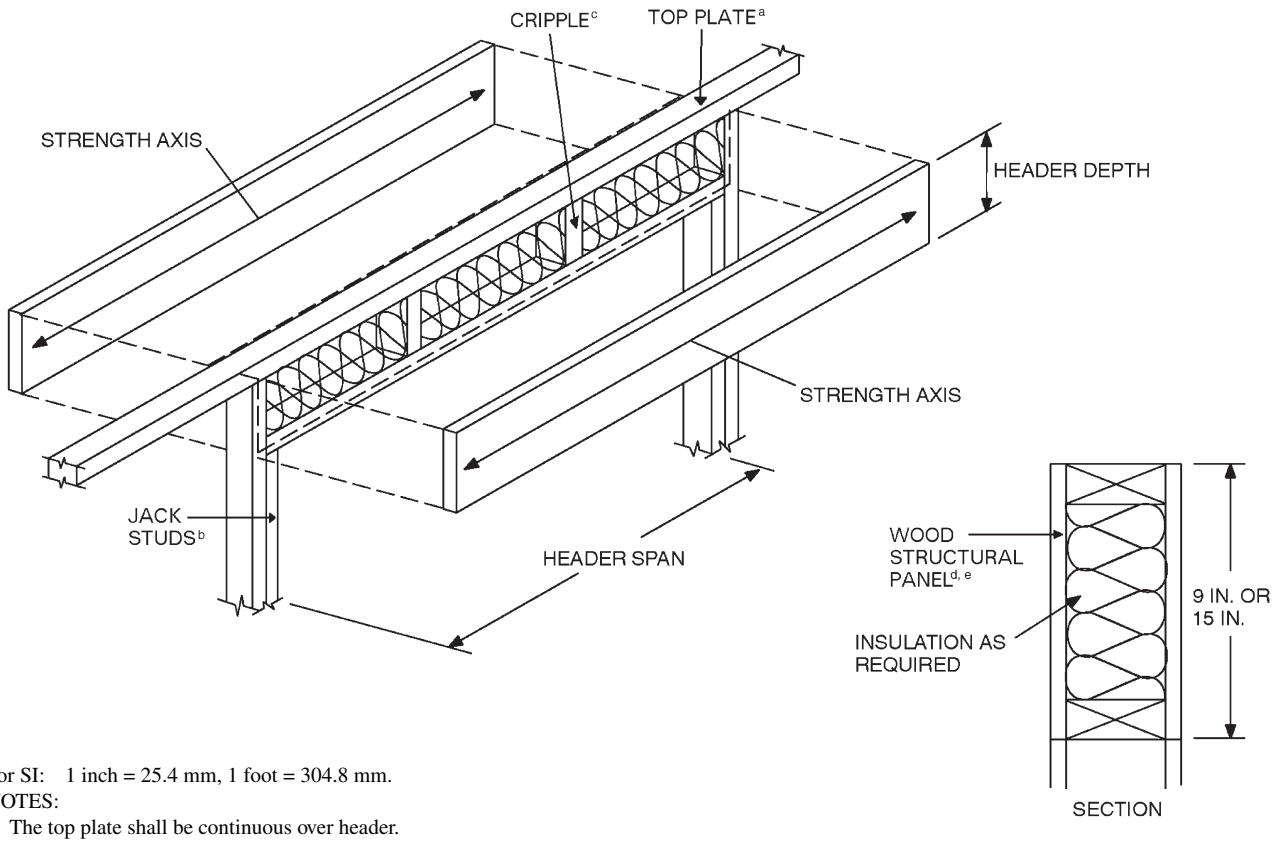
For SI: 1 inch = 25.4 mm.

FIGURE R602.6.1
TOP PLATE FRAMING TO ACCOMMODATE PIPING

TABLE R602.7.2
MAXIMUM SPANS FOR WOOD STRUCTURAL PANEL BOX HEADERS[a]

HEADER CONSTRUCTION[b]	HEADER DEPTH (inches)	HOUSE DEPTH (feet)				
		24	26	28	30	32
Wood structural panel—one side	9	4	4	3	3	—
	15	5	5	4	3	3
Wood structural panel—both sides	9	7	5	5	4	3
	15	8	8	7	7	6

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Spans are based on single story with clear-span trussed roof or two-story with floor and roof supported by interior-bearing walls.
b. See Figure R602.7.2 for construction details.



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

NOTES:

a. The top plate shall be continuous over header.

b. Jack studs shall be used for spans over 4 feet.

c. Cripple spacing shall be the same as for studs.

d. Wood structural panel faces shall be single pieces of $^{15}/_{32}$-inch-thick Exposure 1 (exterior glue) or thicker, installed on the interior or exterior or both sides of the header.

e. Wood structural panel faces shall be nailed to framing and cripples with 8d common or galvanized box nails spaced 3 inches on center, staggering alternate nails $^{1}/_{2}$ inch. Galvanized nails shall be hot-dipped or tumbled.

FIGURE R602.7.2
TYPICAL WOOD STRUCTURAL PANEL BOX HEADER CONSTRUCTION

R602.10.1 Braced wall lines. *Braced wall lines* shall be provided in accordance with this section. The length of a *braced wall line* shall be measured as the distance between the ends of the wall line. The end of a *braced wall line* shall be considered to be either:

1. The intersection with perpendicular exterior walls or projection thereof,
2. The intersection with perpendicular *braced wall lines*.

The end of the *braced wall line* shall be chosen such that the maximum length results.

R602.10.1.1 Braced wall panels. *Braced wall panels* shall be constructed in accordance with the intermittent bracing methods specified in Section R602.10.2, or the continuous sheathing methods specified in Sections R602.10.4 and R602.10.5. Mixing of bracing method shall be permitted as follows:

1. Mixing bracing methods from *story* to *story* is permitted.
2. Mixing bracing methods from *braced wall line* to *braced wall line* within a *story* is permitted, except that continuous sheathing methods shall conform to the additional requirements of Sections R602.10.4 and R602.10.5.
3. Mixing bracing methods within a *braced wall line* is permitted only in Seismic Design Categories A and B, and detached *dwellings* in Seismic Design Category C. The length of required bracing for the *braced wall line* with mixed sheathing types shall have the higher bracing length requirement, in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2), of all types of bracing used.

R602.10.1.2 Length of bracing. The length of bracing along each *braced wall line* shall be the greater of that required by the design wind speed and *braced wall line* spacing in accordance with Table R602.10.1.2(1) as adjusted by the factors in the footnotes or the Seismic Design Category and *braced wall line* length in accordance with Table R602.10.1.2(2) as adjusted by the factors in Table R602.10.1.2(3) or *braced wall panel*

location requirements of Section R602.10.1.4. Only walls that are parallel to the *braced wall line* shall be counted toward the bracing requirement of that line, except angled walls shall be counted in accordance with Section R602.10.1.3. In no case shall the minimum total length of bracing in a *braced wall line*, after all adjustments have been taken, be less than 48 inches (1219 mm) total.

R602.10.1.2.1 Braced wall panel uplift load path. *Braced wall panels* located at exterior walls that support roof rafters or trusses (including stories below top *story*) shall have the framing members connected in accordance with one of the following:

1. Fastening in accordance with Table R602.3(1) where:
    1.1. The basic wind speed does not exceed 90 mph (40 m/s), the wind exposure category is B, the roof pitch is 5:12 or greater, and the roof span is 32 feet (9754 mm) or less, or
    1.2. The net uplift value at the top of a wall does not exceed 100 plf. The net uplift value shall be determined in accordance with Section R802.11 and shall be permitted to be reduced by 60 plf (86 N/mm) for each full wall above.
2. Where the net uplift value at the top of a wall exceeds 100 plf (146 N/mm), installing *approved* uplift framing connectors to provide a continuous load path from the top of the wall to the foundation. The net uplift value shall be as determined in Item 1.2 above.
3. Bracing and fasteners designed in accordance with accepted engineering practice to resist combined uplift and shear forces.

R602.10.1.3 Angled corners. At corners, *braced wall line*s shall be permitted to angle out of plane up to 45 degrees with a maximum diagonal length of 8 feet (2438 mm). When determining the length of bracing required, the length of each *braced wall line* shall be determined as shown in Figure R602.10.1.3. The placement of bracing for the *braced wall lines* shall begin at the point where the *braced wall line*, which contains the angled wall adjoins the adjacent *braced wall line* (Point A as shown in Figure R602.10.1.3). Where an angled corner is constructed at an angle equal to 45 degrees (0.79 rad) and the diagonal length is no more than 8 feet (2438 mm), the angled wall may be considered as part of either of the adjoining *braced wall lines*, but not both. Where the diagonal length is greater than 8 feet (2438 mm), it shall be considered its own *braced wall line* and be braced in accordance with Section R602.10.1 and methods in Section R602.10.2.

R602.10.1.4 Braced wall panel location. *Braced wall panels* shall be located in accordance with Figure R602.10.1.4(1). *Braced wall panels* shall be located not more than 25 feet (7620 mm) on center and shall be permitted to begin no more than 12.5 feet (3810 mm) from the end of a *braced wall line* in accordance with Section R602.10.1 and Figure R602.10.1.4(2). The total combined distance from each end of a *braced wall line* to the outermost *braced wall panel* or panels in the line shall not exceed 12.5 feet (3810 mm). *Braced wall panels* may be offset out-of-plane up to 4 feet (1219 mm) from the designated *braced wall line* provided that the total out-to-out offset of *braced wall panels* in a *braced wall line* is not more than 8 feet (2438 mm) in accordance with Figures R602.10.1.4(3) and R602.10.1.4(4). All *braced wall panels* within a *braced wall line* shall be permitted to be offset from the designated *braced wall line*.

R602.10.1.4.1 Braced wall panel location in Seismic Design Categories D_1 and D_2. *Braced wall lines* at exterior walls shall have a *braced wall panel* located at each end of the *braced wall line*.

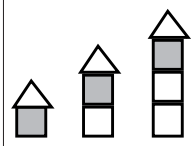
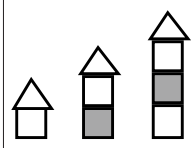
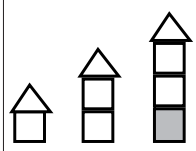
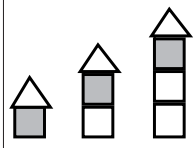
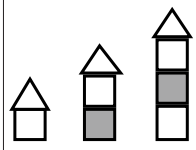
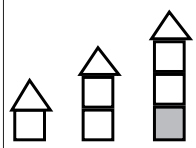
Exception: For *braced wall panel* construction Method WSP of Section R602.10.2, the *braced wall panel* shall be permitted to begin no more than 8 feet (2438 mm) from each end of the *braced wall line* provided one of the following is satisfied in accordance with Figure R602.10.1.4.1:

1. A minimum 24-inch-wide (610 mm) panel is applied to each side of the building corner and the two 24-inch-wide (610 mm) panels at the corner are attached to framing in accordance with Figure R602.10.4.4(1), or
2. The end of each *braced wall panel* closest to the corner shall have a hold-down device fastened to the stud at the edge of the *braced wall panel* closest to the corner and to the foundation or framing below. The hold-down device shall be capable of providing an uplift allowable design value of at least 1,800 pounds (8 kN). The hold-down device shall be installed in accordance with the manufacturer's recommendations.

R602.10.1.5 Braced wall line spacing for Seismic Design Categories D_1 and D_2. Spacing between *braced wall lines* in each *story* shall not exceed 25 feet (7620 mm) on center in both the longitudinal and transverse directions.

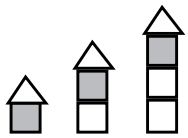
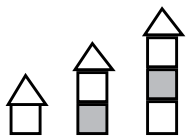
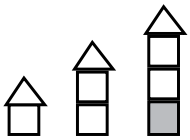
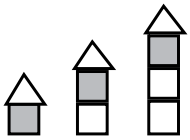
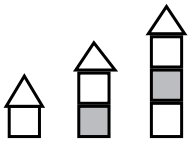
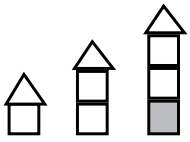
Exception: In one- and two-story buildings, spacing between two adjacent *braced wall lines* shall not exceed 35 feet (10 668 mm) on center in order to accommodate one single room not exceeding 900 square feet (84 m^2) in each *dwelling unit*. Spacing between all other *braced wall lines* shall not exceed 25 feet (7620 mm). A spacing of 35 feet (10 668 mm) or less shall be permitted between *braced wall lines* where the length of wall bracing required by Table R602.10.1.2(2) is multiplied by the appropriate adjustment factor from Table R602.10.1.5, the length-to-width ratio for the floor/roof *diaphragm* does not exceed 3:1, and the top plate lap splice face nailing is twelve 16d nails on each side of the splice.

TABLE R602.10.1.2(1)[a, b, c, d, e]
BRACING REQUIREMENTS BASED ON WIND SPEED
(as a function of braced wall line spacing)

EXPOSURE CATEGORY B, 30 FT MEAN ROOF HEIGHT, 10 FT EAVE TO RIDGE HEIGHT, 10 FT WALL HEIGHT, 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Basic Wind Speed (mph)	**Story Location**	**Braced Wall Line Spacing (feet)**	**Method LIB[f, h]**	**Method GB (double sided)[g]**	**Methods DWB, WSP, SFB, PBS, PCP, HPS[f, i]**	**Continuous Sheathing**
≤ 85 (mph)		10	3.5	3.5	2.0	1.5
		20	6.0	6.0	3.5	3.0
		30	8.5	8.5	5.0	4.5
		40	11.5	11.5	6.5	5.5
		50	14.0	14.0	8.0	7.0
		60	16.5	16.5	9.5	8.0
		10	6.5	6.5	3.5	3.0
		20	11.5	11.5	6.5	5.5
		30	16.5	16.5	9.5	8.0
		40	21.5	21.5	12.5	10.5
		50	26.5	26.5	15.0	13.0
		60	31.5	31.5	18.0	15.5
		10	NP	9.0	5.5	4.5
		20	NP	17.0	10.0	8.5
		30	NP	24.5	14.0	12.0
		40	NP	32.0	18.0	15.5
		50	NP	39.0	22.5	19.0
		60	NP	46.5	26.5	22.5
≤ 90 (mph)		10	3.5	3.5	2.0	2.0
		20	7.0	7.0	4.0	3.5
		30	9.5	9.5	5.5	5.0
		40	12.5	12.5	7.5	6.0
		50	15.5	15.5	9.0	7.5
		60	18.5	18.5	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	13.0	13.0	7.5	6.5
		30	18.5	18.5	10.5	9.0
		40	24.0	24.0	14.0	12.0
		50	29.5	29.5	17.0	14.5
		60	35.0	35.0	20.0	17.0
		10	NP	10.5	6.0	5.0
		20	NP	19.0	11.0	9.5
		30	NP	27.5	15.5	13.5
		40	NP	35.5	20.5	17.5
		50	NP	44.0	25.0	21.5
		60	NP	52.0	30.0	25.5

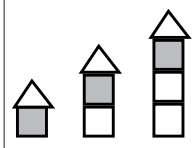
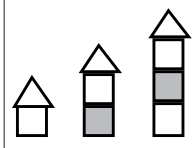
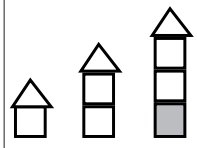
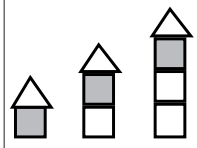
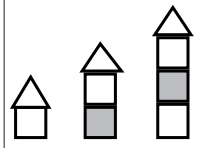
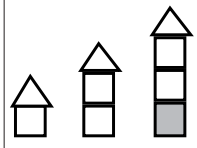
(continued)

TABLE R602.10.1.2(1)[a, b, c, d, e]—continued
BRACING REQUIREMENTS BASED ON WIND SPEED
(as a function of braced wall line spacing)

EXPOSURE CATEGORY B, 30 FT MEAN ROOF HEIGHT, 10 FT EAVE TO RIDGE HEIGHT, 10 FT WALL HEIGHT, 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Basic Wind Speed (mph)	**Story Location**	**Braced wall Line Spacing (feet)**	**Method LIB[f, h]**	**Method GB (doubled sided)[g]**	**Method DWB, WSP, SFB, PBS, PCP, HPS[f, i]**	**Continuous Sheathing**
≤ 95 (mph)		10	4.0	4.0	2.25	2.25
		20	7.75	7.75	4.5	3.75
		30	10.75	10.75	6.25	5.5
		40	14.0	14.0	8.25	6.75
		50	17.25	17.25	10.0	8.5
		60	20.5	20.5	11.75	10.0
		10	7.75	7.75	4.5	4.0
		20	14.5	14.5	8.25	7.25
		30	20.75	20.75	11.75	10.0
		40	26.75	26.75	15.5	13.25
		50	33.0	33.0	19.0	16.25
		60	39.25	39.25	22.5	19.0
		10	NP	11.5	6.75	5.5
		20	NP	21.25	12.25	10.5
		30	NP	30.75	17.5	15.0
		40	NP	39.75	22.75	19.5
		50	NP	49.0	28.0	24.0
		60	NP	58.0	33.25	28.25
≤ 100 (mph)		10	4.5	4.5	2.5	2.5
		20	8.5	8.5	5.0	4.0
		30	12.0	12.0	7.0	6.0
		40	15.5	15.5	9.0	7.5
		50	19.0	19.0	11.0	9.5
		60	22.5	22.5	13.0	11.0
		10	8.5	8.5	5.0	4.5
		20	16.0	16.0	9.0	8.0
		30	23.0	23.0	13.0	11.0
		40	29.5	29.5	17.0	14.5
		50	36.5	36.5	21.0	18.0
		60	43.5	43.5	25.0	21.0
		10	NP	12.5	7.5	6.0
		20	NP	23.5	13.5	11.5
		30	NP	34.0	19.5	16.5
		40	NP	44.0	25.0	21.5
		50	NP	54.0	31.0	26.5
		60	NP	64.0	36.5	31.0

(continued)

TABLE R602.10.1.2(1)[a, b, c, d, e]—continued
BRACING REQUIREMENTS BASED ON WIND SPEED
(as a function of braced wall line spacing)

EXPOSURE CATEGORY B, 30 FT MEAN ROOF HEIGHT, 10 FT EAVE TO RIDGE HEIGHT, 10 FT WALL HEIGHT, 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Basic Wind Speed (mph)	**Story Location**	**Braced wall Line Spacing (feet)**	**Method LIB[f, h]**	**Method GB (doubled sided)[g]**	**Method DWB, WSP, SFB, PBS, PCP, HPS[f, i]**	**Continuous Sheathing**
≤ 105 (mph)		10	5.0	5.0	2.75	2.75
		20	9.25	9.25	5.5	4.5
		30	13.25	13.25	7.75	6.5
		40	17.0	17.0	10.0	8.25
		50	21.0	21.0	12.0	10.5
		60	25.0	25.0	14.25	12.25
		10	9.5	9.5	5.5	4.75
		20	17.5	17.5	10.0	8.75
		30	25.25	25.25	14.5	12.25
		40	32.75	32.75	18.75	16.0
		50	40.25	40.25	23.25	19.75
		60	48.0	48.0	27.5	23.25
		10	NP	14.0	8.25	6.75
		20	NP	26.0	15.0	12.75
		30	NP	37.5	21.5	18.25
		40	NP	48.5	27.75	23.75
		50	NP	59.75	34.25	29.25
		60	NP	70.75	40.5	34.25
≤ 110 (mph)		10	5.5	5.5	3.0	3.0
		20	10.0	10.0	6.0	5.0
		30	14.5	14.5	8.5	7.0
		40	18.5	18.5	11.0	9.0
		50	23.0	23.0	13.0	11.5
		60	27.5	27.5	15.5	13.5
		10	10.5	10.5	6.0	5.0
		20	19.0	19.0	11.0	9.5
		30	27.5	27.5	16.0	13.5
		40	36.0	36.0	20.5	17.5
		50	44.0	44.0	25.5	21.5
		60	52.5	52.5	30.0	25.5
		10	NP	15.5	9.0	7.5
		20	NP	28.5	16.5	14.0
		30	NP	41.0	23.5	20.0
		40	NP	53.0	30.5	26.0
		50	NP	65.5	37.5	32.0
		60	NP	77.5	44.5	37.5

(continued)

TABLE R602.10.1.2(1)[a, b, c, d, e]—continued
BRACING REQUIREMENTS BASED ON WIND SPEED
(as a function of braced wall line spacing)

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

a. Tabulated bracing lengths are based on Wind Exposure Category B, a 30-ft mean roof height, a 10-ft eave to ridge height, a 10-ft wall height, and two braced wall lines sharing load in a given plan direction on a given story level. Methods of bracing shall be as described in Sections R602.10.2, R602.10.4 and R602.10.5. Interpolation shall be permitted.

b. For other mean roof heights and exposure categories, the required bracing length shall be multiplied by the appropriate factor from the following table:

NUMBER OF STORIES	EXPOSURE/HEIGHT FACTORS		
	Exposure B	Exposure C	Exposure D
1	1.0	1.2	1.5
2	1.0	1.3	1.6
3	1.0	1.4	1.7

c. For other roof-to-eave ridge heights, the required bracing length shall be multiplied by the appropriate factor from the following table: interpolation shall be permitted.

SUPPORT CONDITION	ROOF EAVE-TO-RIDGE HEIGHT			
	5 ft or less	10 ft	15 ft	20 ft
Roof only	0.7	1.0	1.3	1.6
Roof + floor	0.85	1.0	1.15	1.3
Roof + 2 floors	0.9	1.0	1.1	NP

d. For a maximum 9-foot wall height, multiplying the table values by 0.95 shall be permitted . For a maximum 8-foot wall height, multiplying, the table values by 0.90 shall be permitted. For a maximum 12-foot wall height, the table values shall be multiplied by 1.1.

e. For three or more braced wall lines in a given plan direction, the required bracing length on each braced wall line shall be multiplied by the appropriate factor from the following table:

NUMBER OF BRACED WALL LINES	ADJUSTMENT FACTOR
3	1.30
4	1.45
≥ 5	1.60

f. Bracing lengths are based on the application of gypsum board finish (or equivalent) applied to the inside face of a braced wall panel. When gypsum board finish (or equivalent) is not applied to the inside face of braced wall panels, the tabulated lengths shall be multiplied by the appropriate factor from the following table:

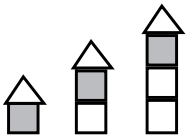
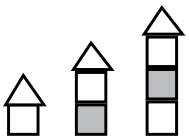
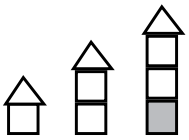
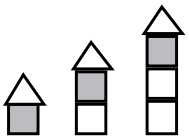
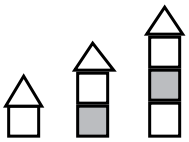
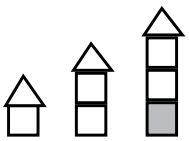
BRACING METHOD	ADJUSTMENT FACTOR
Method LIB	1.8
Methods DWB, WSP, SFB, PBS, PCP, HPS	1.4

g. Bracing lengths for Method GB are based on the application of gypsum board on both faces of a braced wall panel. When Method GB is provided on only one side of the wall, the required bracing amounts shall be doubled. When Method GB braced wall panels installed in accordance with Section R602.10.2 are fastened at 4 inches on center at panel edges, including top and bottom plates, and are blocked at all horizontal joints, multiplying the required bracing percentage for wind loading by 0.7 shall be permitted.

h. Method LIB bracing shall have gypsum board attached to at least one side according to the Section R602.10.2 Method GB requirements.

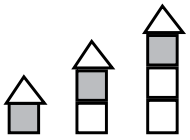
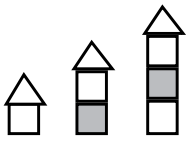
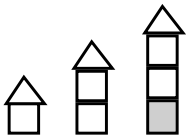
i. Required bracing length for Methods DWB, WSP, SFB, PBS, PCP and HPS in braced wall lines located in one-story buildings and in the top story of two or three story buildings shall be permitted to be multiplied by 0.80 when an approved hold-down device with a minimum uplift design value of 800 pounds is fastened to the end studs of each braced wall panel in the braced wall line and to the foundation or framing below.

TABLE R602.10.1.2(2)[a, b, c]
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY
(AS A FUNCTION OF BRACED WALL LINE LENGTH)

SOIL CLASS D[a] WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Seismic Design Category (SDC)	Story Location	Braced Wall Line Length	Method LIB	Methods DWB, SFB, GB, PBS, PCP, HPS	Method WSP	Continuous Sheathing
SDC A and B and Detached Dwellings in C		Exempt from Seismic Requirements Use Table R602.10.1.2(1) for Bracing Requirements				
SDC C		10	2.5	2.5	1.6	1.4
		20	5.0	5.0	3.2	2.7
		30	7.5	7.5	4.8	4.1
		40	10.0	10.0	6.4	5.4
		50	12.5	12.5	8.0	6.8
		10	NP	4.5	3.0	2.6
		20	NP	9.0	6.0	5.1
		30	NP	13.5	9.0	7.7
		40	NP	18.0	12.0	10.2
		50	NP	22.5	15.0	12.8
		10	NP	6.0	4.5	3.8
		20	NP	12.0	9.0	7.7
		30	NP	18.0	13.5	11.5
		40	NP	24.0	18.0	15.3
		50	NP	30.0	22.5	19.1
SDC D_1		10	NP	3.0	2.0	1.7
		20	NP	6.0	4.0	3.4
		30	NP	9.0	6.0	5.1
		40	NP	12.0	8.0	6.8
		50	NP	15.0	10.0	8.5
		10	NP	6.0	4.5	3.8
		20	NP	12.0	9.0	7.7
		30	NP	18.0	13.5	11.5
		40	NP	24.0	18.0	15.3
		50	NP	30.0	22.5	19.1
		10	NP	8.5	6.0	5.1
		20	NP	17.0	12.0	10.2
		30	NP	25.5	18.0	15.3
		40	NP	34.0	24.0	20.4
		50	NP	42.5	30.0	25.5

(continued)

TABLE R602.10.1.2(2)[a, b, c]—continued
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY
(AS A FUNCTION OF BRACED WALL LINE LENGTH)

SOIL CLASS D[a] WALL HEIGHT = 10 FT 10 PSF FLOOR DEAD LOAD 15 PSF ROOF/CEILING DEAD LOAD BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
Seismic Design Category (SDC)	Story Location	Braced Wall Line Length	Method LIB	METHODS DWB, SFB, GB, PBS, PCP, HPS	Method WSP	Continuous Sheathing
SDC D_2		10	NP	4.0	2.5	2.1
		20	NP	8.0	5.0	4.3
		30	NP	12.0	7.5	6.4
		40	NP	16.0	10.0	8.5
		50	NP	20.0	12.5	10.6
		10	NP	7.5	5.5	4.7
		20	NP	15.0	11.0	9.4
		30	NP	22.5	16.5	14.0
		40	NP	30.0	22.0	18.7
		50	NP	37.5	27.5	23.4
		10	NP	NP	NP	NP
		20	NP	NP	NP	NP
		30	NP	NP	NP	NP
		40	NP	NP	NP	NP
		50	NP	NP	NP	NP

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 47.89 Pa.

a. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.5 of the *Building Code*.

b. Foundation cripple wall panels shall be braced in accordance with Section R602.10.9.

c. Methods of bracing shall be as described in Sections R602.10.2, R602.10.4 and R602.10.5.

TABLE R602.10.1.2(3)
ADJUSTMENT FACTORS TO THE LENGTH OF REQUIRED SEISMIC WALL BRACING[a]

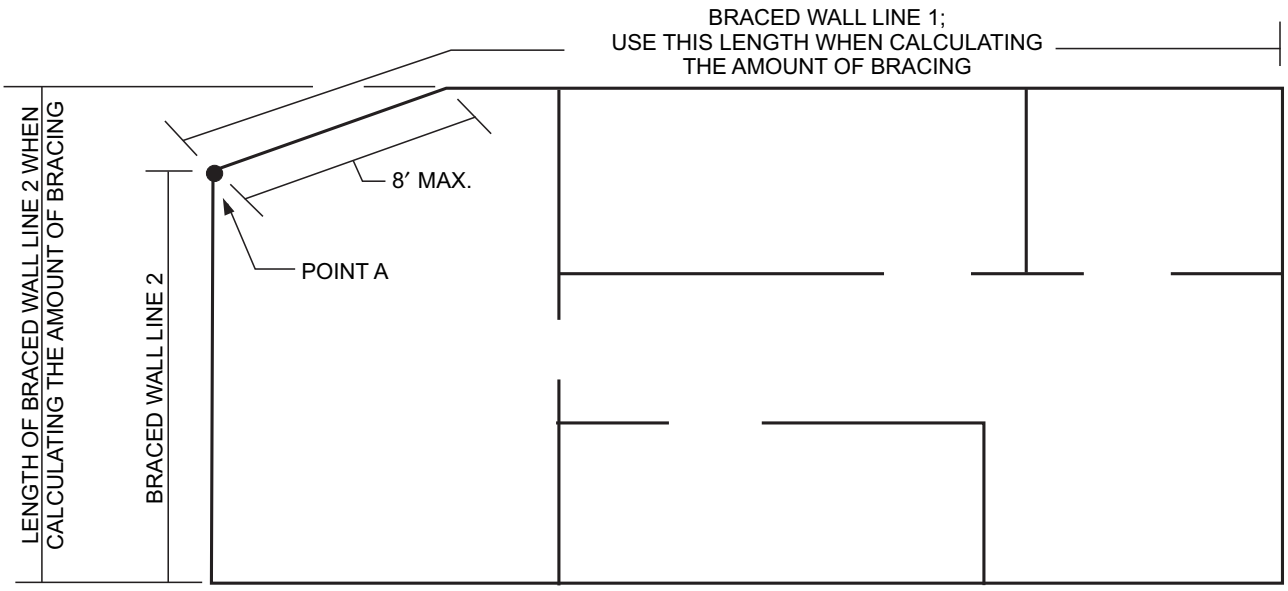
ADJUSTMENT BASED ON:			MULTIPLY LENGTH OF BRACING PER WALL LINE BY:	APPLIES TO:
Story height[b] (Section R301.3)		≤10 ft	1.0	All bracing methods - Sections R602.10.2, R602.10.4 and R602.10.5
		> 10 ≤ 12 ft	1.2	
Braced wall line spacing townhouses in SDC A-C[b,c]		≤ 35 ft	1.0	
		> 35 ≤ 50 ft	1.43	
Wall dead load		> 8 ≤ 15 psf	1.0	
		≤ 8 psf	0.85	
Roof/ceiling dead load for wall supporting[b]	roof only or roof plus one story	≤ 15 psf	1.0	
	roof only	< 15 psf ≤ 25 psf	1.1	
	roof plus one story	< 15 psf ≤ 25 psf	1.2	
Walls with stone or masonry veneer in SDC C-D_2		See Section R703.7		
Cripple walls		See Section R602.10.9		

For SI: 1 foot = 304.8 mm, 1 pound per square foot = 47.89 Pa.

a. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.

b. Linear interpolation shall be permitted.

c. Braced wall line spacing and adjustment to bracing length in SDC D_1 and D_2 shall comply with Section R602.10.1.5.



For SI: 1 foot = 304.8 mm.

FIGURE R602.10.1.3
ANGLED CORNERS

R602.10.2 Intermittent braced wall panel construction methods. The construction of intermittent *braced wall panels* shall be in accordance with one of the methods listed in Table R602.10.2.

R602.10.2.1 Intermittent braced wall panel interior finish material. Intermittent *braced wall panels* shall have gypsum wall board installed on the side of the wall opposite the bracing material. Gypsum wall board shall be not less than $^1/_2$ inch (12.7 mm) in thickness and be fastened in accordance with Table R702.3.5 for interior gypsum wall board.

Exceptions:

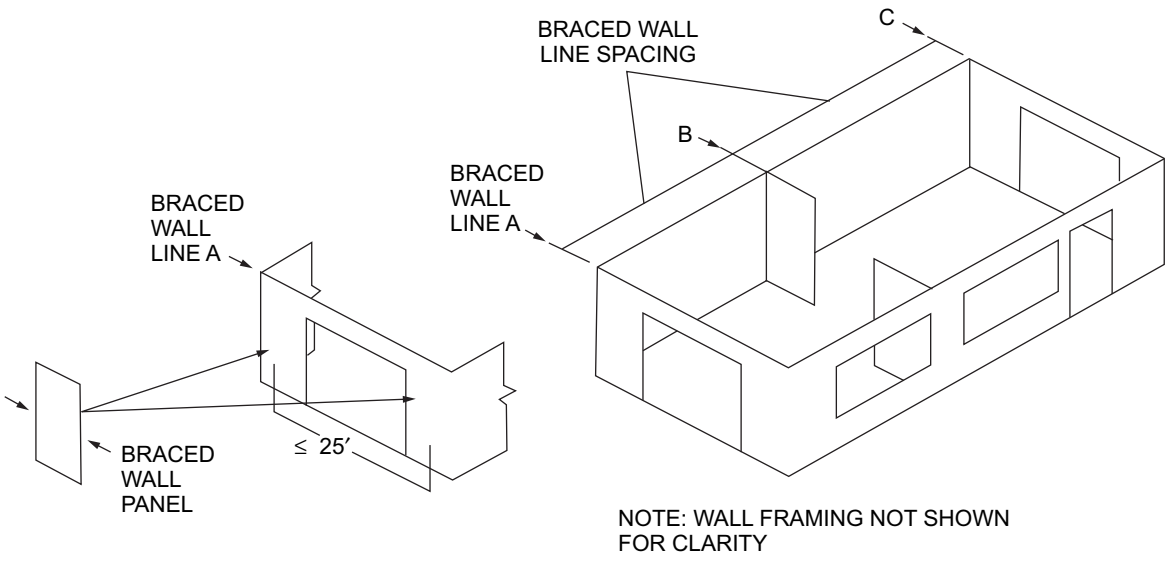
1. Wall panels that are braced in accordance with Methods GB, ABW, PFG and PFH.
2. When an *approved* interior finish material with an in-plane shear resistance equivalent to gypsum board is installed.
3. For Methods DWB, WSP, SFB, PBS, PCP and HPS, omitting gypsum wall board is permitted provided the length of bracing in Tables R602.10.1.2(1) and R602.10.1.2(2) is multiplied by a factor of 1.5.

R602.10.2.2 Adhesive attachment of sheathing in Seismic Design Categories C, D_1 and D_2. Adhesive attachment of wall sheathing shall not be permitted in Seismic Design Categories C, D_1 and D_2.

R602.10.3 Minimum length of braced panels. For Methods DWB, WSP, SFB, PBS, PCP and HPS, each *braced wall panel* shall be at least 48 inches (1219 mm) in length, covering a minimum of three stud spaces where studs are spaced 16 inches (406 mm) on center and covering a minimum of two stud spaces where studs are spaced 24 inches (610 mm) on center. For Method GB, each *braced wall panel* and shall be at least 96 inches (2438 mm) in length where applied to one face of a *braced wall panel* and at least 48 inches (1219 mm) where applied to both faces. For Methods DWB, WSP, SFB, PBS, PCP and HPS, for purposes of computing the length of panel bracing required in Tables R602.10.1.2(1) and R602.10.1.2(2), the effective length of the *braced wall panel* shall be equal to the actual length of the panel. When Method GB panels are applied to only one face of a *braced wall panel*, bracing lengths required in Tables R602.10.1.2(1) and R602.10.1.2(2) for Method GB shall be doubled.

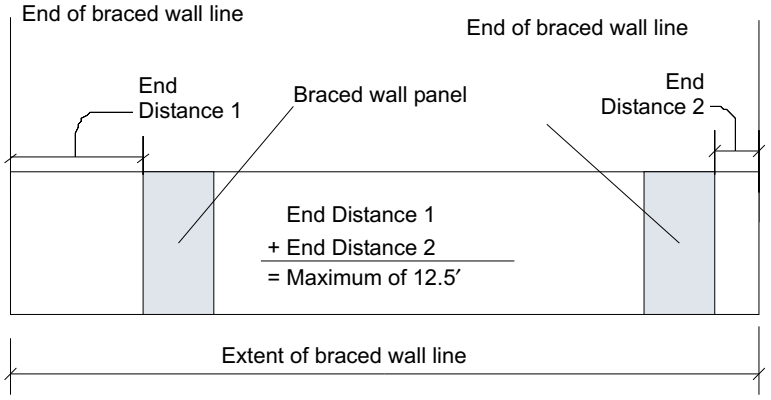
Exceptions:

1. Lengths of *braced wall panels* for continuous sheathing methods shall be in accordance with Table R602.10.4.2.
2. Lengths of Method ABW panels shall be in accordance with Sections R602.10.3.2.
3. Length of Methods PFH and PFG panels shall be in accordance with Section R602.10.3.3 and R602.10.3.4 respectively.
4. For Methods DWB, WSP, SFB, PBS, PCP and HPS in Seismic Design Categories A, B, and C: Panels between 36 inches (914 mm)and 48 inches (1219 mm) in length shall be permitted to count towards the required length of bracing in Tables R602.10.1.2(1) and R602.10.1.2(2), and the effective contribution shall comply with Table R602.10.3.



For SI: 1 foot = 304.8 mm.

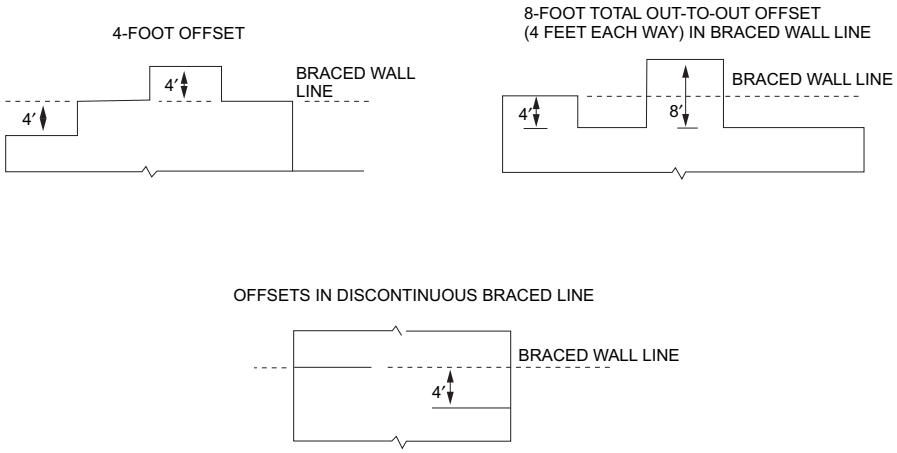
FIGURE R602.10.1.4(1)
BRACED WALL PANELS AND BRACED WALL LINES



Braced wall panel shall be permitted to be located away from the end of a braced wall line, provided the total end distance from each end to the nearest braced wall panel does not exceed 12.5′. If braced wall panel is located at the end of the braced wall line, then end distance is 0′.

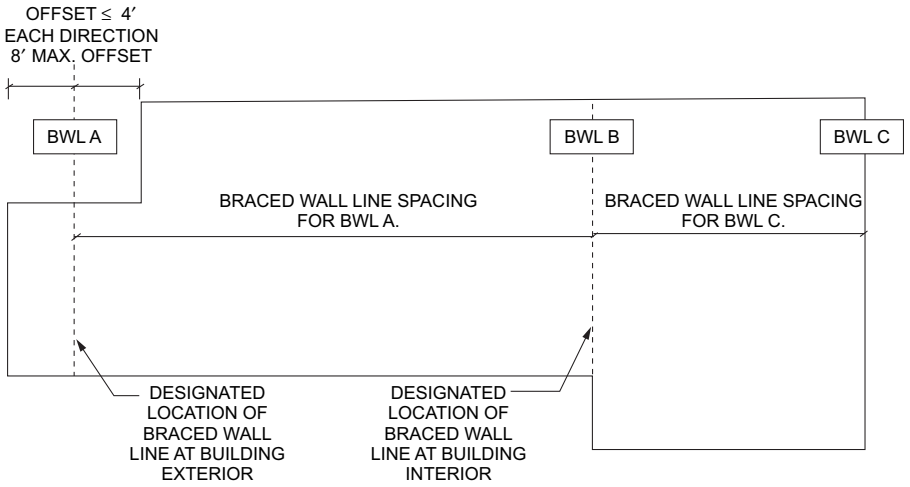
For SI: 1 foot = 304.8 mm.

FIGURE R602.10.1.4(2)
BRACED WALL PANEL END DISTANCE REQUIREMENTS (SDC A, B AND C)



For SI: 1 foot = 304.8 mm.

FIGURE R602.10.1.4(3)
OFFSETS PERMITTED FOR BRACED WALL LINES



NOTE: BRACED WALL SPACING FOR BWL B IS THE GREATER OF THE DISTANCE FROM BWL A TO BWL B OR FROM BWL B TO BWL C.

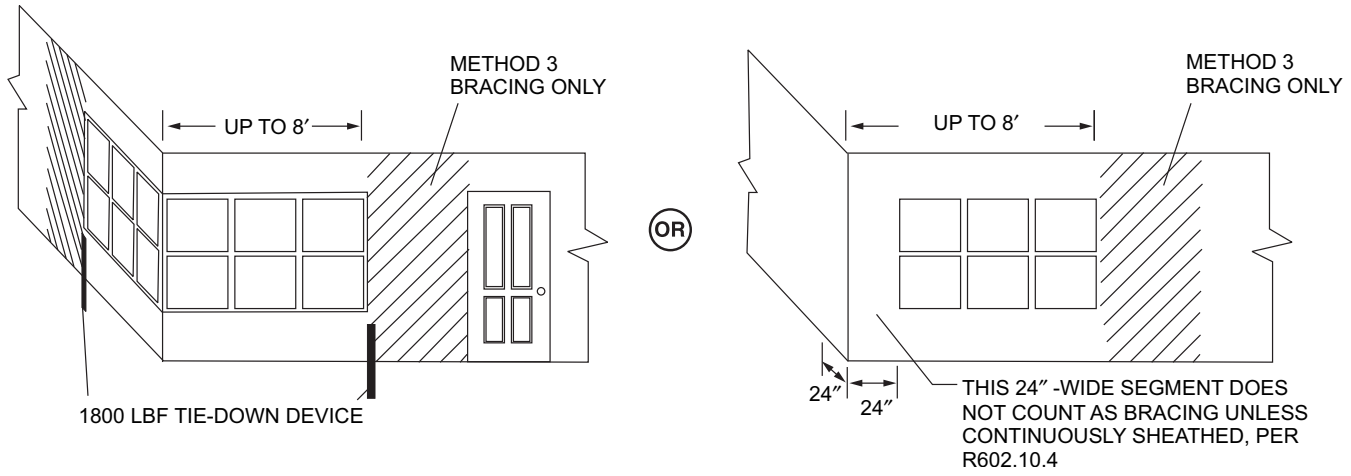
For SI: 1 foot = 304.8 mm.

FIGURE R602.10.1.4(4)
BRACED WALL LINE SPACING

R602.10.3.1 Adjustment of length of braced panels. When *story height* (H), measured in feet, exceeds 10 feet (3048 mm), in accordance with Section R301.3, the minimum length of *braced wall panels* specified in Section R602.10.3 shall be increased by a factor H/10. See Table R602.10.3.1. Interpolation is permitted.

R602.10.3.2 Method ABW: Alternate braced wall panels. Method ABW *braced wall panels* constructed in accordance with one of the following provisions shall be permitted to replace each 4 feet (1219 mm) of *braced wall panel* as required by Section R602.10.3. The maximum height and minimum length and hold-down force of each panel shall be in accordance with Table R602.10.3.2:

1. In one-story buildings, each panel shall be installed in accordance with Figure R602.10.3.2. The hold-down device shall be installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation or on floor framing supported directly on a foundation which is continuous across the entire length of the *braced wall line*.
2. In the first *story* of two-story buildings, each *braced wall panel* shall be in accordance with Item 1 above, except that the wood structural panel sheathing edge nailing spacing shall not exceed 4 inches (102 mm) on center.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound force = 4,448 N.

FIGURE R602.10.1.4.1
BRACED WALL PANELS AT ENDS OF BRACED WALL LINES IN SEISMIC DESIGN CATEGORIES D_1 AND D_2

TABLE R602.10.1.5
ADJUSTMENTS OF BRACING LENGTH FOR BRACED WALL LINE SPACING GREATER THAN 25 FEET[a,b]

BRACED WALL LINE SPACING (feet)	MULTIPLY BRACING LENGTH IN TABLE R602.10.1.2(2) BY:
25	1.0
30	1.2
35	1.4

For SI: 1 foot = 304.8 mm.

a. Linear interpolation is permitted.

b. When a braced wall line has a parallel braced wall line on both sides, the larger adjustment factor shall be used.

TABLE R602.10.2
INTERMITTENT BRACING METHODS

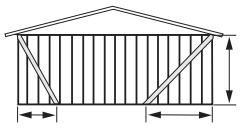
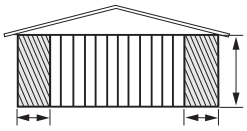
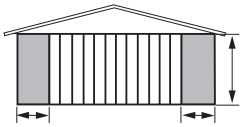
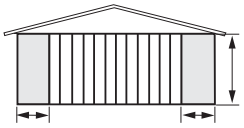
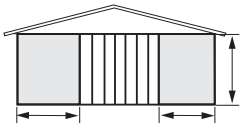
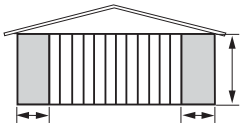
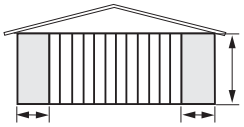
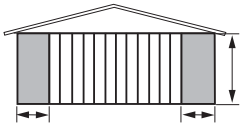
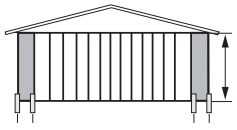
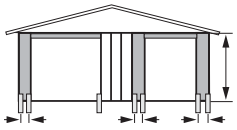
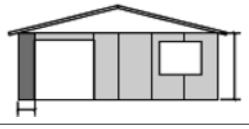
METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
LIB	Let-in-bracing	1 × 4 wood or approved metal straps at 45° to 60° angles for maximum 16″ stud spacing		Wood: 2-8d nails per stud including top and bottom plate metal: per manufacturer
DWB	Diagonal wood boards	$^3/_4$″ (1″ nominal) for maximum 24″ stud spacing		2-8d ($2^1/_2$″ × 0.113″) nails or 2 staples, $1^3/_4$″ per stud
WSP	Wood structural panel (see Section R604)	$^3/_8$″		For exterior sheathing see Table R602.3(3) For interior sheathing see Table R602.3(1)
SFB	Structural fiberboard sheathing	$^1/_2$″ or $^{25}/_{32}$″ for maximum 16″ stud spacing		$1^1/_2$″ galvanized roofing nails or 8d common ($2^1/_2$″ × 0.131) nails at 3″ spacing (panel edges) at 6″ spacing (intermediate supports)
GB	Gypsum board	$^1/_2$″		Nails or screws at 7″ spacing at panel edges including top and bottom plates; for all braced wall panel locations for exterior sheathing nail or screw size, see Table R602.3(1); for interior gypsum board nail or screw size, see Table R702.3.5
PBS	Particleboard sheathing (see Section R605)	$^3/_8$″ or $^1/_2$″ for maximum 16″ stud spacing		$1^1/_2$″ galvanized roofing nails or 8d common ($2^1/_2$″ × 0.131) nails at 3″ spacing (panel edges) at 6 spacing (intermediate supports)
PCP	Portland cement plaster	See Section R703.6 For maximum 16″ stud spacing		$1^1/_2$″, 11 gage, $^7/_{16}$″ head nails at 6″ spacing or $^7/_8$″, 16 gage staples at 6″ spacing
HPS	Hardboard panel siding	$^7/_{16}$″ For maximum 16″ stud spacing		0.092″ dia., 0.225″ head nails with length to accommodate $1^1/_2$″ penetration into studs at 4″ spacing (panel edges), at 8″ spacing (intermediate supports)
ABW	Alternate braced wall	See Section R602.10.3.2		See Section R602.10.3.2
PFH	Intermittent portal frame	See Section R602.10.3.3		See Section R602.10.3.3
PFG	Intermittent portal frame at garage	See Section R602.10.3.4		See Section R602.10.3.4

TABLE R602.10.3
EFFECTIVE LENGTHS FOR BRACED WALL PANELS LESS THAN 48 INCHES IN ACTUAL LENGTH (BRACE METHODS DWB, WSP, SFB, PBS, PCP AND HPS[a])

ACTUAL LENGTH OF BRACED WALL PANEL (inches)	EFFECTIVE LENGTH OF BRACED WALL PANEL (inches)		
	8-foot Wall Height	9-foot Wall Height	10-foot Wall Height
48	48	48	48
42	36	36	N/A
36	27	N/A	N/A

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Interpolation shall be permitted.

TABLE R602.10.3.1
MINIMUM LENGTH REQUIREMENTS FOR BRACED WALL PANELS

SEISMIC DESIGN CATEGORY AND WIND SPEED	BRACING METHOD	HEIGHT OF BRACED WALL PANEL				
		8 ft	9 ft	10 ft	11 ft	12 ft
SDC A, B, C, D_1 and D_2 Wind speed < 110 mph	DWB, WSP, SFB, PBS, PCP, HPS and Method GB when double sided	4′ - 0″	4′ - 0″	4′ - 0″	4′ - 5″	4′ - 10″
	Method GB, single sided	8′ - 0″	8′ - 0″	8′ - 0″	8′ - 10″	9′ - 8″

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

TABLE R602.10.3.2
MINIMUM LENGTH REQUIREMENTS AND HOLD-DOWN FORCES FOR METHOD ABW BRACED WALL PANELS

SEISMIC DESIGN CATEGORY AND WIND SPEED		HEIGHT OF BRACED WALL PANEL				
		8 ft	9 ft	10 ft	11 ft	12 ft
SDC A, B and C Wind speed < 110 mph	Minimum sheathed length	2′ - 4″	2′ - 8″	2′ - 10″	3′ - 2″	3′ - 6″
	R602.10.3.2, item 1 hold-down force (lb)	1800	1800	1800	2000	2200
	R602.10.3.2, item 2 hold-down force (lb)	3000	3000	3000	3300	3600
SDC D_1 and D_2 Wind speed < 110 mph	Minimum sheathed length	2′ - 8″	2′ - 8″	2′ - 10″	NP[a]	NP[a]
	R602.10.3.2, item 1 hold-down force (lb)	1800	1800	1800	NP[a]	NP[a]
	R602.10.3.2, item 2 hold-down force (lb)	3000	3000	3000	NP[a]	NP[a]

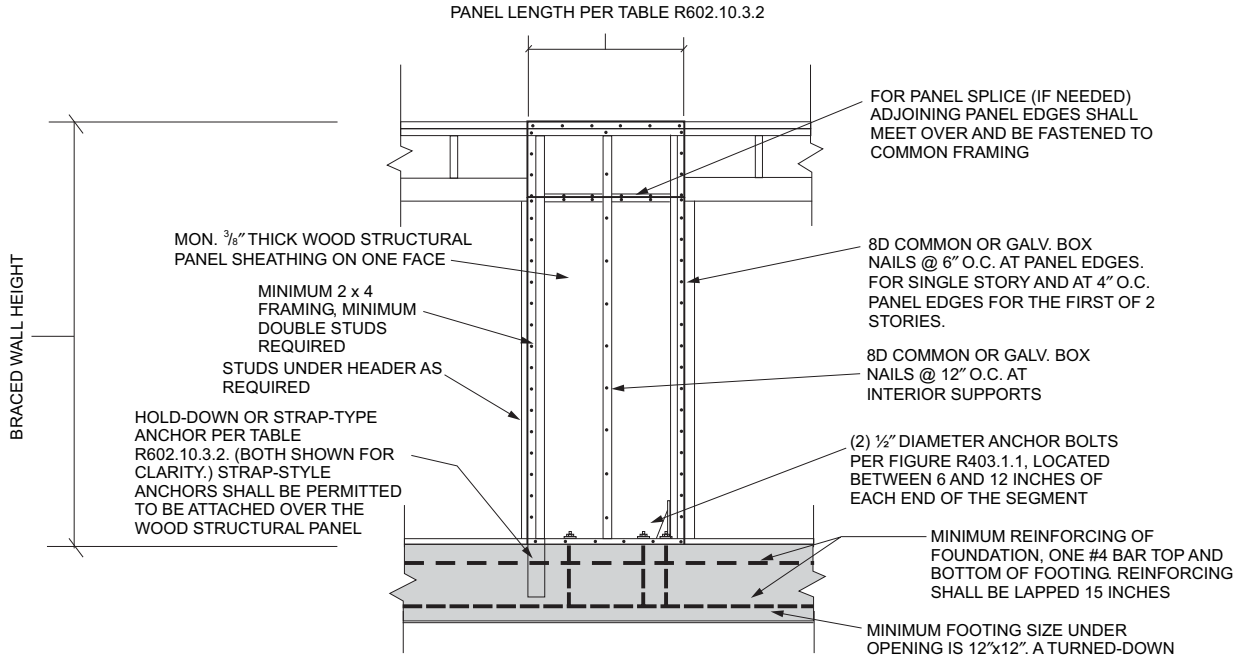
For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 pound = 4.448 N.
a. NP = Not Permitted. Maximum height of 10 feet.

R602.10.3.3 Method PFH: Portal frame with hold-downs. Method PFH *braced wall panels* constructed in accordance with one of the following provisions are also permitted to replace each 4 feet (1219 mm) of *braced wall panel* as required by Section R602.10.3 for use adjacent to a window or door opening with a full-length header:

1. Each panel shall be fabricated in accordance with Figure R602.10.3.3. The wood structural panel sheathing shall extend up over the solid sawn or glued-laminated header and shall be nailed in accordance with Figure R602.10.3.3. A spacer, if used with a built-up header, shall be placed on the side of the built-up beam opposite the wood structural panel sheathing. The header shall extend between the inside faces of the first full-length outer studs of each panel. One anchor bolt not less than $^5/_8$-inch-diameter (16 mm) and installed in accordance with Section R403.1.6 shall be provided in the center of each sill plate. The hold-down devices shall be an embedded-strap type, installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation which is continuous across the entire length of the braced wall line. The foundation shall be reinforced as shown on Figure R602.10.3.2. This reinforcement shall be lapped not less than 15 inches (381 mm) with the reinforcement required in the continuous foundation located directly under the braced wall line.

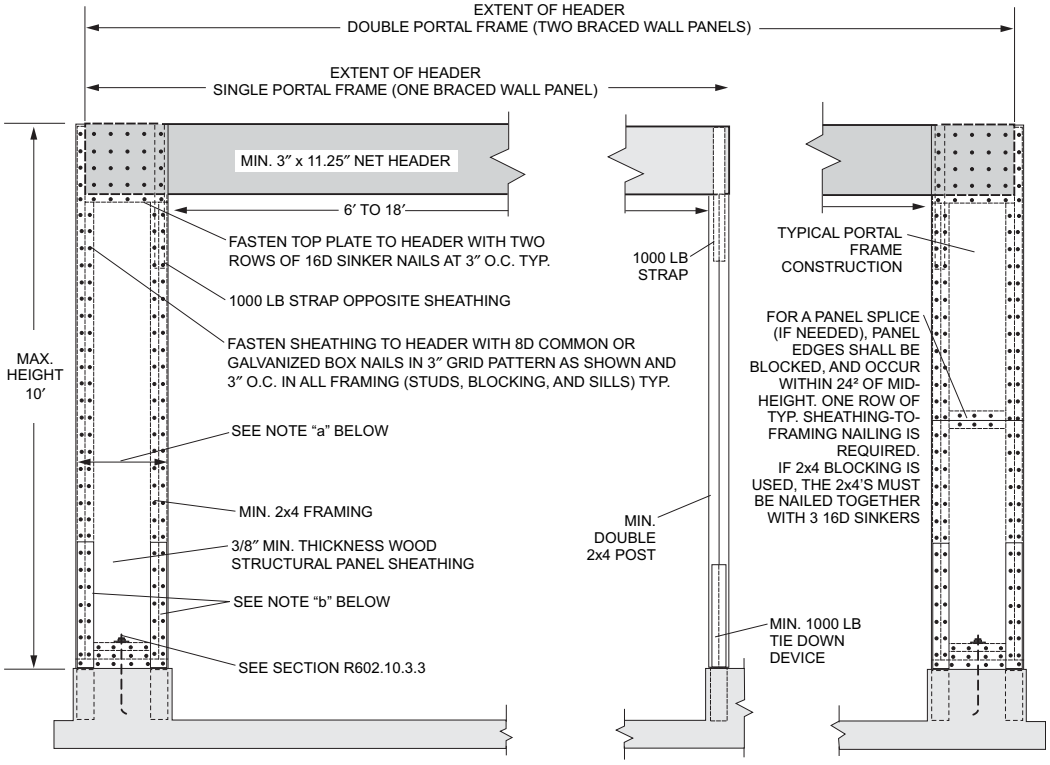
2. In the first *story* of two-story buildings, each wall panel shall be braced in accordance with item 1 above, except that each panel shall have a length of not less than 24 inches (610 mm) as shown in Figure R602.10.3.3.

3. When the brace wall panels indicated in Items 1 and 2 above are located in the middle of a wall line or at a corner not adjacent to a door the wall lengths shall not be less than 16 inches (406 mm) and a height not more than 10 feet (3048 mm). The walls shall have tie-down devices with 4,200 pounds uplift capacity located at the extreme ends of the panels as shown in Figure R602.10.6.3.3(1).



For SI: 1 inch = 25.4 mm.

FIGURE R602.10.3.2
ALTERNATE BRACED WALL PANEL

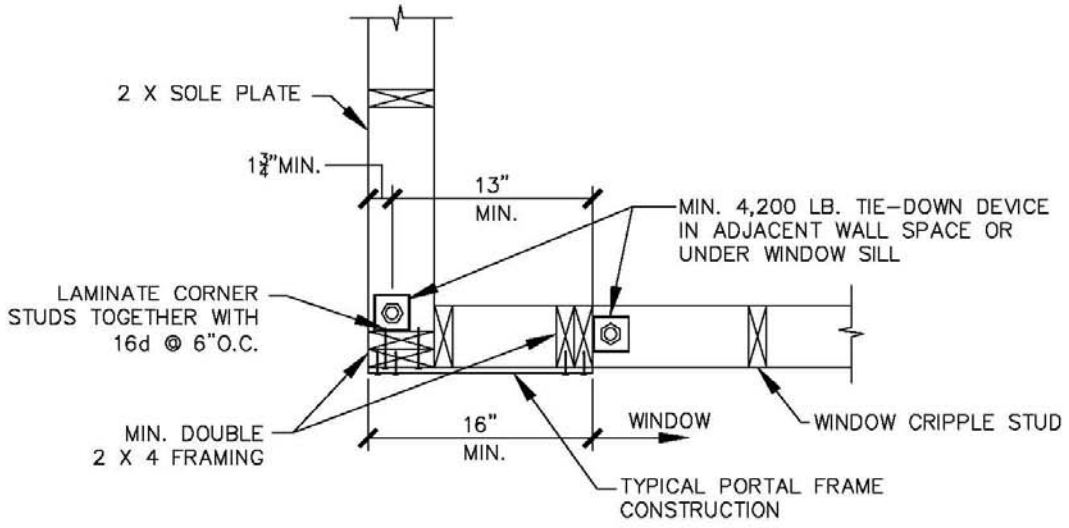


For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound force = 4.448 N.

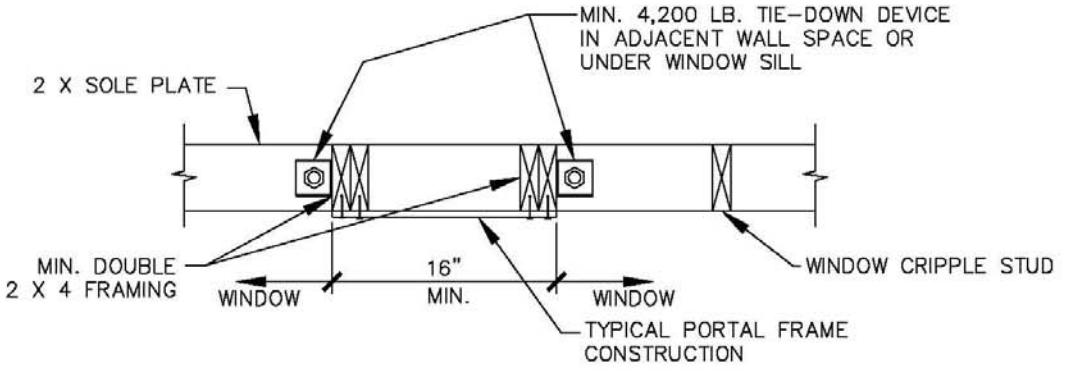
a. Min. width – 20 inches for a one-story structure with 10-foot plate height, 18 inches for a one-story structure with 9-foot plate height and 16 inches for a one-story structure with 8-foot plate height. Min. width – 30 inches for use in the first story of a two-story structure with a 10-foot plate height, 26 inches for use in the first story of a two-story structure with a 9-foot plate height and 24 inches for use in the first story of a two-story structure with a 8-foot plate height.

b. Min. 3500 lb tie-down device (embedded into concrete and nailed into framing).

FIGURE R602.10.3.3
METHOD PFH: PORTAL FRAME WITH HOLD-DOWNS



PORTAL FRAME WITH HOLD–DOWNS AT CORNER CONDITION

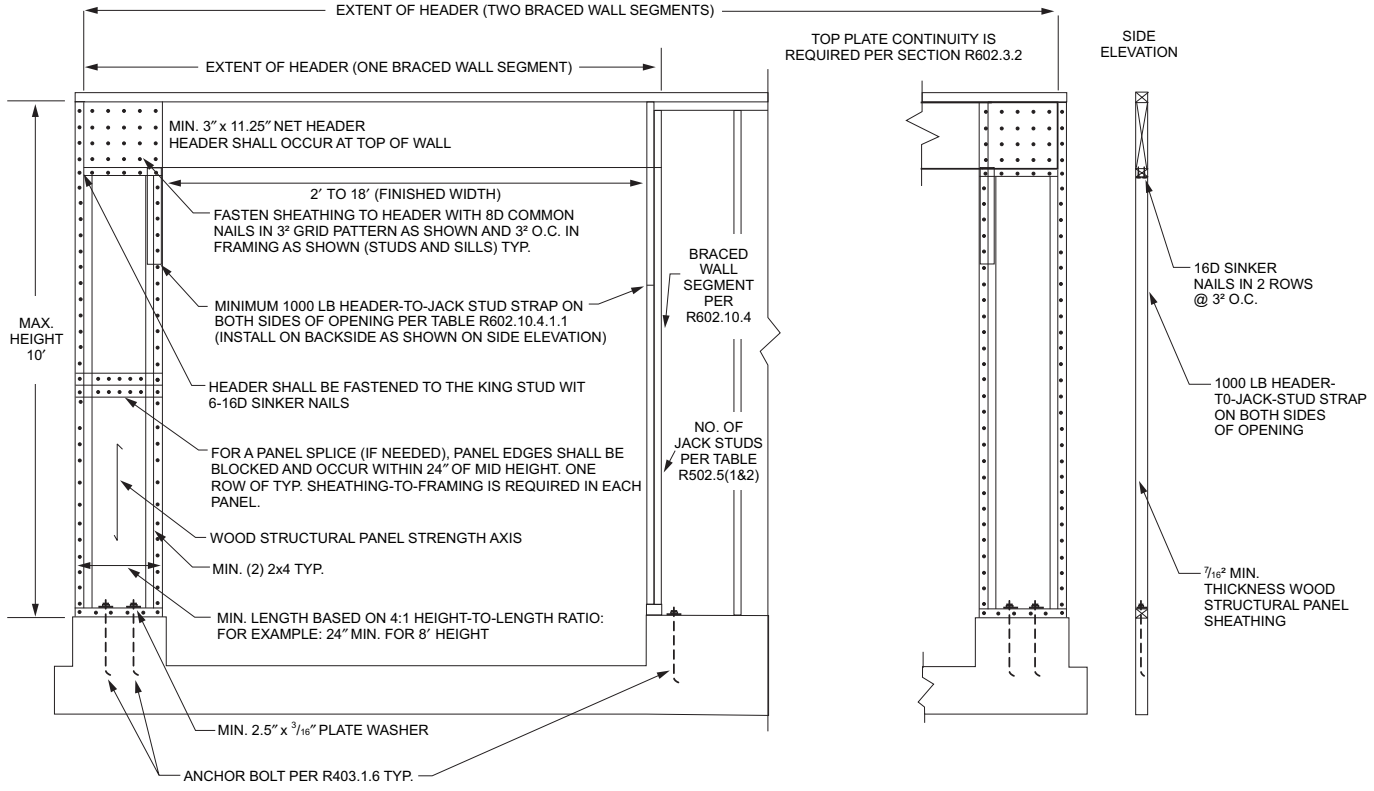


PORTAL FRAME WITH HOLD–DOWNS AT INTERIOR CONDITION

FIGURE R602.10.3.3(1)
METHOD PFH: PORTAL FRAME WITH HOLD-DOWNS ADJACENT TO WINDOW OPENING

R602.10.3.4 Method PFG: at garage door openings in Seismic Design Categories A, B and C. Where supporting a roof or one *story* and a roof, alternate *braced wall panels* constructed in accordance with the following provisions are permitted on either side of garage door openings. For the purpose of calculating wall bracing amounts to satisfy the minimum requirements of Table R602.10.1.2(1), the length of the alternate *braced wall panel* shall be multiplied by a factor of 1.5.

1. *Braced wall panel* length shall be a minimum of 24 inches (610 mm) and *braced wall panel* height shall be a maximum of 10 feet (3048 mm).
2. *Braced wall panel* shall be sheathed on one face with a single layer of $^{7}/_{16}$-inch-minimum (11 mm) thickness wood structural panel sheathing attached to framing with 8d common nails at 3 inches (76 mm) on center in accordance with Figure R602.10.3.4.
3. The wood structural panel sheathing shall extend up over the solid sawn or glued-laminated header and shall be nailed to the header at 3 inches (76 mm) on center grid in accordance with Figure R602.10.3.4.
4. The header shall consist of a minimum of two solid sawn 2×12s (51 by 305 mm) or a 3 inches × 11.25 inch (76 by 286 mm) glued-laminated header. The header shall extend between the inside faces of the first full-length outer studs of each panel in accordance with Figure R602.10.3.4. The clear span of the header between the inner studs of each panel shall be not less than 6 feet (1829 mm) and not more than 18 feet (5486 mm) in length.
5. A strap with an uplift capacity of not less than 1,000 pounds (4448 N) shall fasten the header to the side of the inner studs opposite the sheathing face. Where building is located in Wind Exposure Categories C or D, the strap uplift capacity shall be in accordance with Table R602.10.4.1.1.
6. A minimum of two bolts not less than $^{1}/_{2}$-inch (12.7 mm) diameter shall be installed in accordance with Section R403.1.6. A $^{3}/_{16}$-inch by $2^{1}/_{2}$-inch (4.8 by 63 by 63 mm) by $2^{1}/_{2}$-inch steel plate washer is installed between the bottom plate and the nut of each bolt.
7. *Braced wall panel* shall be installed directly on a foundation.
8. Where an alternate *braced wall panel* is located only on one side of the garage opening, the header shall be connected to a supporting jack stud on the opposite side of the garage opening with a metal strap with an uplift capacity of not less than 1,000 pounds. Where that supporting jack stud is not part of a *braced wall panel* assembly, another 1,000 pounds (4448 N) strap shall be installed to attach the supporting jack stud to the foundation.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound force = 4.448 N.

FIGURE R602.10.3.4
METHOD PFG PORTAL FRAME AT GARAGE DOOR OPENINGS IN SEISMIC DESIGN CATEGORIES A, B AND C

R602.10.4 Continuous sheathing. *Braced wall lines* with continuous sheathing shall be constructed in accordance with this section. All *braced wall lines* along exterior walls on the same *story* shall be continuously sheathed.

Exception: Within Seismic Design Categories A, B and C or in regions where the basic wind speed is less than or equal to 100 mph (45 m/s), other bracing methods prescribed by this code shall be permitted on other *braced wall lines* on the same *story* level or on any *braced wall line* on different *story* levels of the building.

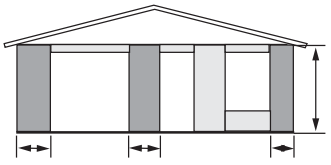
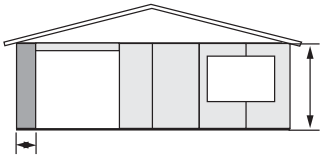
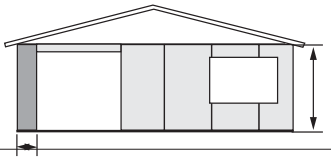
R602.10.4.1 Continuous sheathing braced wall panels. Continuous sheathing methods require structural panel sheathing to be used on all sheathable surfaces on one side of a *braced wall line* including areas above and below openings and gable end walls. *Braced wall panels* shall be constructed in accordance with one of the methods listed in Table R602.10.4.1. Different bracing methods, other than those listed in Table R602.10.4.1, shall not be permitted along a *braced wall line* with continuous sheathing.

R602.10.4.1.1 Continuous portal frame. Continuous portal frame *braced wall panels* shall be constructed in accordance with Figure R602.10.4.1.1. The number of continuous portal frame panels in a single *braced wall line* shall not exceed four. For purposes of resisting wind pressures acting perpendicular to the wall, the requirements of Figure R602.10.4.1.1 and Table R602.10.4.1.1 shall be met. There shall be a maximum of two braced wall segments per header and header length shall not exceed 22 feet (6706 mm). Tension straps shall be installed in accordance with the manufacturer's recommendations.

R602.10.4.2 Length of braced wall panels with continuous sheathing. *Braced wall panels* along a *braced wall line* with continuous sheathing shall be full-height with a length based on the adjacent clear opening height in accordance with Table R602.10.4.2 and Figure R602.10.4.2. Within a *braced wall line* when a panel has an opening on either side of differing heights, the taller opening height shall be used to determine the panel length from Table R602.10.4.2. For Method CS-PF, wall height shall be measured from the top of the header to the bottom of the bottom plate as shown in Figure R602.10.4.1.1.

R602.10.4.3 Length of bracing for continuous sheathing. *Braced wall lines* with continuous sheathing shall be provided with *braced wall panels* in the length required in Tables R602.10.1.2(1) and R602.10.1.2(2). Only those full-height *braced wall panels* complying with the length requirements of Table R602.10.4.2 shall be permitted to contribute to the minimum required length of bracing.

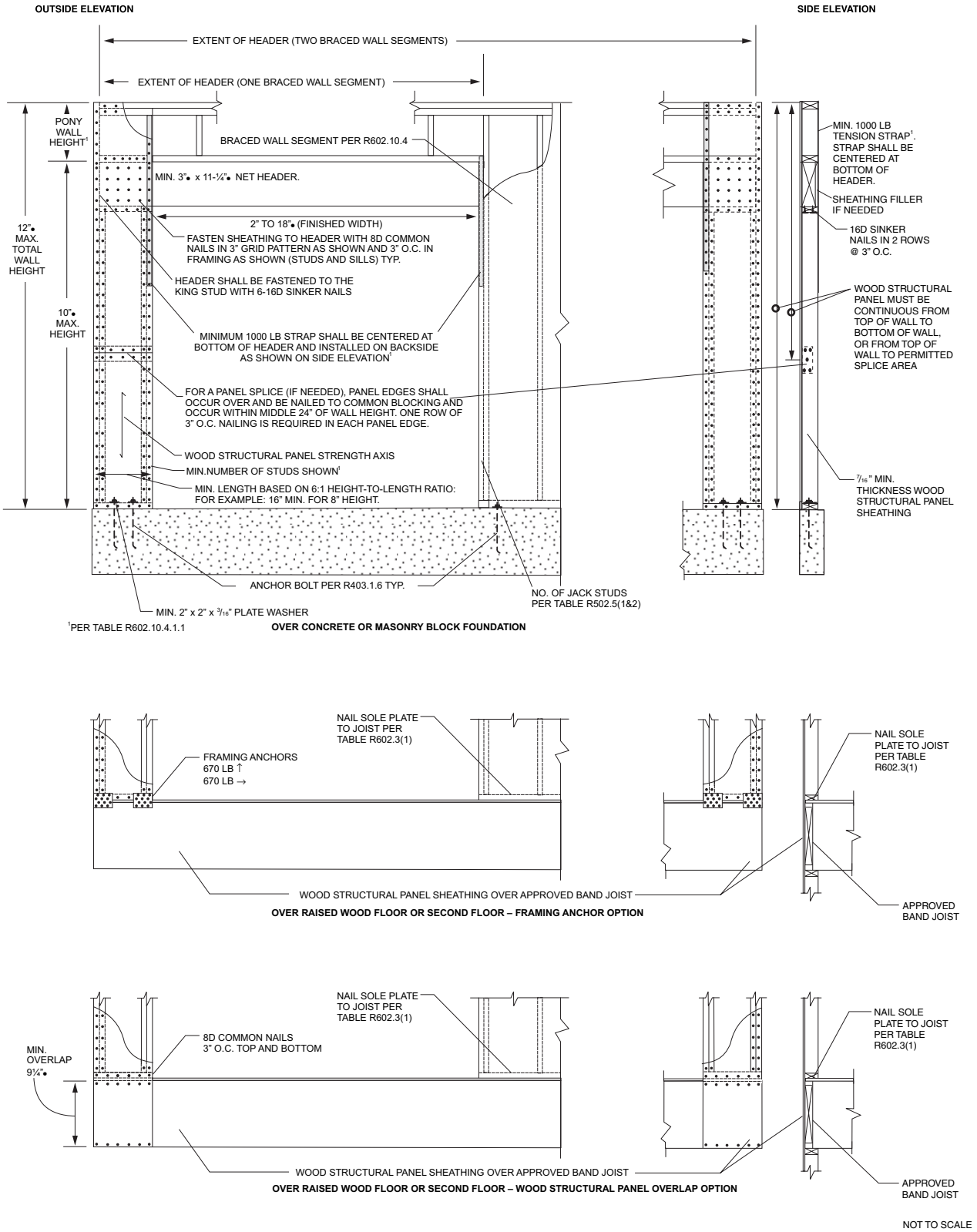
TABLE R602.10.4.1
CONTINUOUS SHEATHING METHODS

METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
CS-WSP	Wood structural panel	$^3/_8$″		6d common (2″ × 0.113″) nails at 6″ spacing (panel edges) and at 12″ spacing (intermediate supports) or 16 ga. × $1^3/_4$ staples at 3″ spacing (panel edges) and 6″ spacing (intermediate supports)
CS-G	Wood structural panel adjacent to garage openings and supporting roof load only[a,b]	$^3/_8$″		See Method CS-WSP
CS-PF	Continuous portal frame	See Section R602.10.4.1.1		See Section R602.10.4.1.1

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 47.89 Pa.

a. Applies to one wall of a garage only.

b. Roof covering dead loads shall be 3 psf or less.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound force = 4.448 N.

FIGURE R602.10.4.1.1
METHOD CS-PF: CONTINUOUS PORTAL FRAME PANEL CONSTRUCTION

TABLE R602.10.4.1.1
TENSION STRAP CAPACITY REQUIRED FOR RESISTING WIND PRESSURES PERPENDICULAR TO 6:1 ASPECT RATIO WALLS[a,b]

MINIMUM WALL STUD FRAMING NOMINAL SIZE AND GRADE	MAXIMUM PONY WALL HEIGHT (feet)	MAXIMUM TOTAL WALL HEIGHT (feet)	MAXIMUM OPENING WIDTH (feet)	BASIC WIND SPEED (mph)					
				85	90	100	85	90	100
				Exposure B			Exposure C		
				Tension strap capacity required (lbf)[a,b]					
2 × 4 No. 2 Grade	0	10	18	1000	1000	1000	1000	1000	1000
	1	10	9	1000	1000	1000	1000	1000	1275
			16	1000	1000	1750	1800	2325	3500
			18	1000	1200	2100	2175	2725	DR
	2	10	9	1000	1000	1025	1075	1550	2500
			16	1525	2025	3125	3200	3900	DR
			18	1875	2400	3575	3700	DR	DR
	2	12	9	1000	1200	2075	2125	2750	4000
			16	2600	3200	DR	DR	DR	DR
			18	3175	3850	DR	DR	DR	DR
	4	12	9	1775	2350	3500	3550	DR	DR
			16	4175	DR	DR	DR	DR	DR
2 × 6 Stud Grade	2	12	9	1000	1000	1325	1375	1750	2550
			16	1650	2050	2925	3000	3550	DR
			18	2025	2450	3425	3500	4100	DR
	4	12	9	1125	1500	2225	2275	2775	3800
			16	2650	3150	DR	DR	DR	DR
			18	3125	3675	DR	DR	DR	DR

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound force = 4.448 N.
a. DR = design required.
b. Strap shall be installed in accordance with manufacturer's recommendations.

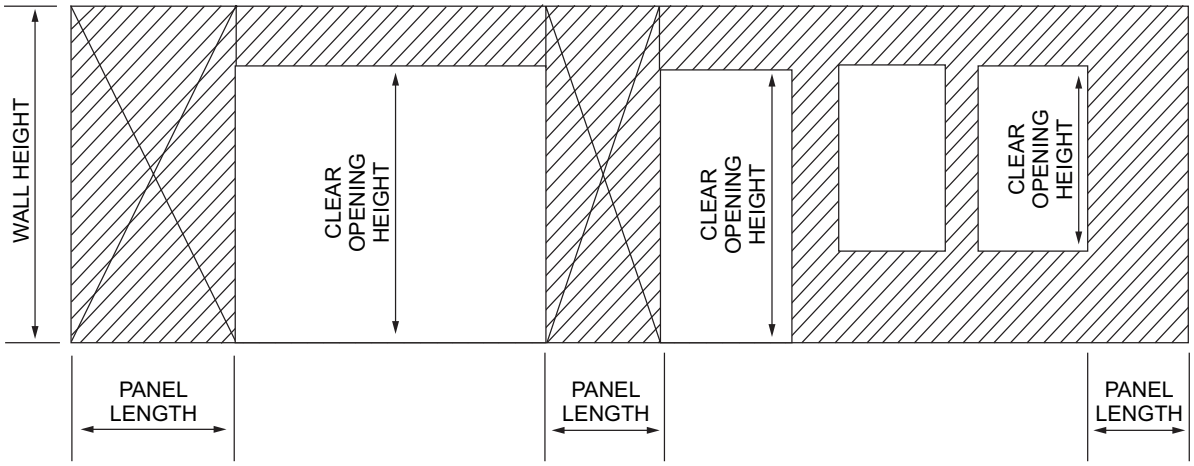


FIGURE R602.10.4.2
BRACED WALL PANELS WITH CONTINUOUS SHEATHING

TABLE R602.10.4.2
LENGTH REQUIREMENTS FOR BRACED WALL PANELS WITH CONTINUOUS SHEATHING[a] (inches)

METHOD	ADJACENT CLEAR OPENING HEIGHT (inches)	WALL HEIGHT (feet)				
		8	9	10	11	12
CS-WSP	64	24	27	30	33	36
	68	26	27	30	—	—
	72	28	27	30	—	—
	76	29	30	30	—	—
	80	31	33	30	—	—
	84	35	36	33	—	—
	88	39	39	36	—	—
	92	44	42	39	—	—
	96	48	45	42	—	—
	100	—	48	45	—	—
	104	—	51	48	—	—
	108	—	54	51	—	—
	112	—	—	54	44	—
	116	—	—	57	—	—
	120	—	—	60	—	—
	122	—	—	—	—	48
	132	—	—	—	66	—
	144	—	—	—	—	75
CS-G	≤ 120	24	27	30	—	—
CS-PF	≤ 120	16	18	20	—	—

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Interpolation shall be permitted.

R602.10.4.4 Continuously sheathed braced wall panel location and corner construction. For all continuous sheathing methods, full-height *braced wall panels* complying with the length requirements of Table R602.10.4.2 shall be located at each end of a *braced wall line* with continuous sheathing and at least every 25 feet (7620 mm) on center. A minimum 24 inch (610 mm) wood structural panel corner return shall be provided at both ends of a *braced wall line* with continuous sheathing in accordance with Figures R602.10.4.4(1) and R602.10.4.4(2). In lieu of the corner return, a hold-down device with a minimum uplift design value of 800 pounds (3560 N) shall be fastened to the corner stud and to the foundation or framing below in accordance with Figure R602.10.4.4(3).

Exception: The first *braced wall panel* shall be permitted to begin 12.5 feet (3810 mm) from each end of the *braced wall line* in Seismic Design Categories A, B and C and 8 feet (2438 mm) in Seismic Design Categories D_1 and D_2 provided one of the following is satisfied:

1. A minimum 24 inch (610 mm) long, full-height wood structural panel is provided at both sides of a corner constructed in accordance with Figure R602.10.4.4(1) at the *braced wall line* ends in accordance with Figure R602.10.4.4(4), or
2. The *braced wall panel* closest to the corner shall have a hold-down device with a minimum uplift design value of 800 pounds (3560 N) fastened to the stud at the edge of the *braced wall panel* closest to the corner and to the foundation or framing below in accordance with Figure R602.10.4.4(5).

R602.10.5 Continuously-sheathed braced wall line using Method CS-SFB (structural fiberboard sheathing). Continuously sheathed *braced wall lines* using structural fiberboard sheathing shall comply with this section. Different bracing methods shall not be permitted within a continuously sheathed *braced wall line*. Other bracing methods prescribed by this code shall be permitted on other *braced wall lines* on the same *story* level or on different *story* levels of the building.

R602.10.5.1 Continuously sheathed braced wall line requirements. Continuously-sheathed *braced wall lines* shall be in accordance with Figure R602.10.4.2 and shall comply with all of the following requirements:

1. Structural fiberboard sheathing shall be applied to all exterior sheathable surfaces of a *braced wall line* including areas above and below openings.
2. Only full-height or blocked *braced wall panels* shall be used for calculating the braced wall length in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2).

R602.10.5.2 Braced wall panel length. In a continuously-sheathed structural fiberboard *braced wall line*, the minimum *braced wall panel* length shall be in accordance with Table R602.10.5.2.

R602.10.5.3 Braced wall panel location and corner construction. A *braced wall panel* shall be located at each end of a continuously-sheathed *braced wall line*. A minimum 32-inch (813 mm) structural fiberboard sheathing panel corner return shall be provided at both ends of a continuously-sheathed *braced wall line* in accordance with Figure R602.10.4.4(1) In lieu of the corner return, a hold-down device with a minimum uplift design value of 800 pounds (3560 N) shall be fastened to the corner stud and to the foundation or framing below in accordance with Figure R602.10.4.4(3).

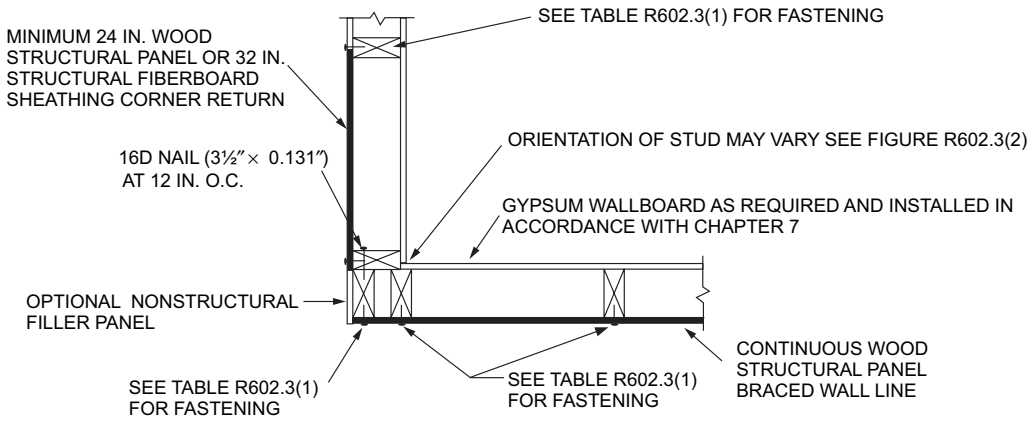
Exception: The first *braced wall panel* shall be permitted to begin 12 feet 6 inches (3810 mm) from each end of the *braced wall line* in Seismic Design Categories A, B and C provided one of the following is satisfied:

1. A minimum 32-inch-long (813 mm), full-height structural fiberboard sheathing panel is provided at both sides of a corner constructed in accordance with Figure R602.10.4.4(1) at the *braced wall line* ends in accordance with Figure R602.10.4.4(4), or
2. The *braced wall panel* closest to the corner shall have a hold-down device with a minimum uplift design value of 800 pounds (3560 N) fastened to the stud at the edge of the *braced wall panel* closest to the corner and to the foundation or framing below in accordance with Figure R602.10.4.4(5).

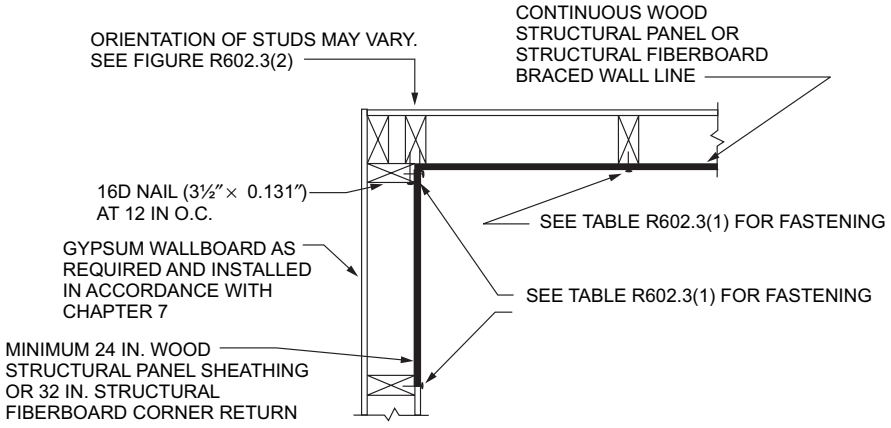
R602.10.5.4 Continuously sheathed braced wall lines. Where a continuously-sheathed *braced wall line* is used in Seismic Design Categories D_1 and D_2 or regions where the basic wind speed exceeds 100 miles per hour (45 m/s), the *braced wall line* shall be designed in accordance with accepted engineering practice and the provisions of the *Building Code*. Also, all other exterior *braced wall lines* in the same *story* shall be continuously sheathed.

R602.10.6 Braced wall panel connections. *Braced wall panels* shall be connected to floor framing or foundations as follows:

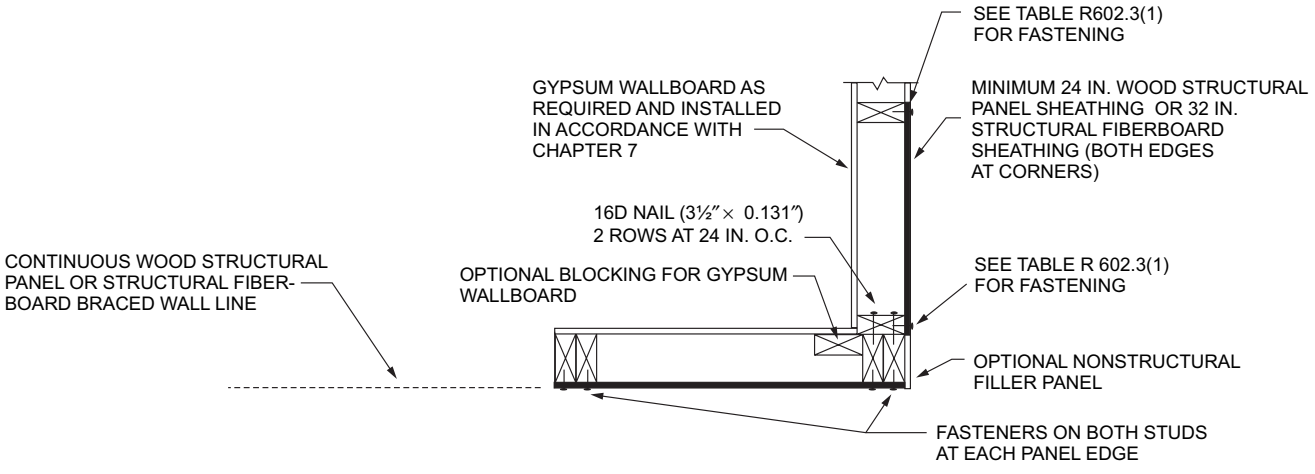
1. Where joists are perpendicular to a *braced wall panel* above or below, a rim joist, band joist or blocking shall be provided along the entire length of the *braced wall panel* in accordance with Figure R602.10.6(1). Fastening of top and bottom wall plates to framing, rim joist, band joist and/or blocking shall be in accordance with Table R602.3(1).
2. Where joists are parallel to a *braced wall panel* above or below, a rim joist, end joist or other parallel framing member shall be provided directly above and below the *braced wall panel* in accordance with Figure R602.10.6(2). Where a parallel framing member is not located directly above and below the panel, full-depth blocking at 16 inch (406 mm) spacing shall be provided between the parallel framing members to each side of the *braced wall panel* in accordance with Figure R602.10.6(2). Fastening of blocking and wall plates shall be in accordance with Table R602.3(1) and Figure R602.10.6(2).
3. Connections of *braced wall panel*s to concrete or masonry shall be in accordance with Section R403.1.6.



(a) OUTSIDE CORNER DETAIL



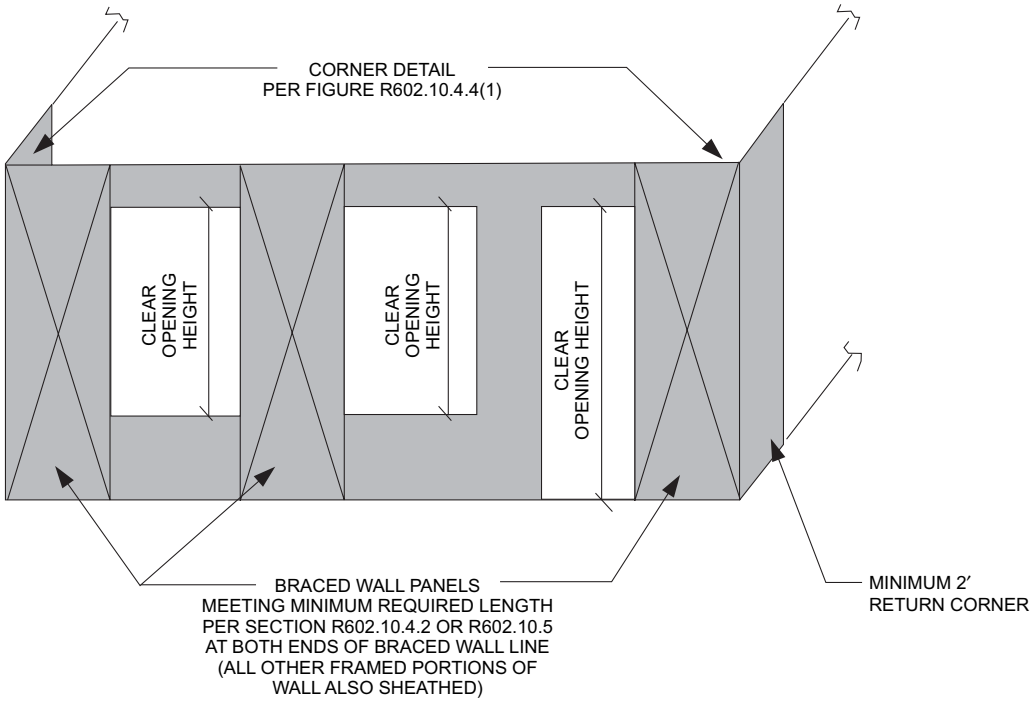
(b) INSIDE CORNER DETAIL



(c) GARAGE DOOR CORNER

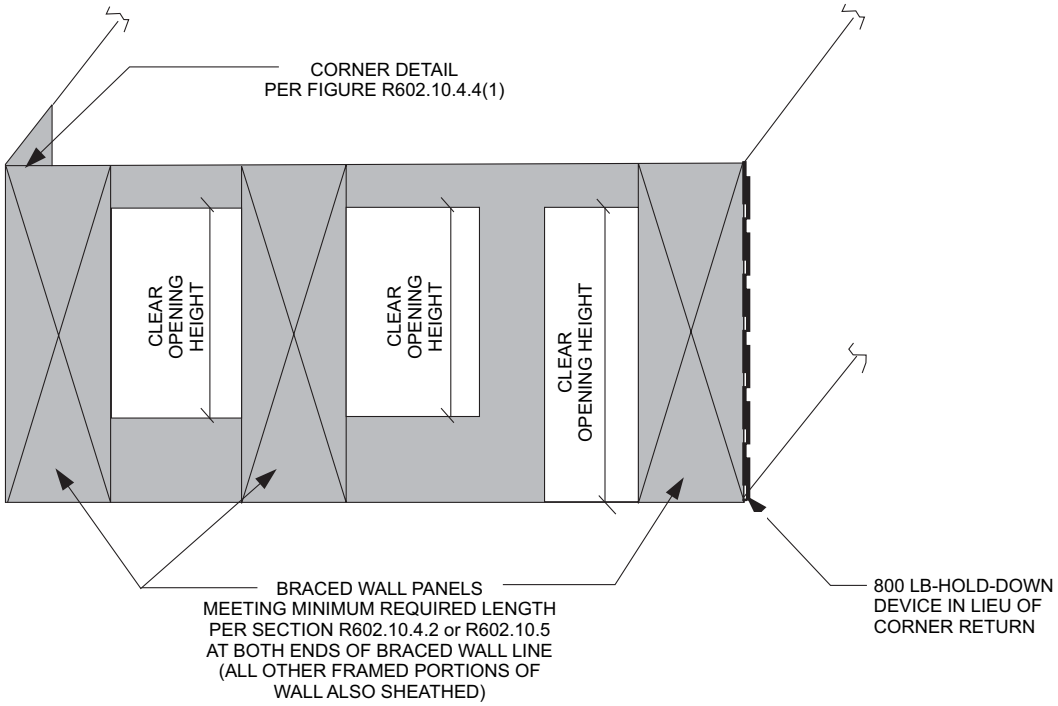
For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

FIGURE R602.10.4.4(1)
TYPICAL EXTERIOR CORNER FRAMING FOR CONTINUOUS SHEATHING



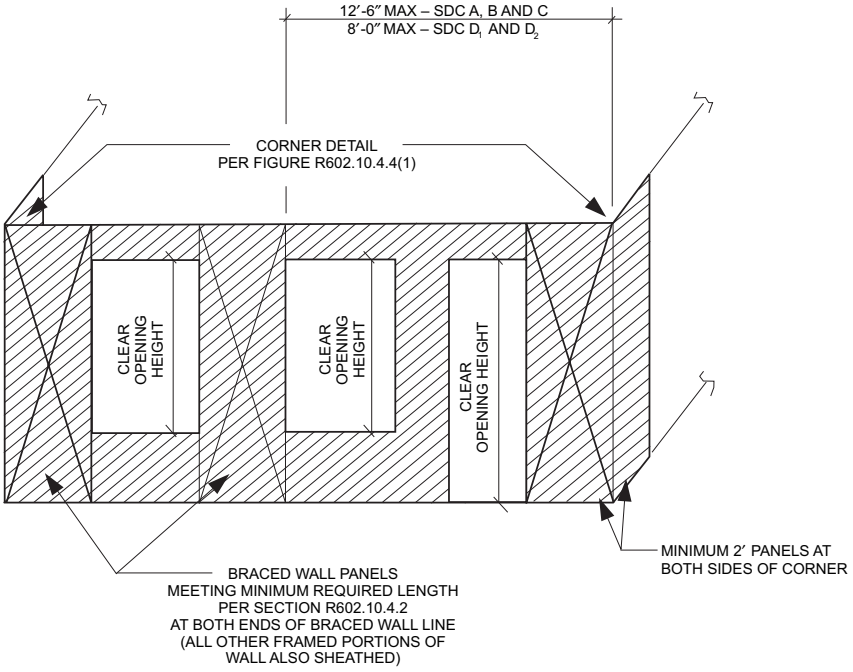
For SI: 1 foot = 304.8 mm.

FIGURE R602.10.4.4(2)
BRACED WALL LINE WITH CONTINUOUS SHEATHING WITH CORNER RETURN PANEL



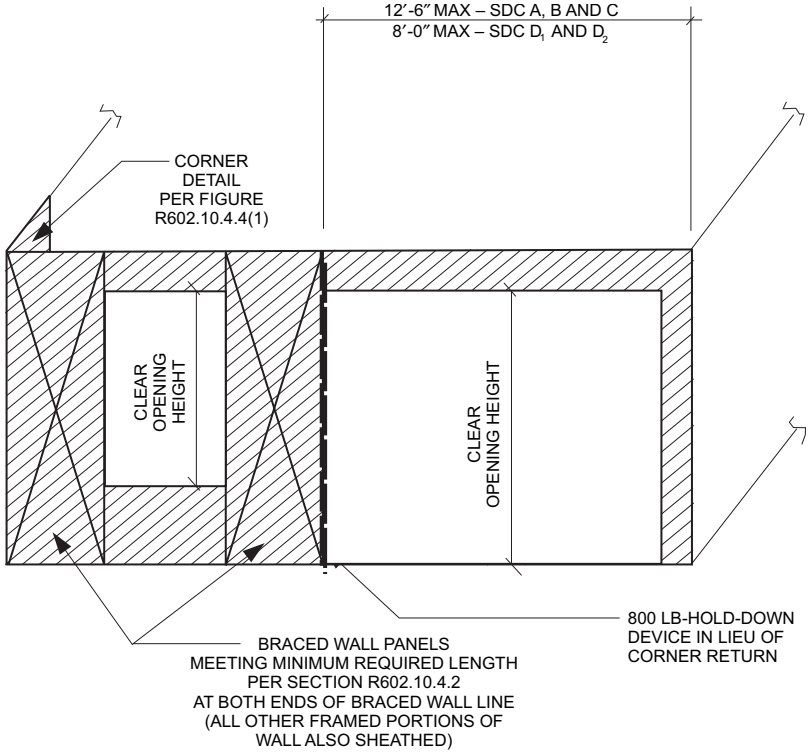
For SI: 1 inch = 25.4 mm, 1 pound = 4.448 N.

FIGURE R602.10.4.4(3)
BRACED WALL LINE WITH CONTINUOUS SHEATHING WITHOUT CORNER RETURN PANEL



For SI: 1 inch = 25.4 mm.

FIGURE R602.10.4.4(4)
BRACED WALL LINE WITH CONTINUOUS SHEATHING FIRST BRACED WALL PANEL AWAY FROM END OF WALL LINE WITHOUT TIE DOWN



For SI: 1 foot = 305 mm. 1 pound = 4.448 N.

FIGURE R602.10.4.4(5)
BRACED WALL LINE WITH CONTINUOUS SHEATHING—FIRST BRACED WALL PANEL AWAY FROM END OF WALL LINE WITH HOLD-DOWN

TABLE R602.10.5.2
MINIMUM LENGTH REQUIREMENTS FOR STRUCTURAL FIBERBOARD BRACED WALL PANELS IN A CONTINUOUSLY-SHEATHED WALL[a]

MINIMUM LENGTH OF STRUCTURAL FIBERBOARD BRACED WALL PANEL (inches)			MINIMUM OPENING CLEAR HEIGHT NEXT TO THE STRUCTURAL FIBERBOARD BRACED WALL PANEL (% of wall height)
8-foot wall	9-foot wall	10-foot wall	
48	54	60	100
32	36	40	85
24	27	30	67

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Interpolation is permitted.

R602.10.6.1 Braced wall panel connections for Seismic Design Categories D_1 and D_2. *Braced wall panels* shall be fastened to required foundations in accordance with Section R602.11.1, and top plate lap splices shall be face-nailed with at least eight 16d nails on each side of the splice.

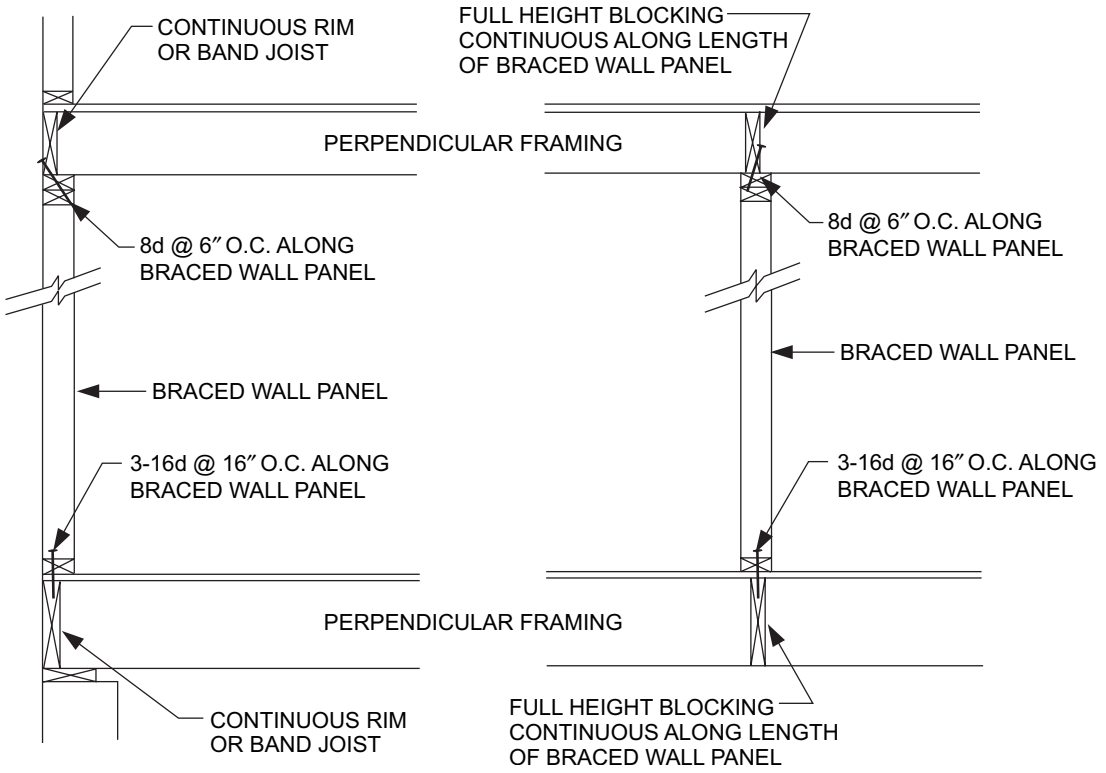
R602.10.6.2 Connections to roof framing. Exterior *braced wall panels* shall be connected to roof framing as follows.

1. Parallel rafters or roof trusses shall be attached to the top plates of *braced wall panels* in accordance with Table R602.3(1).
2. For SDC A, B and C and wind speeds less than 100 miles per hour (45 m/s), where the distance from the top of the rafters or roof trusses and perpendicular top plates is $9^1/_4$ inches (235 mm) or less, the rafters or roof trusses shall be connected to the top plates of *braced wall lines* in accordance with Table R602.3(1) and blocking need not be installed. Where the distance from the top of the rafters and perpendicular top plates is between $9^1/_4$ inches (235 mm) and $15^1/_4$ inches (387 mm) the rafters shall be connected to the top plates of *braced wall panels* with blocking in accordance with Figure R602.10.6.2(1) and attached in accordance with Table R602.3(1). Where the distance from the top of the roof trusses and perpendicular top plates is between $9^1/_4$ inches (235 mm) and $15^1/_4$ inches (387 mm) the roof trusses shall be connected to the top plates of *braced wall panels* with blocking in accordance with Table R602.3(1).
3. For SDC D_1 and D_2 or wind speeds of 100 miles per hour (45 m/s) or greater, where the distance between the top of rafters or roof trusses and perpendicular top plates is $15^1/_4$ inches (387 mm) or less, rafters or roof trusses shall be connected to the top plates of *braced wall panels* with blocking in accordance with Figure R602.10.6.2(1) and attached in accordance with Table R602.3(1).
4. For all seismic design categories and wind speeds, where the distance between the top of rafters or roof trusses and perpendicular top plates exceeds $15^1/_4$ inches (387 mm), perpendicular rafters or roof trusses shall be connected to the top plates of *braced wall panels* in accordance with one of the following methods:
   4.1. In accordance with Figure R602.10.6.2(2),
   4.2. In accordance with Figure R602.10.6.2(3),
   4.3. With full height engineered blocking panels designed for values listed in American Forest and Paper Association (AF&PA) Wood Frame Construction Manual for One- and Two-Family *Dwellings* (WFCM). Both the roof and floor sheathing shall be attached to the blocking panels in accordance with Table R602.3(1).
   4.4. Designed in accordance with accepted engineering methods.

Lateral support for the rafters and ceiling joists shall be provided in accordance with Section R802.8. Lateral support for trusses shall be provided in accordance with Section R802.10.3. Ventilation shall be provided in accordance with Section R806.1.

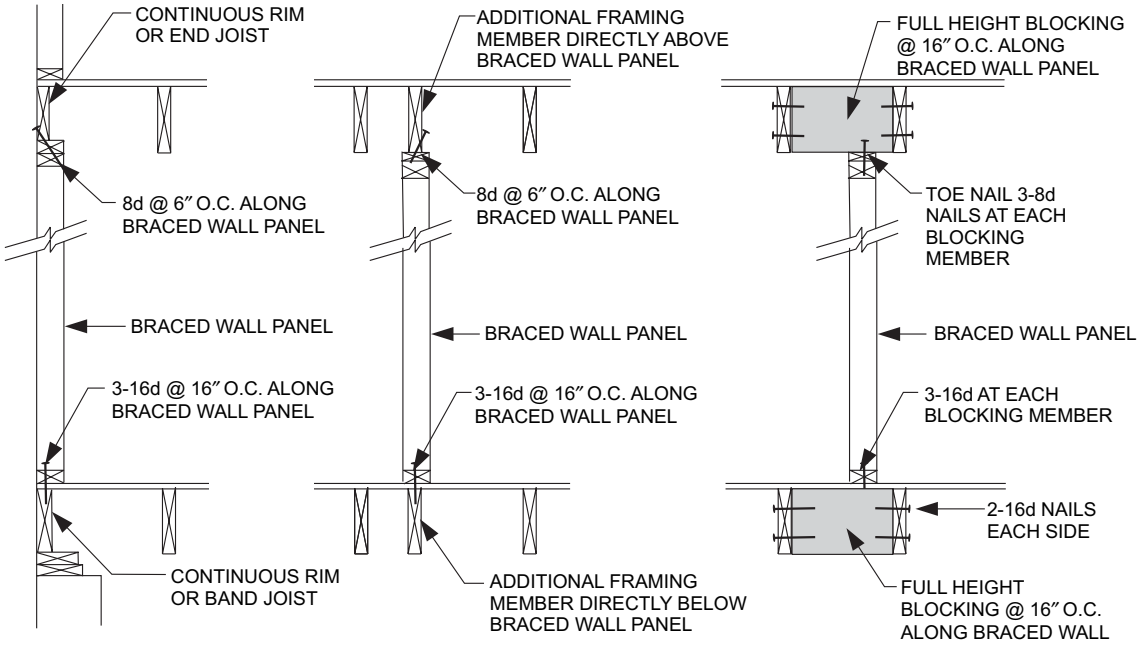
R602.10.7 Braced wall panel support. *Braced wall panel* support shall be provided as follows:

1. Cantilevered floor joists, supporting *braced wall lines*, shall comply with Section R502.3.3. Solid blocking shall be provided at the nearest bearing wall location. In Seismic Design Categories A, B and C, where the cantilever is not more than 24 inches (610 mm), a full height rim joist instead of solid blocking shall be provided.
2. Elevated post or pier foundations supporting *braced wall panels* shall be designed in accordance with accepted engineering practice.
3. Masonry stem walls with a length of 48 inches (1220 mm) or less supporting *braced wall panels* shall be reinforced in accordance with Figure R602.10.7. Masonry stem walls with a length greater than 48 inches (1220 mm) supporting *braced wall panels* shall be constructed in accordance with Section R403.1 *Braced wall panels* constructed in accordance with Sections R602.10.3.2 and R602.10.3.3 shall not be attached to masonry stem walls.



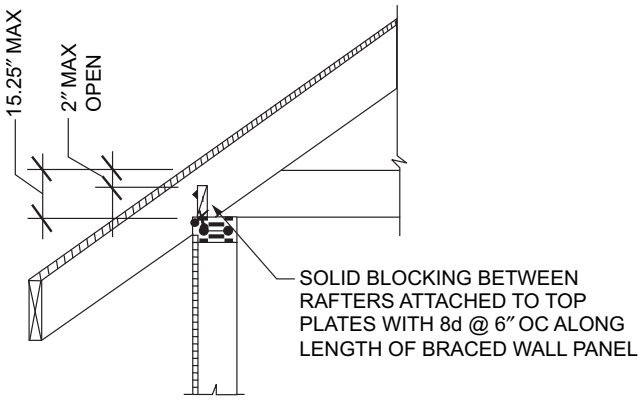
For SI: 1 inch = 25.4 mm.

FIGURE R602.10.6(1)
BRACED WALL PANEL CONNECTION WHEN PERPENDICULAR TO FLOOR/CEILING FRAMING



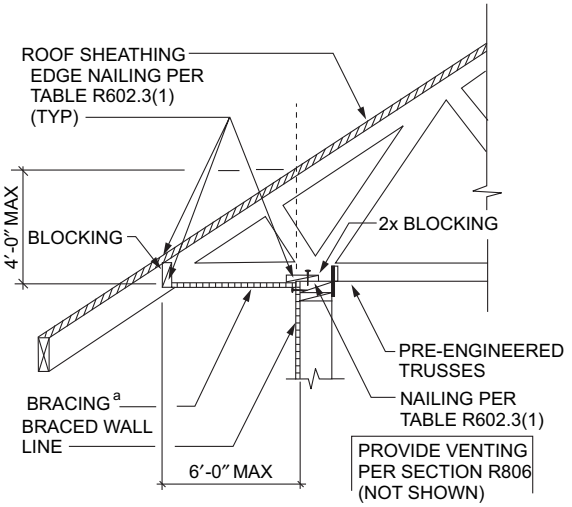
For SI: 1 inch = 25.4 mm.

FIGURE R602.10.6(2)
BRACED WALL PANEL CONNECTION WHEN PARALLEL TO FLOOR/CEILING FRAMING



For SI: 1 inch = 25.4 mm.

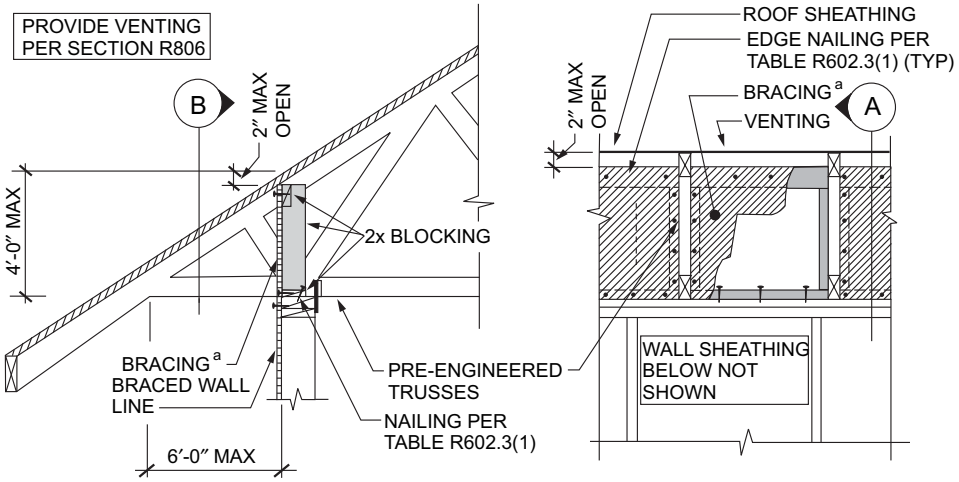
FIGURE R602.10.6.2(1)
BRACED WALL PANEL CONNECTION TO PERPENDICULAR RAFTERS



a. METHODS OF BRACING SHALL BE AS DESCRIBED IN SECTION R602.10.2 METHOD DWB, WSP, SFB, GB, PBS, PCP OR HPS

For SI: 1 inch = 25.4 mm.

FIGURE R602.10.6.2(2)
BRACED WALL PANEL CONNECTION OPTION TO PERPENDICULAR RAFTERS OR ROOF TRUSSES



a. METHODS OF BRACING SHALL BE AS DESCRIBED IN SECTION R602.10.2 METHODS DWB, WSP, SFB, GB, PBS, PCP OR HPS

A SECTION

B ELEVATION

FIGURE R602.10.6.2(3)
BRACED WALL PANEL CONNECTION OPTION TO PERPENDICULAR RAFTERS OR ROOF TRUSSES

R602.10.7.1 Braced wall panel support for Seismic Design Category D_2. In one-story buildings located in Seismic Design Category D_2, *braced wall panels* shall be supported on continuous foundations at intervals not exceeding 50 feet (15 240 mm). In two-story buildings located in Seismic Design Category D_2, all *braced wall panels* shall be supported on continuous foundations.

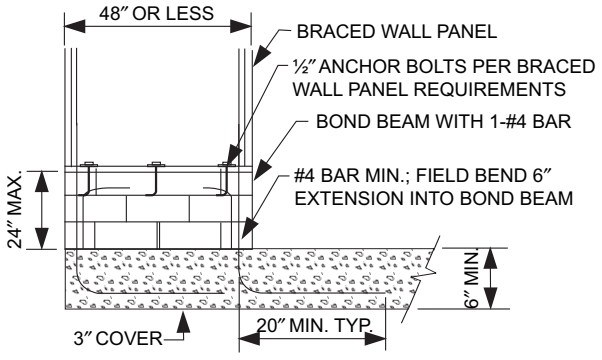
Exception: Two-story buildings shall be permitted to have interior *braced wall panels* supported on continuous foundations at intervals not exceeding 50 feet (15 240 mm) provided that:

1. The height of cripple walls does not exceed 4 feet (1219 mm).
2. First-floor *braced wall panels* are supported on doubled floor joists, continuous blocking or floor beams.
3. The distance between bracing lines does not exceed twice the building width measured parallel to the *braced wall line*.

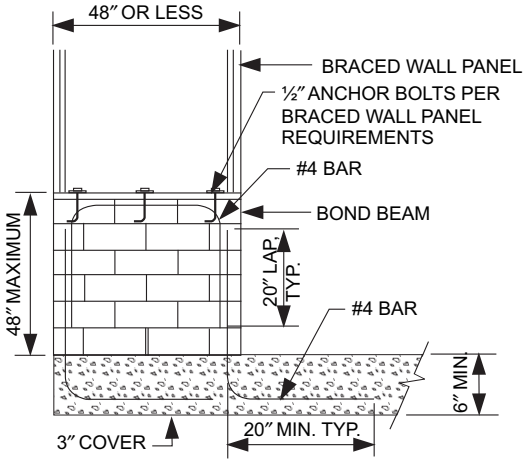
R602.10.8 Panel joints. All vertical joints of panel sheathing shall occur over, and be fastened to common studs. Horizontal joints in *braced wall panels* shall occur over, and be fastened to common blocking of a minimum $1^1/_2$ inch (38 mm) thickness.

Exceptions:

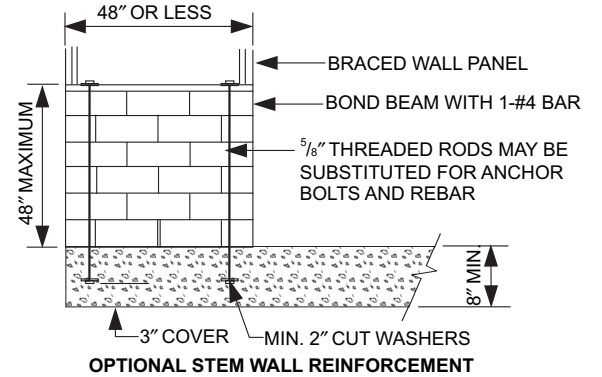
1. Blocking at horizontal joints shall not be required in wall segments that are not counted as *braced wall panels*.
2. Where the bracing length provided is at least twice the minimum length required by Tables R602.10.1.2(1) and R602.10.1.2(2) blocking at horizontal joints shall not be required in *braced wall panels* constructed using Methods WSP, SFB, GB, PBS or HPS.
3. When Method GB panels are installed horizontally, blocking of horizontal joints is not required.



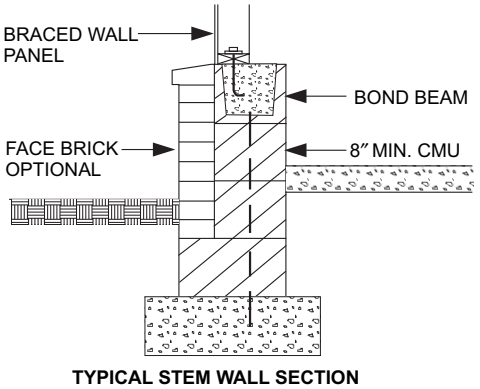
SHORT STEM WALL REINFORCEMENT



TALL STEM WALL REINFORCEMENT



OPTIONAL STEM WALL REINFORCEMENT



TYPICAL STEM WALL SECTION

NOTE: GROUT BOND BEAMS AND ALL CELLS WHICH CONTAIN REBAR, THREADED RODS AND ANCHOR BOLTS.

For SI: 1 inch = 25.4 mm.

FIGURE R602.10.7
MASONRY STEM WALLS SUPPORTING BRACED WALL PANELS

R602.10.9 Cripple wall bracing. In Seismic Design Categories other than D_2, cripple walls shall be braced with a length and type of bracing as required for the wall above in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2) with the following modifications for cripple wall bracing:

1. The length of bracing as determined from Tables R602.10.1.2(1) and R602.10.1.2(2) shall be multiplied by a factor of 1.15, and
2. The wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

R602.10.9.1 Cripple wall bracing in Seismic Design Categories D_1 and D_2. In addition to the requirements of Section R602.10.9, where *braced wall lines* at interior walls occur without a continuous foundation below, the length of parallel exterior cripple wall bracing shall be $1^1/_2$ times the length required by Tables R602.10.1.2(1) and R602.10.1.2(2). Where cripple walls braced using Method WSP of Section R602.10.2 cannot provide this additional length, the capacity of the sheathing shall be increased by reducing the spacing of fasteners along the perimeter of each piece of sheathing to 4 inches (102 mm) on center.

In Seismic Design Category D_2, cripple walls shall be braced in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2).

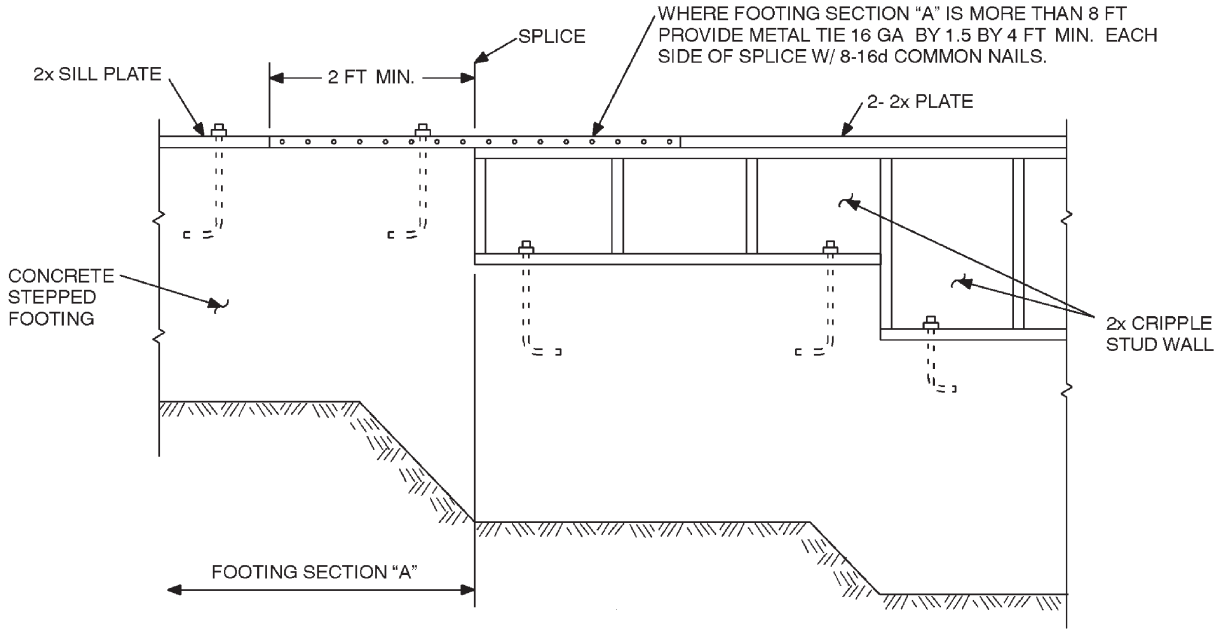
R602.10.9.2 Redesignation of cripple walls. In any Seismic Design Category, cripple walls shall be permitted to be redesignated as the first *story* walls for purposes of determining wall bracing requirements. If the cripple walls are redesignated, the stories above the redesignated *story* shall be counted as the second and third stories, respectively.

R602.11 Wall anchorage. *Braced wall line* sills shall be anchored to concrete or masonry foundations in accordance with Sections R403.1.6 and R602.11.1.

602.11.1 Wall anchorage for all buildings in Seismic Design Categories D_1 and D_2 and townhouses in Seismic Design Category C. Plate washers, a minimum of 0.229 inch by 3 inches by 3 inches (5.8 mm by 76 mm by 76 mm) in size, shall be provided between the foundation sill plate and the nut except where *approved* anchor straps are used. The hole in the plate washer is permitted to be diagonally slotted with a width of up to $^3/_{16}$ inch (5 mm) larger than the bolt diameter and a slot length not to exceed $1^3/_4$ inches (44 mm), provided a standard cut washer is placed between the plate washer and the nut.

R602.11.2 Stepped foundations in Seismic Design Categories D_1 and D_2. In all buildings located in Seismic Design Categories D_1 or D_2, where the height of a required *braced wall line* that extends from foundation to floor above varies more than 4 feet (1219 mm), the *braced wall line* shall be constructed in accordance with the following:

1. Where the lowest floor framing rests directly on a sill bolted to a foundation not less than 8 feet (2440 mm) in length along a line of bracing, the line shall be considered as braced. The double plate of the cripple stud wall beyond the segment of footing that extends to the lowest framed floor shall be spliced by extending the



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
Note: Where footing Section "A" is less than 8 feet long in a 25-foot-long wall, install bracing at cripple stud wall.

FIGURE R602.11.2
STEPPED FOUNDATION CONSTRUCTION

upper top plate a minimum of 4 feet (1219 mm) along the foundation. Anchor bolts shall be located a maximum of 1 foot and 3 feet (305 and 914 mm) from the step in the foundation. See Figure R602.11.2.

2. Where cripple walls occur between the top of the foundation and the lowest floor framing, the bracing requirements of Sections R602.10.9 and R602.10.9.1 shall apply.
3. Where only the bottom of the foundation is stepped and the lowest floor framing rests directly on a sill bolted to the foundations, the requirements of Sections R403.1.6 and R602.11.1 shall apply.

R602.12 Wall bracing and stone and masonry veneer. Where stone and masonry veneer is installed in accordance with Section R703.7, wall bracing shall comply with this section.

For all buildings in Seismic Design Categories A, B and C, wall bracing at exterior and interior *braced wall lines* shall be in accordance with Section R602.10 and the additional requirements of Table R602.12(1).

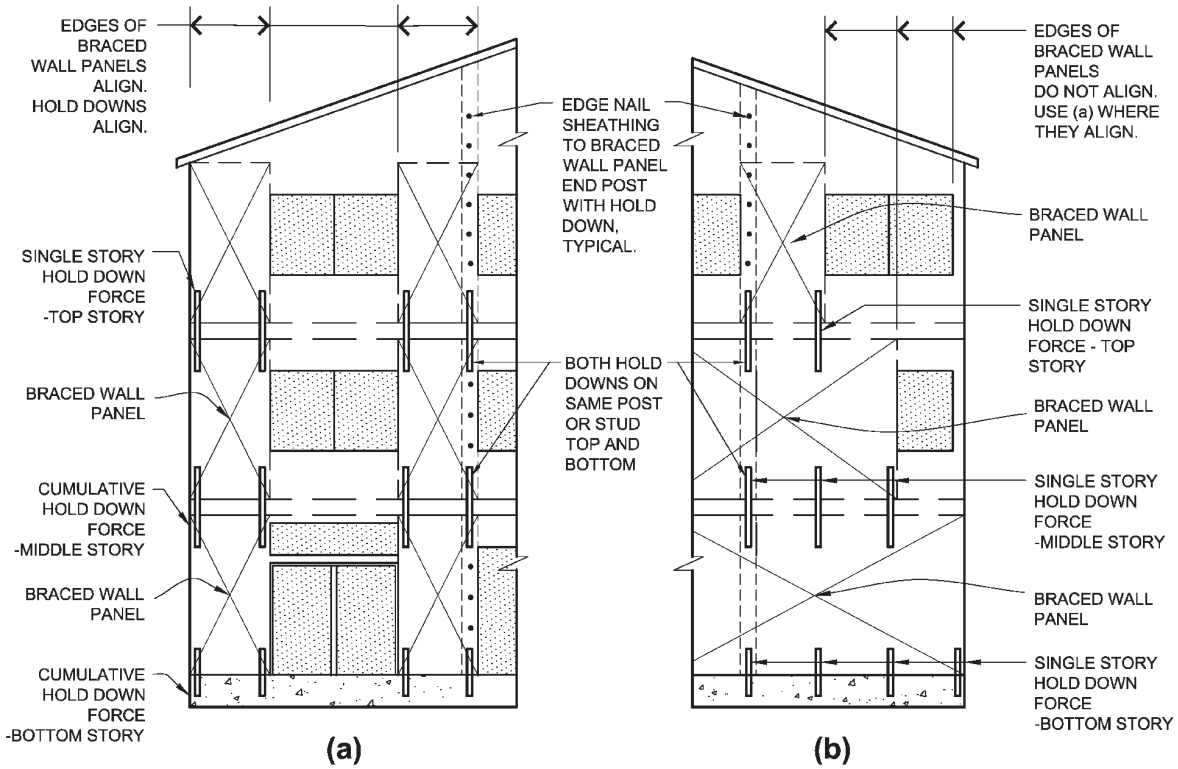
For detached one- or two-family *dwellings* in Seismic Design Categories D_1 and D_2, wall bracing and hold downs at exterior and interior *braced wall lines* shall be in accordance with Sections R602.10 and R602.11 and the additional requirements of Section R602.12.1 and Table R602.12(2). In Seismic Design Categories D_1 and D_2, cripple walls are not permitted, and required interior *braced wall lines* shall be supported on continuous foundations.

R602.12.1 Seismic Design Categories D_1 and D_2. Wall bracing where stone and masonry veneer exceeds the first *story height* in Seismic Design Categories D_1 and D_2 shall conform to the requirements of Sections R602.10 and R602.11 and the following requirements.

R602.12.1.1 Length of bracing. The length of bracing along each *braced wall line* shall be in accordance with Table R602.12(2).

R602.12.1.2 Braced wall panel location. *Braced wall panels* shall begin no more than 8 feet (2440 mm) from each end of a *braced wall line* and shall be spaced a maximum of 25 feet (7620 mm) on center.

R602.12.1.3 Braced wall panel construction. *Braced wall panels* shall be constructed of sheathing with a thickness of not less than $^{7}/_{16}$ inch (11 mm) nailed with 8d common nails spaced 4 inches (102 mm) on center at all panel edges and 12 inches (305 mm) on center at intermediate supports. The end of each *braced wall panel* shall have a hold down device in accordance with Table R602.12(2) installed at each end. Size, height and spacing of wood studs shall be in accordance with Table R602.3(5).



(a) Braced wall panels stacked (aligned story to story). Use cumulative hold down force.
(b) Braced wall panels not stacked. Use single story hold down force.

FIGURE R602.12
HOLD DOWNS AT EXTERIOR AND INTERIOR BRACED WALL PANELS

TABLE R602.12(1)
STONE OR MASONRY VENEER WALL BRACING REQUIREMENTS, WOOD OR STEEL FRAMING, SEISMIC DESIGN CATEGORIES A, B and C

SEISMIC DESIGN CATEGORY	NUMBER OF WOOD FRAMED STORIES	WOOD FRAMED STORY	MINIMUM SHEATHING AMOUNT (length of braced wall line length)[a]
A or B	1, 2 or 3	all	Table R602.10.1.2(2)
C	1	1 only	Table R602.10.1.2(2)
	2	top	Table R602.10.1.2(2)
		bottom	1.5 times length required by Table R602.10.1.2(2)
	3	top	Table R602.10.1.2(2)
		middle	1.5 times length required by Table R602.10.1.2(2)
		bottom	1.5 times length required by Table R602.10.1.2(2)

a. Applies to exterior and interior braced wall lines.

TABLE R602.12(2)
STONE OR MASONRY VENEER WALL BRACING REQUIREMENTS, ONE- AND TWO-FAMILY DETACHED DWELLINGS, SEISMIC DESIGN CATEGORIES D_1 and D_2

SEISMIC DESIGN CATEGORY	NUMBER OF STORIES[a]	STORY	MINIMUM SHEATHING AMOUNT (percent of braced wall line length)[b]	MINIMUM SHEATHING THICKNESS AND FASTENING	SINGLE STORY HOLD DOWN FORCE (lb)[c]	CUMULATIVE HOLD DOWN FORCE (lb)[d]
D_1	1	1 only	45	$^7/_{16}$-inch wood structural panel sheathing with 8d common nails spaced at 4 inches on center at panel edges, 12 inches on center at intermediate supports; 8d common nails at 4 inches on center at braced wall panel end posts with hold down attached	2100	—
	2	top	45		2100	—
		bottom	45		3700	5800
	3	top	45		2100	—
		middle	45		3700	5800
		bottom	60		3700	9500
D_2	1	1 only	55		2300	—
	2	top	55		2300	—
		bottom	55		3900	6200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

a. Cripple walls are not permitted in Seismic Design Categories D_1 and D_2.

b. Applies to exterior and interior braced wall lines.

c. Hold down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single story hold down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained. [See Figure R602.12].

d. Where hold down connectors from stories above align with stories below, use cumulative hold down force to size middle and bottom story hold down connectors. (See Figure R602.12).

R602.12.1.4 Minimum length of braced panel. Each *braced wall panel* shall be at least 48 inches (1219 mm) in length, covering a minimum of 3 stud spaces where studs are spaced 16 inches (406 mm) on center and covering a minimum of 2 stud spaced where studs are spaced 24 inches on center.

R602.12.1.5 Alternate braced wall panel. Alternate *braced wall panels* described in Section R602.10.3.2 shall not replace the *braced wall panel* specification of this section.

R602.12.1.6 Continuously sheathed wall bracing. Continuously sheathed provisions of Section R602.10.4 shall not be used in conjunction with the wall bracing provisions of this section.

SECTION R603
STEEL WALL FRAMING

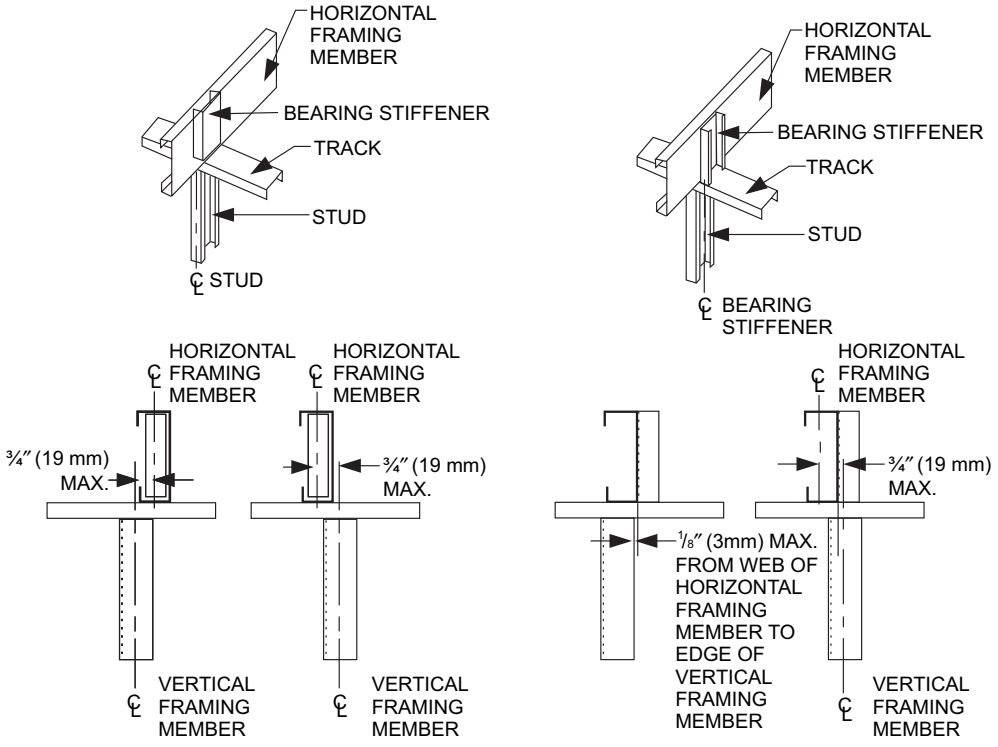
R603.1 General. Elements shall be straight and free of any defects that would significantly affect structural performance. Cold-formed steel wall framing members shall comply with the requirements of this section.

R603.1.1 Applicability limits. The provisions of this section shall control the construction of exterior cold-formed steel wall framing and interior load-bearing cold-formed steel wall framing for buildings not more than 60 feet (18 288 mm) long perpendicular to the joist or truss span, not more than 40 feet (12 192 mm) wide parallel to the joist or truss span, and less than or equal to three stories above *grade plane*. All exterior walls installed in accordance with the provisions of this section shall be considered as load-bearing walls. Cold-formed steel walls constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 110 miles per hour (49 m/s) Exposure B or C and a maximum ground snow load of 70 pounds per square foot (3.35 kPa).

R603.1.2 In-line framing. Load-bearing cold-formed steel studs constructed in accordance with Section R603 shall be located in-line with joists, trusses and rafters in accordance with Figure R603.1.2 and the tolerances specified as follows:

1. The maximum tolerance shall be $^3/_4$ inch (19 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.
2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be $^1/_8$ inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.

R603.2 Structural framing. Load-bearing cold-formed steel wall framing members shall comply with Figure R603.2(1) and with the dimensional and minimum thickness requirements specified in Tables R603.2(1) and R603.2(2). Tracks shall comply with Figure R603.2(2) and shall have a minimum flange width of $1^1/_4$ inches (32 mm). The maximum inside bend radius for members shall be the greater of $^3/_{32}$ inch (2.4 mm) minus half the base steel thickness or 1.5 times the base steel thickness.



For SI: 1 inch = 25.4 mm,

FIGURE R603.1.2
IN-LINE FRAMING

R603.2.1 Material. Load-bearing cold-formed steel framing members shall be cold-formed to shape from structural quality sheet steel complying with the requirements of one of the following:

1. ASTM A 653: Grades 33, and 50 (Class 1 and 3).
2. ASTM A 792: Grades 33, and 50A.
3. ASTM A 1003: Structural Grades 33 Type H, and 50 Type H.

R603.2.2 Identification. Load-bearing cold-formed steel framing members shall have a legible *label*, stencil, stamp or embossment with the following information as a minimum:

1. Manufacturer's identification.
2. Minimum base steel thickness in inches (mm).
3. Minimum coating designation.
4. Minimum yield strength, in kips per square inch (ksi) (MPa).

R603.2.3 Corrosion protection. Load-bearing cold-formed steel framing shall have a metallic coating complying with ASTM A 1003 and one of the following:

1. A minimum of G 60 in accordance with ASTM A 653.
2. A minimum of AZ 50 in accordance with ASTM A 792.

R603.2.4 Fastening requirements. Screws for steel-to-steel connections shall be installed with a minimum edge distance and center-to-center spacing of $^1/_2$ inch (12.7 mm), shall be self-drilling tapping and shall conform to ASTM C 1513. Structural sheathing shall be attached to cold-formed steel studs with minimum No. 8 self-drilling tapping screws that conform to ASTM C 1513. 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 wall framing with minimum No. 6 screws conforming to ASTM C 954 or ASTM C 1513 with a bugle head style and shall be installed in accordance with Section R702. For all connections, screws shall extend through the steel a minimum of three exposed threads. All fasteners shall have rust inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.

Where No. 8 screws are specified in a steel-to-steel connection, the required number of screws in the connection is permitted to be reduced in accordance with the reduction factors in Table R603.2.4, when larger screws are used or when one of the sheets of steel being connected is thicker than 33 mils (0.84 mm). When applying the reduction factor, the resulting number of screws shall be rounded up.

TABLE R603.2.4
SCREW SUBSTITUTION FACTOR

SCREW SIZE	THINNEST CONNECTED STEEL SHEET (mils)	
	33	43
#8	1.0	0.67
#10	0.93	0.62
#12	0.86	0.56

For SI: 1 mil = 0.0254 mm.

R603.2.5 Web holes, web hole reinforcing and web hole patching. Web holes, web hole reinforcing and web hole patching shall be in accordance with this section.

TABLE R603.2(1)
LOAD-BEARING COLD-FORMED STEEL STUD SIZES

MEMBER DESIGNATION[a]	WEB DEPTH (inches)	MINIMUM FLANGE WIDTH (inches)	MAXIMUM FLANGE WIDTH (inches)	MINIMUM LIP SIZE (inches)
350S162-t	3.5	1.625	2	0.5
550S162-t	5.5	1.625	2	0.5

For SI: 1 inch = 25.4 mm; 1 mil = 0.0254 mm.

a. The member designation is defined by the first number representing the member depth in hundredths of an inch "S" representing a stud or joist member, the second number representing the flange width in hundredths of an inch, and the letter "t" shall be a number representing the minimum base metal thickness in mils [See Table R603.2(2)].

TABLE R603.2(2)
MINIMUM THICKNESS OF COLD-FORMED STEEL MEMBERS

DESIGNATION THICKNESS (mils)	MINIMUM BASE STEEL THICKNESS (inches)
33	0.0329
43	0.0428
54	0.0538
68	0.0677
97	0.0966

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm.

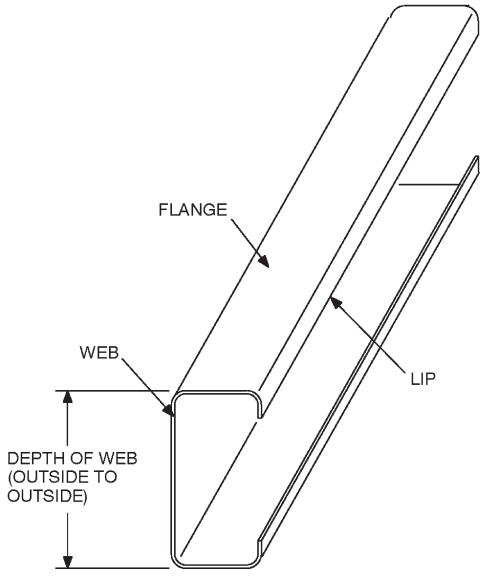


FIGURE R603.2(1)
C-SHAPED SECTION

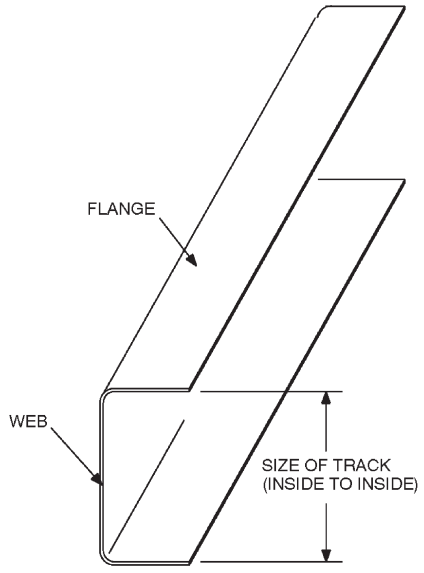


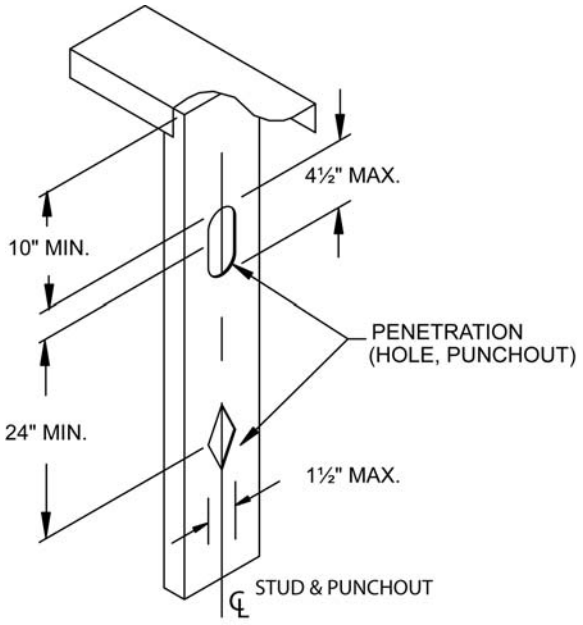
FIGURE R603.2(2)
TRACK SECTION

R603.2.5.1 Web holes. Web holes in wall studs and other structural members shall comply with all of the following conditions:

1. Holes shall conform to Figure R603.2.5.1;
2. Holes shall be permitted only along the centerline of the web of the framing member;
3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm);
4. Holes shall have a web hole width not greater than 0.5 times the member depth, or $1^1/_2$ inches (38 mm);
5. Holes shall have a web hole length not exceeding $4^1/_2$ inches (114 mm); and
6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).

Framing members with web holes not conforming to the above requirements shall be reinforced in accordance with Section R603.2.5.2, patched in accordance with Section R603.2.5.3 or designed in accordance with accepted engineering practice.

R603.2.5.2 Web hole reinforcing. Web holes in gable endwall studs not conforming to the requirements of Section R603.2.5.1 shall be permitted to be reinforced if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shape section with a hole that does not exceed the web hole size limitations of Section R603.2.5.1 for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend at least 1 inch (25.4 mm) beyond all edges of the hole.



For SI: 1 inch = 25.4 mm.

FIGURE R603.2.5.1
WEB HOLES

The steel reinforcing shall be fastened to the web of the receiving member with No.8 screws spaced no more than 1 inch (25.4 mm) center-to-center along the edges of the patch with minimum edge distance of $^1/_2$ inch (12.7 mm).

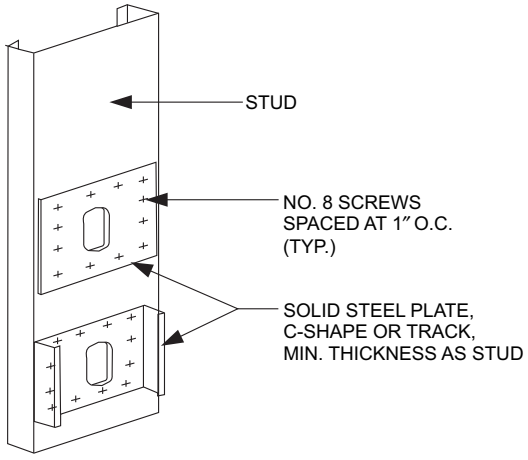
R603.2.5.3 Hole patching. Web holes in wall studs and other structural members not conforming to the require-

ments in Section R603.2.5.1 shall be permitted to be patched in accordance with either of the following methods:

1. Framing members shall be replaced or designed in accordance with accepted engineering practice when web holes exceed the following size limits:
   1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web; or
   1.2. The length of the hole measured along the web exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.
2. Web holes not exceeding the dimensional requirements in Section R603.2.5.3, Item 1 shall be patched with a solid steel plate, stud section or track section in accordance with Figure R603.2.5.3. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend at least 1 inch (25.4 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced no more than 1 inch (25.4 mm) center-to-center along the edges of the patch with a minimum edge distance of $^1/_2$ inch (12.7 mm).

R603.3 Wall construction. All exterior cold-formed steel framed walls and interior load-bearing cold-formed steel framed walls shall be constructed in accordance with the provisions of this section.

R603.3.1 Wall to foundation or floor connection. Cold-formed steel framed walls shall be anchored to foundations or floors in accordance with Table R603.3.1 and Figure R603.3.1(1), R603.3.1(2) or R603.3.1(3). Anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks. Anchor bolts shall extend a minimum of 15 inches (381 mm) into masonry or 7 inches (178 mm) into concrete. Foundation anchor straps shall be permitted, in lieu of anchor bolts, if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.



For SI: 1 inch = 25.4 mm.

FIGURE R603.2.5.3
STUD WEB HOLE PATCH

R603.3.1.1 Gable endwalls. Gable endwalls with heights greater than 10 feet (3048 mm) shall be anchored to foundations or floors in accordance with Tables R603.3.1.1(1) or R603.3.1.1(2).

R603.3.2 Minimum stud sizes. Cold-formed steel walls shall be constructed in accordance with Figures R603.3.1(1), R603.3.1(2), or R603.3.1(3), as applicable. Exterior wall stud size and thickness shall be determined in accordance with the limits set forth in Tables R603.3.2(2) through R603.3.2(31). Interior load-bearing wall stud size and thickness shall be determined in accordance with the limits set forth in Tables R603.3.2(2) through R603.3.2(31) based upon an 85 miles per hour (38 m/s) Exposure A/B wind value and the building width, stud spacing and snow load, as appropriate. Fastening requirements shall be in accordance with Section R603.2.4 and Table R603.3.2(1). Top and bottom tracks shall have the same minimum thickness as the wall studs.

Exterior wall studs shall be permitted to be reduced to the next thinner size, as shown in Tables R603.3.2(2) through R603.3.2(31), but not less than 33 mils (0.84 mm) ,where both of the following conditions exist:

1. Minimum of $^1/_2$ inch (12.7 mm) gypsum board is installed and fastened in accordance with Section R702 on the interior surface.
2. Wood structural sheathing panels of minimum $^7/_{16}$ inch (11 mm) thick oriented strand board or $^{15}/_{32}$ inch (12 mm) thick plywood is installed and fastened in accordance with Section R603.9.1 and Table R603.3.2(1) on the outside surface.

Interior load-bearing walls shall be permitted to be reduced to the next thinner size, as shown in Tables R603.3.2(2) through R603.3.2(31), but not less than 33 mils (0.84 mm), where a minimum of $^1/_2$ inch (12.7 mm) gypsum board is installed and fastened in accordance with Section R702 on both sides of the wall. The tabulated stud thickness for load-bearing walls shall be used when the *attic* load is 10 pounds per square feet (480 Pa) or less. A limited *attic* storage load of 20 pounds per square feet (960 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(2) through R603.3.2(31).

For two-story buildings, the tabulated stud thickness for walls supporting one floor, roof and ceiling shall be used when second floor live load is 30 pounds per square feet (1440 Pa). Second floor live loads of 40 psf (1920 pounds per square feet) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(2) through R603.3.2(21).

For three-story buildings, the tabulated stud thickness for walls supporting one or two floors, roof and ceiling shall be used when the third floor live load is 30 pounds per square feet (1440 Pa). Third floor live loads of 40 pounds per square feet (1920 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(22) through R603.3.2(31).

TABLE R603.3.1
WALL TO FOUNDATION OR FLOOR CONNECTION REQUIREMENTS[a,b]

FRAMING CONDITION	WIND SPEED (mph) AND EXPOSURE					
	85 B	90 B	100 B 85 C	110 B 90 C	100 C	< 110 C
Wall bottom track to floor per Figure R603.3.1(1)	1-No. 8 screw at 12″ o.c.	1-No. 8 screw at 12″ o.c.	1-No. 8 screw at 12″ o.c.	1-No. 8 screw at 12″ o.c.	2-No. 8 screws at 12″ o.c.	2 No. 8 screws at 12″ o.c.
Wall bottom track to foundation per Figure R603.3.1(2)[d]	1/2″ minimum diameter anchor bolt at 6′ o.c.	1/2″ minimum diameter anchor bolt at 6′ o.c.	1/2″ minimum diameter anchor bolt at 4′ o.c.	1/2″ minimum diameter anchor bolt at 4′ o.c.	1/2″ minimum diameter anchor bolt at 4′ o.c.	1/2″ minimum diameter anchor bolt at 4′ o.c.
Wall bottom track to wood sill per Figure R603.3.1(3)	Steel plate spaced at 4′ o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 4′ o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3′ o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3′ o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2′ o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2′ o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails
Wind uplift connector strength to 16″ stud spacing[c]	NR	NR	NR	NR	NR	65 lb per foot of wall length
Wind uplift connector strength for 24″ stud spacing[c]	NR	NR	NR	NR	NR	100 lb per foot of wall length

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm, 1 lb = 4.45 N.

a. Anchor bolts are to be located not more than 12 inches from corners or the termination of bottom tracks (e.g., at door openings or corners). Bolts are to extend a minimum of 15 inches into masonry or 7 inches into concrete.

b. All screw sizes shown are minimum.

c. NR = uplift connector not required.

d. Foundation anchor straps are permitted in place of anchor bolts, if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.

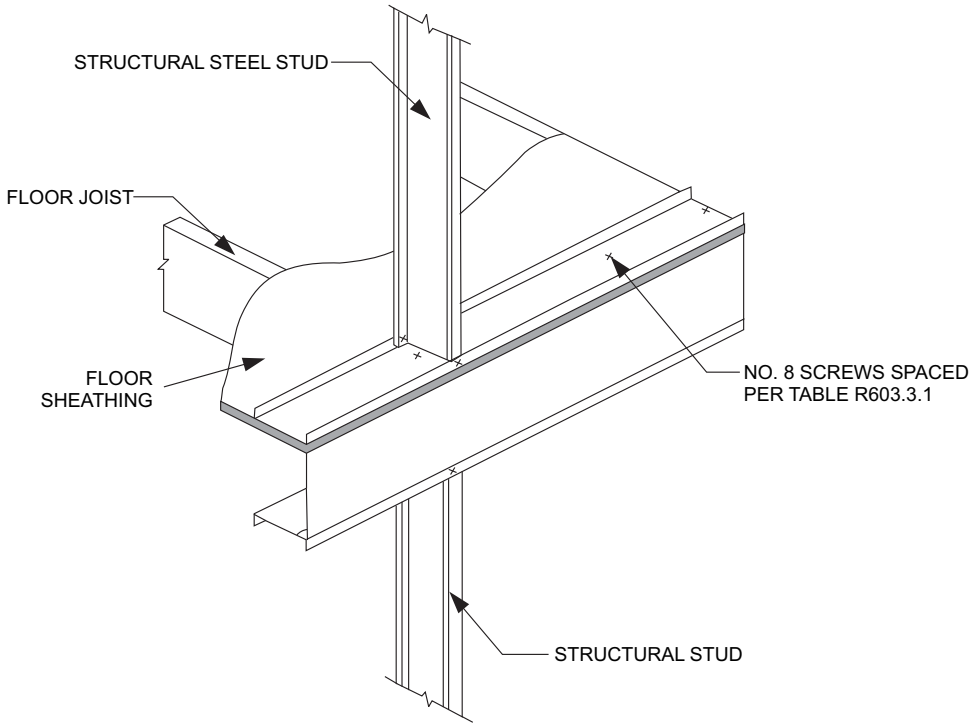
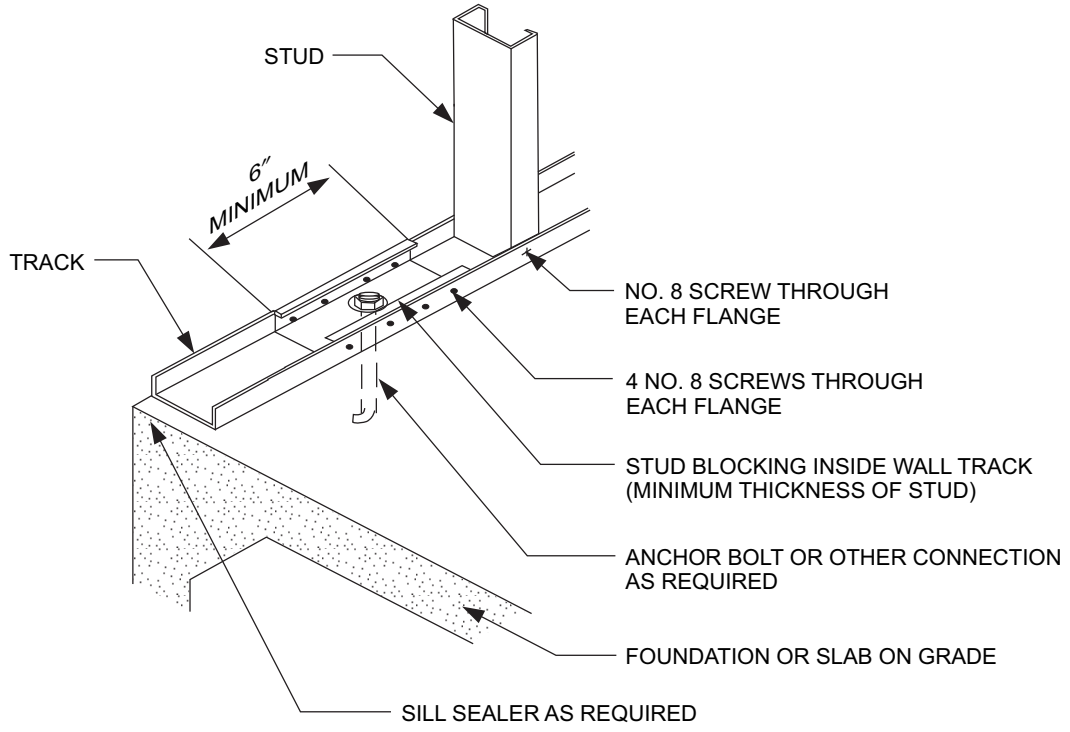
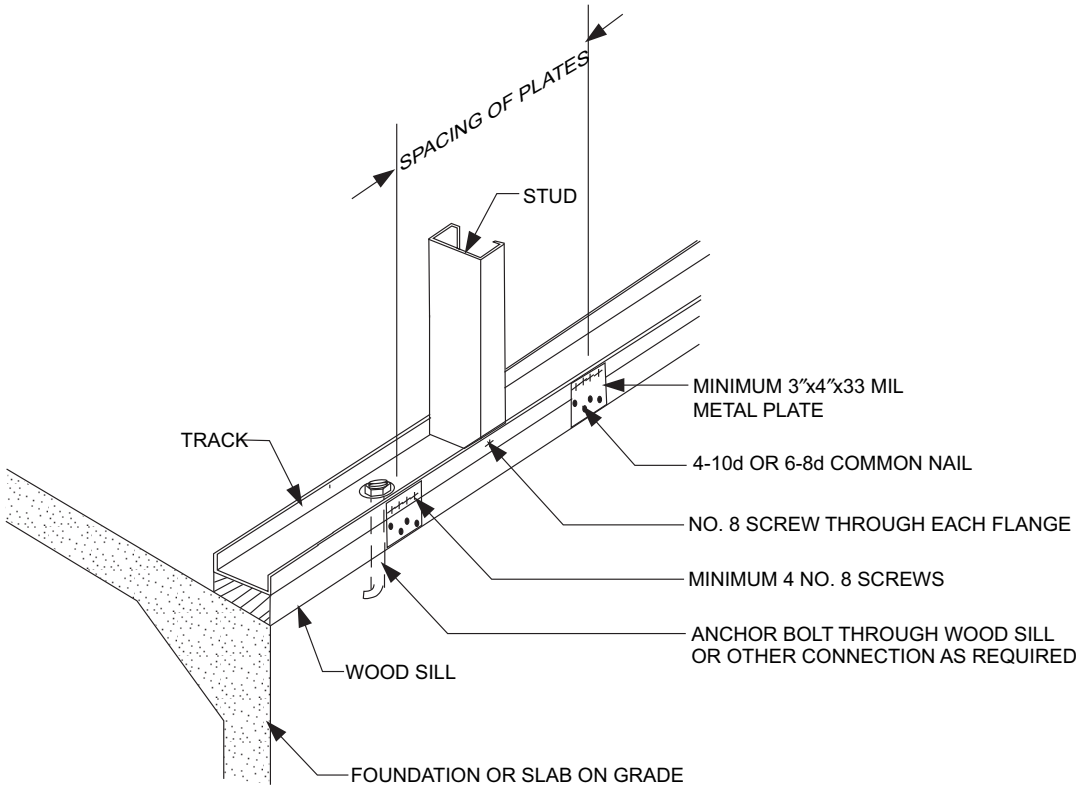


FIGURE R603.3.1(1)
WALL TO FLOOR CONNECTION



For SI: 1 inch = 25.4 mm.

FIGURE R603.3.1(2)
WALL TO FOUNDATION CONNECTION



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm.

FIGURE R603.3.1(3)
WALL TO WOOD SILL CONNECTION

TABLE R603.3.1.1(1)
GABLE ENDWALL TO FLOOR CONNECTION REQUIREMENTS[a,b,c]

BASIC WIND SPEED (mph)		WALL BOTTOM TRACK TO FLOOR JOIST OR TRACK CONNECTION		
Exposure		Stud height, h (ft)		
B	C	10 < h ≤ 14	14 < h ≤ 18	18 < h ≤ 22
85	—	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.
90	—	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.
100	85	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.
110	90	1-No. 8 screw @ 12″ o.c.	1-No. 8 screw @ 12″ o.c.	2-No. 8 screws @ 12″ o.c.
—	100	1-No. 8 screw @ 12″ o.c.	2-No. 8 screws @ 12″ o.c.	1-No. 8 screw @ 8″ o.c.
—	110	2-No. 8 screws @ 12″ o.c.	1-No. 8 screw @ 8″ o.c.	2-No. 8 screws @ 8″ o.c.

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

a. Refer to Table R603.3.1.1(2) for gable endwall bottom track to foundation connections.

b. Where attachment is not given, special design is required.

c. Stud height, *h*, is measured from wall bottom track to wall top track or brace connection height.

TABLE R603.3.1.1(2)
GABLE ENDWALL BOTTOM TRACK TO FOUNDATION CONNECTION REQUIREMENTS[a,b,c]

BASIC WIND SPEED (mph)		MINIMUM SPACING FOR $^1/_2$ IN. DIAMETER ANCHOR BOLTS[d]		
Exposure		Stud height, h (ft)		
B	C	10 < h ≤ 14	14 < h ≤ 18	18 < h ≤ 22
85	—	6′ - 0″ o.c.	6′ - 0″ o.c.	6′ - 0″ o.c.
90	—	6′ - 0″ o.c.	5′ - 7″ o.c.	6′ - 0″ o.c.
100	85	5′ - 10″ o.c.	6′ - 0″ o.c.	6′ - 0″ o.c.
110	90	4′ - 10″ o.c.	5′ - 6″ o.c.	6′ - 0″ o.c.
—	100	4′ - 1″ o.c.	6′ - 0″ o.c.	6′ - 0″ o.c.
—	110	5′ - 1″ o.c.	6′ - 0″ o.c.	5′ - 2″ o.c.

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

a. Refer to Table R603.3.1.1(1) for gable endwall bottom track to floor joist or track connection connections.

b. Where attachment is not given, special design is required.

c. Stud height, *h*, is measured from wall bottom track to wall top track or brace connection height.

d. Foundation anchor straps are permitted in place of anchor bolts if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.

R603.3.2.1 Gable endwalls. The size and thickness of gable endwall studs with heights less than or equal to 10 feet (3048 mm) shall be permitted in accordance with the limits set forth in Tables R603.3.2.1(1) or R603.3.2.1(2). The size and thickness of gable endwall studs with heights greater than 10 feet (3048 mm) shall be determined in accordance with the limits set forth in Tables R603.3.2.1(3) or R603.3.2.1(4).

R603.3.3 Stud bracing. The flanges of cold-formed steel studs shall be laterally braced in accordance with one of the following:

1. Gypsum board on both sides, structural sheathing on both sides, or gypsum board on one side and structural sheathing on the other side of load-bearing walls with gypsum board installed with minimum No. 6 screws in accordance with Section R702 and structural sheathing installed in accordance with Section R603.9.1 and Table R603.3.2(1).
2. Horizontal steel straps fastened in accordance with Figure R603.3.3(1) on both sides at mid-height for 8-foot (2438 mm) walls, and at one-third points for 9-foot and 10-foot (2743 mm and 3048 mm) walls. Horizontal steel straps shall be at least 1.5 inches in width and 33 mils in thickness (38 mm by 0.84 mm). Straps shall be attached to the flanges of studs with one No. 8 screw. In-line blocking shall be installed between studs at the termination of all straps and at 12 foot (3658 mm) intervals along the strap. Straps shall be fastened to the blocking with two No. 8 screws.
3. Sheathing on one side and strapping on the other side fastened in accordance with Figure R603.3.3(2). Sheathing shall be installed in accordance with Item 1. Steel straps shall be installed in accordance with Item 2.

R603.3.4 Cutting and notching. Flanges and lips of cold-formed steel studs and headers shall not be cut or notched.

TABLE R603.3.2(1)
WALL FASTENING SCHEDULE[a]

DESCRIPTION OF BUILDING ELEMENT	NUMBER AND SIZE OF FASTENERS[a]	SPACING OF FASTENERS
Floor joist to track of load-bearing wall	2-No. 8 screws	Each joist
Wall stud to top or bottom track	2-No. 8 screws	Each end of stud, one per flange
Structural sheathing to wall studs	No. 8 screws[b]	6″ o.c. on edges and 12″ o.c. at intermediate supports
Roof framing to wall	Approved design or tie down in accordance with Section R802.11	

For SI: 1 inch = 25.4 mm.

a. All screw sizes shown are minimum.

b. Screws for attachment of structural sheathing panels are to be bugle-head, flat-head, or similar head styles with a minimum head diameter of 0.29 inch.

R603.3.5 Splicing. Steel studs and other structural members shall not be spliced. Tracks shall be spliced in accordance with Figure R603.3.5.

R603.4 Corner framing. In exterior walls, corner studs and the top tracks shall be installed in accordance with Figure R603.4.

R603.5 Exterior wall covering. The method of attachment of exterior wall covering materials to cold-formed steel stud wall framing shall conform to the manufacturer's installation instructions.

R603.6 Headers. Headers shall be installed above all wall openings in exterior walls and interior load-bearing walls. Box beam headers and back-to-back headers each shall be formed from two equal sized C-shaped members in accordance with Figures R603.6(1) and R603.6(2), respectively, and Tables R603.6(1) through R603.6(24). L-shaped headers shall be permitted to be constructed in accordance with AISI S230. Alternately, headers shall be permitted to be designed and constructed in accordance with AISI S100, Section D4.

R603.6.1 Headers in gable endwalls. Box beam and back-to-back headers in gable endwalls shall be permitted to be constructed in accordance with Section R603.6 or with the header directly above the opening in accordance with Figures R603.6.1(1) and R603.6.1(2) and the following provisions:

1. Two 362S162-33 for openings less than or equal to 4 feet (1219 mm).
2. Two 600S162-43 for openings greater than 4 feet (1219 mm) but less than or equal to 6 feet (1830 mm).
3. Two 800S162-54 for openings greater than 6 feet (1829 mm) but less than or equal to 9 feet (2743 mm).

R603.7 Jack and king studs. The number of jack and king studs installed on each side of a header shall comply with Table R603.7(1). King, jack and cripple studs shall be of the same dimension and thickness as the adjacent wall studs. Headers shall be connected to king studs in accordance with Table R603.7(2) and the following provisions:

1. For box beam headers, one-half of the total number of required screws shall be applied to the header and one half to the king stud by use of C-shaped or track member in accordance with Figure R603.6(1). The track or C-shape sections shall extend the depth of the header minus $^1/_2$ inch (12.7 mm) and shall have a minimum thickness not less than that of the wall studs.
2. For back-to-back headers, one-half the total number of screws shall be applied to the header and one-half to the king stud by use of a minimum 2-inch-by-2-inch (51 mm × 51 mm) clip angle in accordance with Figure R603.6(2). The clip angle shall extend the depth of the header minus $^1/_2$ inch (12.7 mm) and shall have a minimum thickness not less than that of the wall studs. Jack and king studs shall be interconnected with structural sheathing in accordance with Figures R603.6(1) and R603.6(2).

R603.8 Head and sill track. Head track spans above door and window openings and sill track spans beneath window openings shall comply with Table R603.8. For openings less than 4 feet (1219 mm) in height that have both a head track and a sill track, multiplying the spans by 1.75 shall be permitted in Table R603.8. For openings less than or equal to 6 feet (1829 mm) in height that have both a head track and a sill track, multiplying the spans in Table R603.8 by 1.50 shall be permitted.

R603.9 Structural sheathing. Structural sheathing shall be installed in accordance with Figure R603.9 and this section on all sheathable exterior wall surfaces, including areas above and below openings.

R603.9.1 Sheathing materials. Structural sheathing panels shall consist of minimum $^7/_{16}$-inch (11 mm) thick oriented strand board or $^{15}/_{32}$-inch (12 mm) thick plywood.

R603.9.2 Determination of minimum length of full height sheathing. The minimum length of full height sheathing on each *braced wall line* shall be determined by multiplying the length of the *braced wall line* by the percentage obtained from Table R603.9.2(1) and by the plan aspect-ratio adjustment factors obtained from Table R603.9.2(2). The minimum length of full height sheathing shall not be less than 20 percent of the *braced wall line* length.

To be considered full height sheathing, structural sheathing shall extend from the bottom to the top of the wall without interruption by openings. Only sheathed, full height wall sections, uninterrupted by openings, which are a minimum of 48 inches (1219 mm) wide, shall be counted toward meeting the minimum percentages in Table R603.9.2(1). In addition, structural sheathing shall comply with all of the following requirements:

1. Be installed with the long dimension parallel to the stud framing (i.e. vertical orientation) and shall cover the full vertical height of wall from the bottom of the bottom track to the top of the top track of each *story*. Installing the long dimension perpendicular to the stud framing or using shorter segments shall be per-

mitted provided that the horizontal joint is blocked as described in Item 2 below.

2. Be blocked when the long dimension is installed perpendicular to the stud framing (i.e. horizontal orientation). Blocking shall be a minimum of 33 mil (0.84 mm) thickness. Each horizontal structural sheathing panel shall be fastened with No. 8 screws spaced at 6 inches (152 mm) on center to the blocking at the joint.
3. Be applied to each end (corners) of each of the exterior walls with a minimum 48 inch (1219 mm) wide panel.

R603.9.2.1 The minimum percentage of full-height structural sheathing shall be multiplied by 1.10 for 9 foot (2743 mm) high walls and multiplied by 1.20 for 10 foot (3048 mm) high walls.

R603.9.2.2 For hip roofed homes, the minimum percentages of full height sheathing in Table R603.9.2(1), based upon wind, shall be permitted to be multiplied by a factor of 0.95 for roof slopes not exceeding 7:12 and a factor of 0.9 for roof slopes greater than 7:12.

R603.9.2.3 In the lowest *story* of a *dwelling*, multiplying the percentage of full height sheathing required in Table R603.9.2(1) by 0.6, shall be permitted provided hold down anchors are provided in accordance with Section R603.9.4.2.

R603.9.3 Structural sheathing fastening. All edges and interior areas of structural sheathing panels shall be fastened to framing members and tracks in accordance with Figure R603.9 and Table R603.3.2(1). Screws for attachment of structural sheathing panels shall be bugle-head, flat-head, or similar head style with a minimum head diameter of 0.29 inch (8 mm).

For continuously-sheathed *braced wall lines* using wood structural panels installed with No. 8 screws spaced 4-inches (102 mm) on center at all panel edges and 12 inches (304.8 mm) on center on intermediate framing members, the following shall apply:

1. Multiplying the percentages of full height sheathing in Table R603.9.2(1) by 0.72 shall be permitted.
2. For bottom track attached to foundations or framing below, the bottom track anchor or screw connection spacing in Table R505.3.1(1) and Table R603.3.1 shall be multiplied by 2/3.

R603.9.4 Uplift connection requirements. Uplift connections shall be provided in accordance with this section.

R603.9.4.1 Where wind speeds are in excess of 100 miles per hour (45 m/s), Exposure C, walls shall be provided wind direct uplift connections in accordance with AISI S230, Section E13.3, and AISI S230, Section F7.2, as required for 110 miles per hour (49 m/s), Exposure C.

R603.9.4.2 Where the percentage of full height sheathing is adjusted in accordance with Section R603.9.2.3, a hold-down anchor, with a strength of 4,300 pounds (19 kN), shall be provided at each end of each full-height sheathed wall section used to meet the minimum percent sheathing requirements of Section R603.9.2. Hold down anchors shall be attached to back-to-back studs; structural sheathing panels shall have edge fastening to the studs, in accordance with Section R603.9.3 and AISI S230, Table E11-1.

A single hold down anchor, installed in accordance with Figure R603.9.2, shall be permitted at the corners of buildings.

R603.9.5 Structural sheathing for stone and masonry veneer. In Seismic Design Category C, where stone and masonry veneer is installed in accordance with Section R703.7, the length of structural sheathing for walls supporting one *story*, roof and ceiling shall be the greater of the amount required by Section R603.9.2 or 36 percent, modified by Section R603.9.2 except Section R603.9.2.2 shall not be permitted.

SECTION R604
WOOD STRUCTURAL PANELS

R604.1 Identification and grade. Wood structural panels shall conform to DOC PS 1 or DOC PS 2 or, when manufactured in Canada, CSA O437 or CSA O325. All panels shall be identified by a grade mark or certificate of inspection issued by an *approved* agency.

R604.2 Allowable spans. The maximum allowable spans for wood structural panel wall sheathing shall not exceed the values set forth in Table R602.3(3).

R604.3 Installation. Wood structural panel wall sheathing shall be attached to framing in accordance with Table R602.3(1) or Table R602.3.(3). Wood structural panels marked Exposure 1 or Exterior are considered water-repellent sheathing under the code.

SECTION R605
PARTICLEBOARD

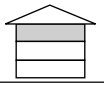
R605.1 Identification and grade. Particleboard shall conform to ANSI A208.1 and shall be so identified by a grade mark or certificate of inspection issued by an *approved* agency. Particleboard shall comply with the grades specified in Table R602.3(4).

SECTION R606
GENERAL MASONRY CONSTRUCTION

R606.1 General. Masonry construction shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of TMS 402/ACI 530/ASCE 5.

R606.1.1 Professional registration not required. When the empirical design provisions of TMS 402/ACI 530/ASCE 5 Chapter 5 or the provisions of this section are used to design masonry, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction* having authority.

TABLE R603.3.2(2)
24-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a, b, c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	43	43	43	43
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	43	43	43	43
			24	43	43	43	43	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
—	110 mph	350S162	16	33	33	33	33	43	43	43	43	43	43	43	43
			24	43	43	43	43	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	43	43	43	43	43	43	43	43	43	43	43

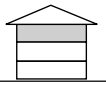
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(3)
24-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
50 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
—	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33

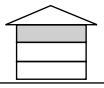
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(4)
28-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	110 mph	350S162	16	33	33	33	33	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43

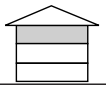
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(5)
28-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
50 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	33
—	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	43

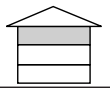
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(6)
32-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	43	43	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	43	43
—	110 mph	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	43

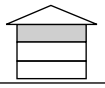
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(7)
32-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
50 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43

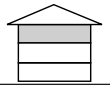
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(8)
36-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	33	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	33	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	43	43	43	43	43	43	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
—	110 mph	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43
			24	43	43	54	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	43	43	43	54

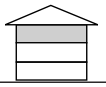
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(9)
36-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
50 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	33	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	33	54	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	110 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43

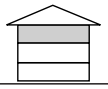
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(10)
40-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54
90 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	43	43	54	33	43	43	54	43	43	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	33	43	43	54	43	43	43	54	43	43	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	54	68	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	54	33	33	43	54
—	110 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54
			24	43	43	54	68	54	54	54	68	68	68	68	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	43	54

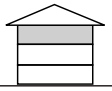
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(11)
40-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a,b,c]
50 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	54	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	43	43
—	110 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	43	43	43	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(12)
24-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	33	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	33	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	43	43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	43	43
			24	43	43	43	43	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
—	110 mph	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(13)
24-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	33
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
—	110 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	43	43
			24	43	43	43	43	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(14)
28-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	43
—	100 mph	350S162	16	33	33	33	43	33	33	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	43	43	43	43	43	43	43	43
—	110 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54
			24	43	43	54	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(15)
28-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	100 mph	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	43	43	43	54	43	43	43	43	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
—	110 mph	350S162	16	33	33	33	43	33	33	33	33	43	43	43	43
			24	43	43	43	54	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(16)
32-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	33	43	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	33	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	33	43	43
110 mph	90 mph	350S162	16	33	33	43	43	33	33	33	43	43	43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	43	43	43	54
—	100 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	43
			24	43	43	54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	43	43	43	43	43	43	43	54
—	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	54	54
			24	54	54	54	68	54	54	54	68	68	68	68	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	43	43	43	43	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(17)
32-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	33	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	43	43
—	110 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	33	43	33	33	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(18)
36-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	43	43	33	33	43	43	33	33	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
90 mph	—	350S162	16	33	33	43	43	33	33	43	43	33	33	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
100 mph	85 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	43
			24	43	43	54	68	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
110 mph	90 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	68	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
—	100 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	54	54	68	54	68	68	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
—	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	54	54	54
			24	54	54	54	68	54	54	54	68	68	68	68	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(19)
36-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	33	33	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	33	33	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
—	110 mph	350S162	16	33	33	43	43	33	33	33	43	43	43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(20)
40-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	68	43	43	54	68	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	54
90 mph	—	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	68	43	43	54	68	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	54
100 mph	85 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	68	43	43	54	68	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	54
110 mph	90 mph	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54
			24	43	43	54	68	54	54	54	68	54	54	68	68
		550S162	16	33	33	43	43	33	33	33	43	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	54
—	100 mph	350S162	16	43	43	43	54	43	43	43	54	43	43	54	54
			24	54	54	54	68	54	54	54	68	68	68	68	97
		550S162	16	33	33	43	43	33	33	33	43	33	33	43	43
			24	43	43	54	54	43	43	43	54	43	43	54	54
—	110 mph	350S162	16	43	43	43	54	43	43	43	54	54	54	54	54
			24	54	54	54	68	54	54	68	68	68	68	68	97
		550S162	16	33	33	43	43	33	33	33	43	33	33	43	43
			24	43	43	54	54	43	43	43	54	43	43	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(21)
40-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	33	43	43	54	33	33	43	43	33	33	43	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	43	43	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	33	43	43	54	33	33	43	43	33	33	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	54	54	43	43	43	54	43	43	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	33	43	43	54	33	33	43	43	33	33	43	43
110 mph	90 mph	350S162	16	33	33	43	43	33	33	33	43	33	33	43	43
			24	43	43	54	54	43	43	43	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	33	43	43
—	100 mph	350S162	16	33	33	43	43	33	33	33	43	43	43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	43	43	43
—	110 mph	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	68	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	43	43	43	54

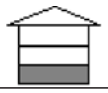
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second floor dead load is 10 psf.
Second floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(22)
24-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
90 mph	—	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
100 mph	85 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
110 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	68	68
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
—	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
—	110 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	54	54	68	54	54	68	68	68	68	68	97
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(23)
24-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	54	54	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43
90 mph	—	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	54	54	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43
100 mph	85 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	54	54	43	43	43	43	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43
110 mph	90 mph	350S162	16	33	33	33	43	33	33	33	33	33	33	43	43
			24	43	43	54	54	43	43	43	43	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43
—	100 mph	350S162	16	33	33	33	43	33	33	33	33	43	43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43
—	110 mph	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43

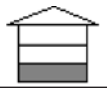
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(24)
28-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
33 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
90 mph	—	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
100 mph	85 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
110 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	54	54
			24	54	54	54	68	54	54	68	68	68	68	68	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	110 mph	350S162	16	43	43	43	43	43	43	43	43	54	54	54	54
			24	54	68	68	68	68	68	68	68	68	68	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(25)
28-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43
90 mph	—	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43
100 mph	85 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43
110 mph	90 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43
—	100 mph	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43
—	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	68	68	68	68
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	33
			24	43	43	43	54	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(26)
32-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
90 mph	—	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
100 mph	85 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
110 mph	90 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	54	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
—	100 mph	350S162	16	43	43	43	54	43	43	43	43	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
—	110 mph	350S162	16	43	43	43	54	43	43	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	97	97	97	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54

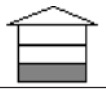
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(27)
32-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
50 ksi STEEL



WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54
90 mph	—	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54
100 mph	85 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54
110 mph	90 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54
—	100 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	68	68	68	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54
—	110 mph	350S162	16	43	43	43	43	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	54	54	54	68	68	68	68
		550S162	16	43	43	43	43	33	33	33	43	33	33	43	43
			24	54	54	54	54	43	43	43	54	43	43	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(28)
36-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	97	68	68	68	68	68	68	68	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68
90 mph	—	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	97	68	68	68	68	68	68	68	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68
100 mph	85 mph	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	97	68	68	68	68	68	68	68	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68
110 mph	90 mph	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	97	68	68	68	68	68	68	97	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68
—	100 mph	350S162	16	54	54	54	54	43	43	54	54	54	54	54	54
			24	68	68	68	97	68	68	68	68	97	97	97	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68
—	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	68
			24	68	68	68	97	68	68	68	97	97	97	97	97
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	54	54	68	68

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(29)
36-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
90 mph	—	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
100 mph	85 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
110 mph	90 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	100 mph	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	110 mph	350S162	16	43	43	43	54	43	43	43	43	43	54	54	54
			24	68	68	68	68	54	54	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(30)
40-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
90 mph	—	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
100 mph	85 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
110 mph	90 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
—	100 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	97	97	97	97	68	68	68	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
—	110 mph	350S162	16	54	54	54	54	54	54	54	54	54	54	68	68
			24	97	97	97	97	68	68	97	97	97	97	97	97
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2(31)
40-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a,b,c]
50 ksi STEEL

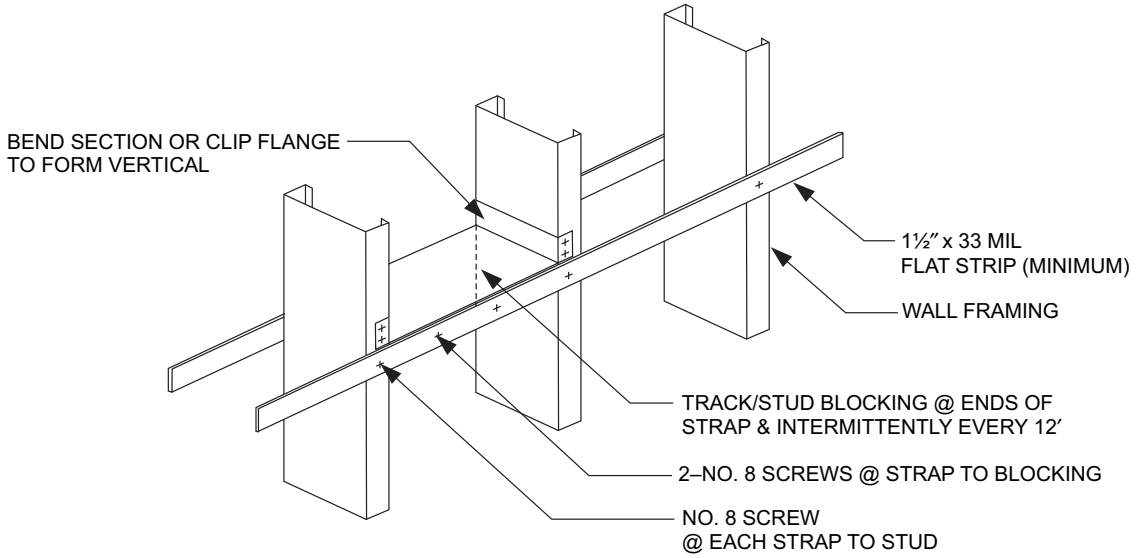
WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-Foot Studs				9-Foot Studs				10-Foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
85 mph	—	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
90 mph	—	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
100 mph	85 mph	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
110 mph	90 mph	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
—	100 mph	350S162	16	54	54	54	54	43	43	43	43	43	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54
—	110 mph	350S162	16	54	54	54	54	43	43	43	43	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	97
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	68	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 1000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

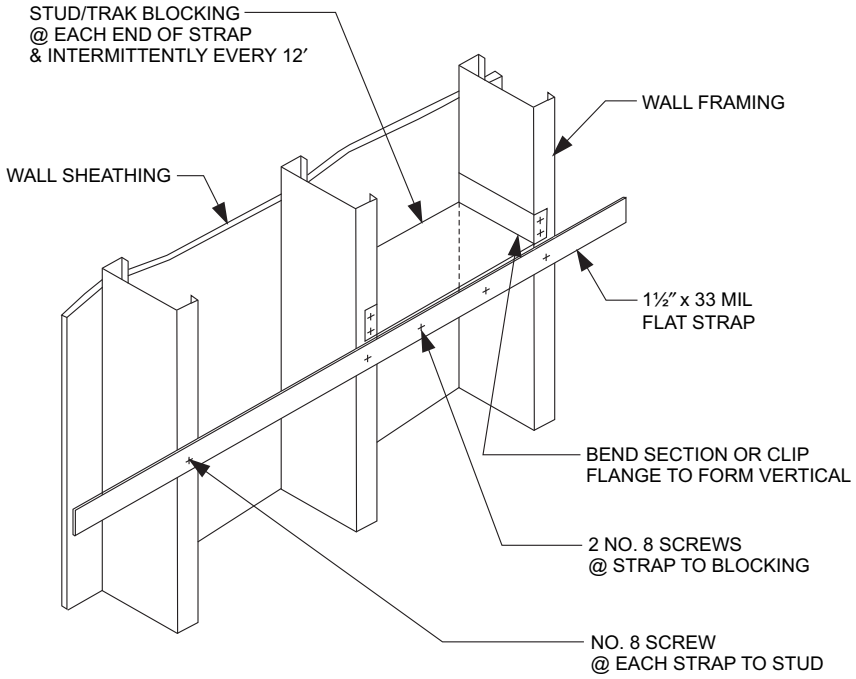
b. Design load assumptions:
Top and middle floor dead load is 10 psf.
Top floor live load is 30 psf.
Middle floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.



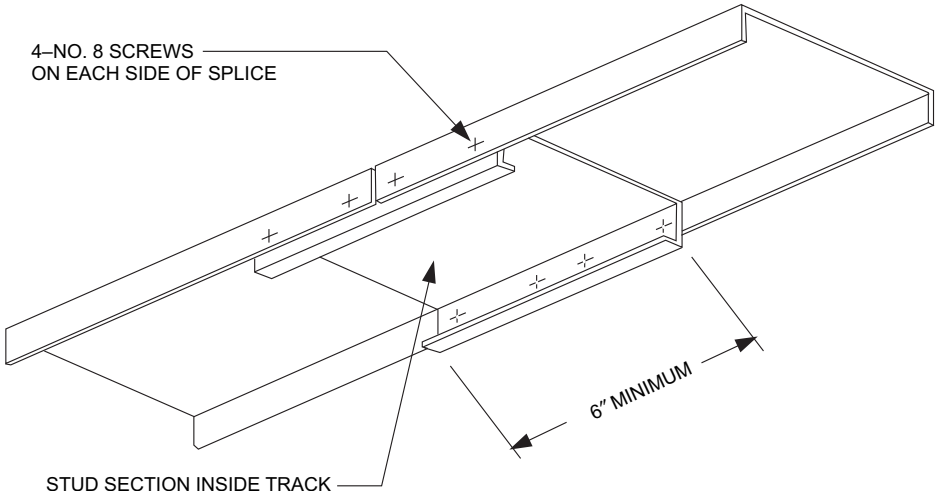
For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm.

FIGURE R603.3.3(1)
STUD BRACING WITH STRAPPING ONLY



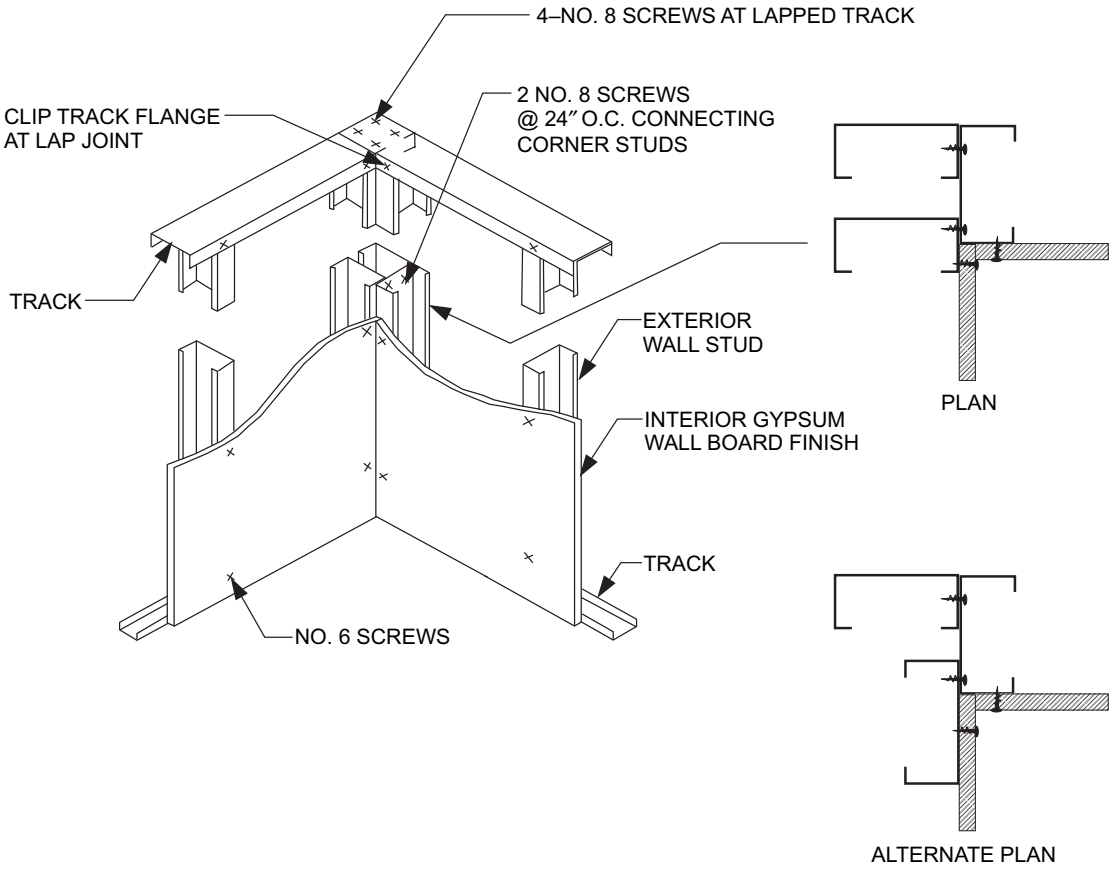
For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm.

FIGURE R603.3.3(2)
STUD BRACING WITH STRAPPING AND SHEATHING MATERIAL



For SI: 1 inch = 25.4 mm.

FIGURE R603.3.5
TRACK SPLICE



For SI: 1 inch = 25.4 mm.

FIGURE R603.4
CORNER FRAMING

TABLE R603.3.2.1(1)
ALL BUILDING WIDTHS
GABLE ENDWALLS 8, 9 OR 10 FEET IN HEIGHT[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (Mils)		
Exp. B	Exp. C			8-foot studs	9-foot studs	10-foot studs
85 mph	—	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
90 mph	—	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
100 mph	85 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
110 mph	90 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
—	100 mph	350S162	16	33	33	43
			24	43	43	54
		550S162	16	33	33	33
			24	33	33	33
—	110 mph	350S162	16	33	43	43
			24	43	54	54
		550S162	16	33	33	33
			24	33	33	43

For SI: 1 inch = 25.4, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 6.895 MPa.

a. Deflection criterion *L*/240.

b. Design load assumptions:
Ground snow load is 70 psf.
Roof and ceiling dead load is 12 psf.
Floor dead load is 10 psf.
Floor live load is 40 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2.1(2)
ALL BUILDING WIDTHS
GABLE ENDWALLS 8, 9 OR 10 FEET IN HEIGHT[a,b,c]
50 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (Mils)		
Exp. B	Exp. C			8-foot studs	9-foot studs	10-foot studs
85 mph	—	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
90 mph	—	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
100 mph	85 mph	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
110 mph	90 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
—	100 mph	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
—	110 mph	350S162	16	33	33	33
			24	33	43	54
		550S162	16	33	33	33
			24	33	33	33

For SI: 1 inch = 25.4, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 6.895 MPa.

a. Deflection criterion *L*/240.

b. Design load assumptions:
Ground snow load is 70 psf.
Roof and ceiling dead load is 12 psf.
Floor dead load is 10 psf.
Floor live load is 40 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2.1(3)
ALL BUILDING WIDTHS
GABLE ENDWALLS OVER 10 FEET IN HEIGHT[a,b,c]
33 ksi STEEL

WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (Mils)					
				Stud Height, h (feet)					
Exp. B	Exp. C			10 < h ≤ 12	12 < h ≤ 14	14 < h ≤ 16	16 < h ≤ 18	18 < h ≤ 20	20 < h ≤ 22
85 mph	—	350S162	16	33	43	54	97	—	—
			24	43	54	97	—	—	—
		550S162	16	33	33	33	43	43	54
			24	33	33	43	54	68	97
90 mph	—	350S162	16	33	43	68	97	—	—
			24	43	68	97	—	—	—
		550S162	16	33	33	33	43	54	54
			24	33	33	43	54	68	97
100 mph	85 mph	350S162	16	43	54	97	—	—	—
			24	54	97	—	—	—	—
		550S162	16	33	33	43	54	54	68
			24	33	43	54	68	97	97
110 mph	90 mph	350S162	16	43	68	—	—	—	—
			24	68	—	—	—	—	—
		550S162	16	33	43	43	54	68	97
			24	43	54	68	97	97	—
—	100 mph	350S162	16	54	97	—	—	—	—
			24	97	—	—	—	—	—
		550S162	16	33	43	54	68	97	—
			24	43	68	97	97	—	—
—	110 mph	350S162	16	68	97	—	—	—	—
			24	97	—	—	—	—	—
		550S162	16	43	54	68	97	97	—
			24	54	68	97	—	—	—

For SI: 1 inch = 25.4, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 6.895 MPa.

a. Deflection criterion *L*/240.

b. Design load assumptions:
Ground snow load is 70 psf.
Roof and ceiling dead load is 12 psf.
Floor dead load is 10 psf.
Floor live load is 40 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

TABLE R603.3.2.1(4)
ALL BUILDING WIDTHS
GABLE ENDWALLS OVER 10 FEET IN HEIGHT[a,b,c]
50 ksi STEEL

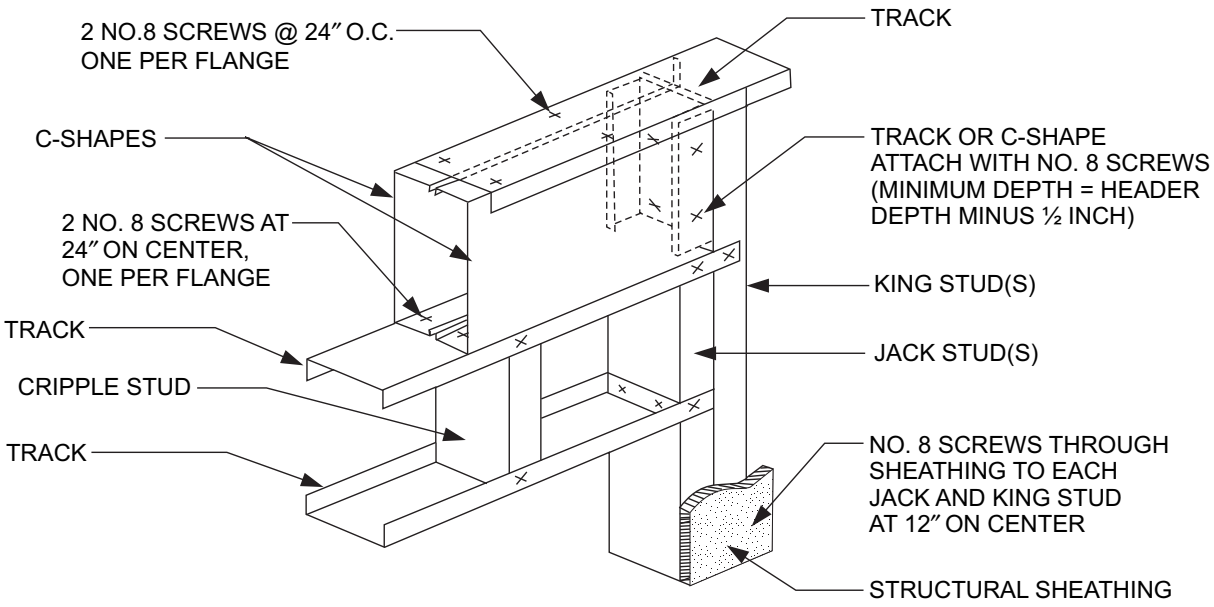
WIND SPEED		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (Mils)					
				Stud Height, h (feet)					
Exp. B	Exp. C			10 < h ≤ 12	12 < h ≤ 14	14 < h ≤ 16	16 < h ≤ 18	18 < h ≤ 20	20 < h ≤ 22
85 mph	—	350S162	16	33	43	54	97	—	—
			24	33	54	97	—	—	—
		550S162	16	33	33	33	33	43	54
			24	33	33	33	43	54	97
90 mph	—	350S162	16	33	43	68	97	—	—
			24	43	68	97	—	—	—
		550S162	16	33	33	33	33	43	54
			24	33	33	43	43	68	97
100 mph	85 mph	350S162	16	33	54	97	—	—	—
			24	54	97	—	—	—	—
		550S162	16	33	33	33	43	54	68
			24	33	33	43	54	97	97
110 mph	90 mph	350S162	16	43	68	—	—	—	—
			24	68	—	—	—	—	—
		550S162	16	33	33	43	43	68	97
			24	33	43	54	68	97	—
—	100 mph	350S162	16	54	97	—	—	—	—
			24	97	—	—	—	—	—
		550S162	16	33	33	43	54	97	—
			24	43	54	54	97	—	—
—	110 mph	350S162	16	54	97	—	—	—	—
			24	97	—	—	—	—	—
		550S162	16	33	43	54	68	97	—
			24	43	54	68	97	—	—

For SI: 1 inch = 25.4, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479kPa, 1 ksi = 6.895 MPa.

a. Deflection criterion *L*/240.

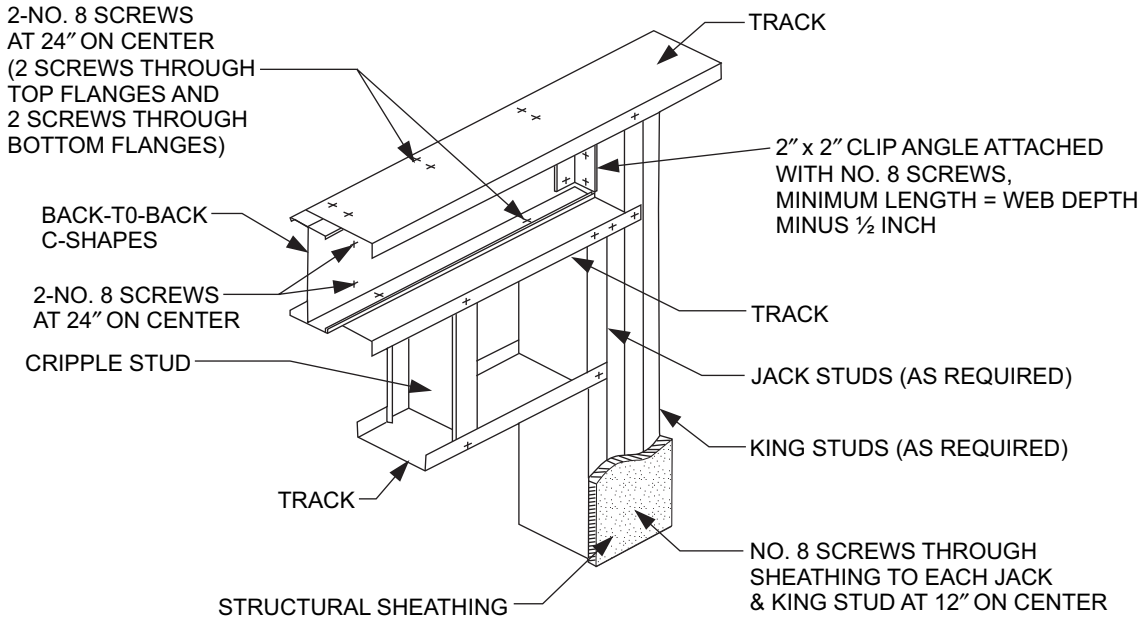
b. Design load assumptions:
Ground snow load is 70 psf.
Roof and ceiling dead load is 12 psf.
Floor dead load is 10 psf.
Floor live load is 40 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.



For SI: 1 inch = 25.4 mm.

FIGURE R603.6(1)
BOX BEAM HEADER



For SI: 1 inch = 25.4 mm.

FIGURE 603.6(2)
BACK-TO-BACK HEADER

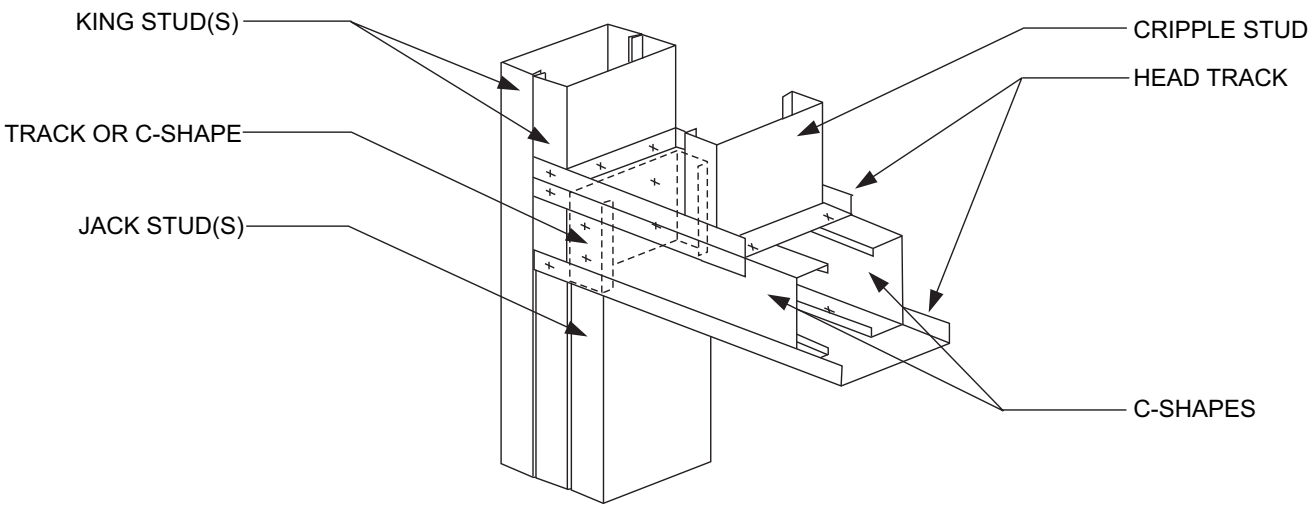
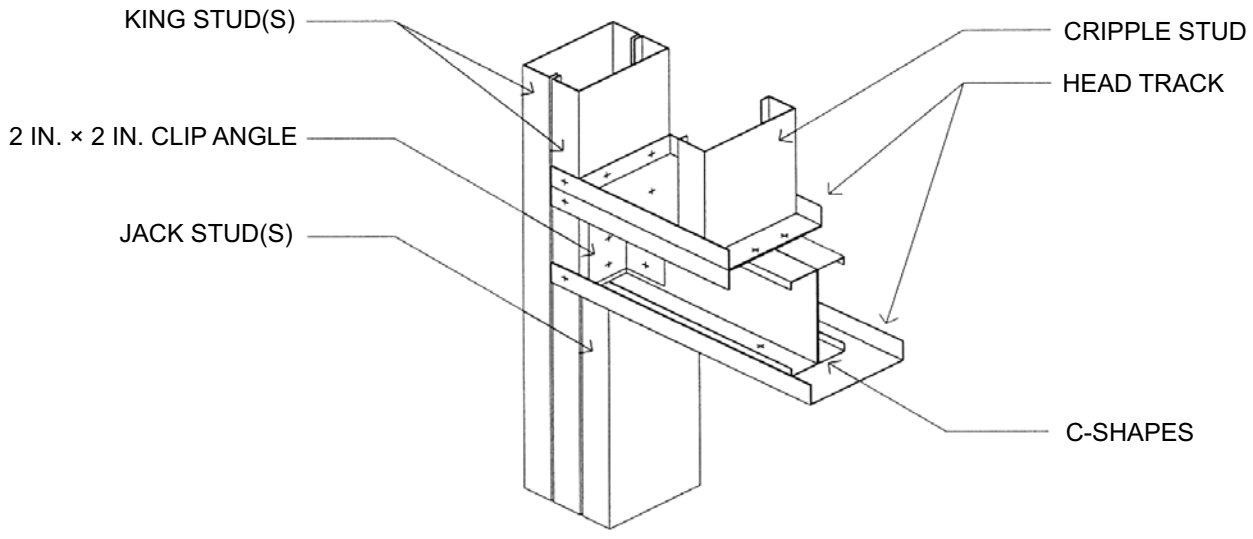


FIGURE R603.6.1(1)
BOX BEAM HEADER IN GABLE ENDWALL



For SI: 1 inch = 25.4 mm.

FIGURE R603.6.1(2)
BACK-TO-BACK HEADER IN GABLE ENDWALL

TABLE R603.6(1)
BOX-BEAM HEADER SPANS
Headers Supporting Roof and Ceiling Only (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	3′-3″	2′-8″	2′-2″	—	—	2′-8″	2′-2″	—	—	—
2-350S162-43	4′-2″	3′-9″	3′-4″	2′-11″	2′-7″	3′-9″	3′-4″	2′-11″	2′-7″	2′-2″
2-350S162-54	5′-0″	4′-6″	4′-1″	3′-8″	3′-4″	4′-6″	4′-1″	3′-8″	3′-3″	3′-0″
2-350S162-68	5′-7″	5′-1″	4′-7″	4′-3″	3′-10″	5′-1″	4′-7″	4′-2″	3′-10″	3′-5″
2-350S162-97	7′-1″	6′-6″	6′-1″	5′-8″	5′-3″	6′-7″	6′-1″	5′-7″	5′-3″	4′-11″
2-550S162-33	4′-8″	4′-0″	3′-6″	3′-0″	2′-6″	4′-1″	3′-6″	3′-0″	2′-6″	—
2-550S162-43	6′-0″	5′-4″	4′-10″	4′-4″	3′-11″	5′-5″	4′-10″	4′-4″	3′-10″	3′-5″
2-550S162-54	7′-0″	6′-4″	5′-9″	5′-4″	4′-10″	6′-5″	5′-9″	5′-3″	4′-10″	4′-5″
2-550S162-68	8′-0″	7′-4″	6′-9″	6′-3″	5′-10″	7′-5″	6′-9″	6′-3″	5′-9″	5′-4″
2-550S162-97	9′-11″	9′-2″	8′-6″	8′-0″	7′-6″	9′-3″	8′-6″	8′-0″	7′-5″	7′-0″
2-800S162-33	4′-5″	3′-11″	3′-5″	3′-1″	2′-10″	3′-11″	3′-6″	3′-1″	2′-9″	2′-3″
2-800S162-43	7′-3″	6′-7″	5′-11″	5′-4″	4′-10″	6′-7″	5′-11″	5′-4″	4′-9″	4′-3″
2-800S162-54	8′-10″	8′-0″	7′-4″	6′-9″	6′-2″	8′-1″	7′-4″	6′-8″	6′-1″	5′-7″
2-800S162-68	10′-5″	9′-7″	8′-10″	8′-2″	7′-7″	9′-8″	8′-10″	8′-1″	7′-6″	7′-0″
2-800S162-97	13′-1″	12′-1″	11′-3″	10′-7″	10′-0″	12′-2″	11′-4″	10′-6″	10′-0″	9′-4″
2-1000S162-43	7′-10″	6′-10″	6′-1″	5′-6″	5′-0″	6′-11″	6′-1″	5′-5″	4′-11″	4′-6″
2-1000S162-54	10′-0″	9′-1″	8′-3″	7′-7″	7′-0″	9′-2″	8′-4″	7′-7″	6′-11″	6′-4″
2-1000S162-68	11′-11″	10′-11″	10′-1″	9′-4″	8′-8″	11′-0″	10′-1″	9′-3″	8′-7″	8′-0″
2-1000S162-97	15′-3″	14′-3″	13′-5″	12′-6″	11′-10″	14′-4″	13′-5″	12′-6″	11′-9″	11′-0″
2-1200S162-54	11′-1″	10′-0″	9′-2″	8′-5″	7′-9″	10′-1″	9′-2″	8′-4″	7′-7″	7′-0″
2-1200S162-68	13′-3″	12′-1″	11′-2″	10′-4″	9′-7″	12′-3″	11′-2″	10′-3″	9′-6″	8′-10″
2-1200S162-97	16′-8″	15′-7″	14′-8″	13′-11″	13′-3″	15′-8″	14′-8″	13′-11″	13′-2″	12′-6″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/Ceiling dead load is 12 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header

TABLE R603.6(2)
BOX-BEAM HEADER SPANS
Headers Supporting Roof and Ceiling Only (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	4′-4″	3′-11″	3′-6″	3′-2″	2′-10″	3′-11″	3′-6″	3′-1″	2′-9″	2′-5″
2-350S162-43	5′-6″	5′-0″	4′-7″	4′-2″	3′-10″	5′-0″	4′-7″	4′-2″	3′-10″	3′-6″
2-350S162-54	6′-2″	5′-10″	5′-8″	5′-3″	4′-10″	5′-11″	5′-8″	5′-2″	4′-10″	4′-6″
2-350S162-68	6′-7″	6′-3″	6′-0″	5′-10″	5′-8″	6′-4″	6′-1″	5′-10″	5′-8″	5′-6″
2-350S162-97	7′-3″	6′-11″	6′-8″	6′-5″	6′-3″	7′-0″	6′-8″	6′-5″	6′-3″	6′-0″
2-550S162-33	6′-2″	5′-6″	5′-0″	4′-7″	4′-2″	5′-7″	5′-0″	4′-6″	4′-1″	3′-8″
2-550S162-43	7′-9″	7′-2″	6′-7″	6′-1″	5′-8″	7′-3″	6′-7″	6′-1″	5′-7″	5′-2″
2-550S162-54	8′-9″	8′-5″	8′-1″	7′-9″	7′-3″	8′-6″	8′-1″	7′-8″	7′-2″	6′-8″
2-550S162-68	9′-5″	9′-0″	8′-8″	8′-4″	8′-1″	9′-1″	8′-8″	8′-4″	8′-1″	7′-10″
2-550S162-97	10′-5″	10′-0″	9′-7″	9′-3″	9′-0″	10′-0″	9′-7″	9′-3″	8′-11″	8′-8″
2-800S162-33	4′-5″	3′-11″	3′-5″	3′-1″	2′-10″	3′-11″	3′-6″	3′-1″	2′-9″	2′-6″
2-800S162-43	9′-1″	8′-5″	7′-8″	6′-11″	6′-3″	8′-6″	7′-8″	6′-10″	6′-2″	5′-8″
2-800S162-54	10′-10″	10′-2″	9′-7″	9′-0″	8′-5″	10′-2″	9′-7″	8′-11″	8′-4″	7′-9″
2-800S162-68	12′-8″	11′-10″	11′-2″	10′-7″	10′-1″	11′-11″	11′-2″	10′-7″	10′-0″	9′-6″
2-800S162-97	14′-2″	13′-6″	13′-0″	12′-7″	12′-2″	13′-8″	13′-1″	12′-7″	12′-2″	11′-9″
2-1000S162-43	7′-10″	6′-10″	6′-1″	5′-6″	5′-0″	6′-11″	6′-1″	5′-5″	4′-11″	4′-6″
2-1000S162-54	12′-3″	11′-5″	10′-9″	10′-2″	9′-6″	11′-6″	10′-9″	10′-1″	9′-5″	8′-9″
2-1000S162-68	14′-5″	13′-5″	12′-8″	12′-0″	11′-6″	13′-6″	12′-8″	12′-0″	11′-5″	10′-10″
2-1000S162-97	17′-1″	16′-4″	15′-8″	14′-11″	14′-3″	16′-5″	15′-9″	14′-10″	14′-1″	13′-6″
2-1200S162-54	12′-11″	11′-3″	10′-0″	9′-0″	8′-2″	11′-5″	10′-0″	9′-0″	8′-1″	7′-4″
2-1200S162-68	15′-11″	14′-10″	14′-0″	13′-4″	12′-8″	15′-0″	14′-0″	13′-3″	12′-7″	11′-11″
2-1200S162-97	19′-11″	18′-7″	17′-6″	16′-8″	15′-10″	18′-9″	17′-7″	16′-7″	15′-9″	15′-0″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/Ceiling dead load is 12 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(3)
BOX-BEAM HEADER SPANS
Headers Supporting Roof and Ceiling Only (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	2′-4″	—	—	—	—	—	—	—	—	—
2-350S162-54	3′-1″	2′-8″	2′-3″	—	—	2′-1″	—	—	—	—
2-350S162-68	3′-7″	3′-2″	2′-8″	2′-3″	—	2′-6″	—	—	—	—
2-350S162-97	5′-1″	4′-7″	4′-3″	3′-11″	3′-7″	4′-1″	3′-8″	3′-4″	3′-0″	2′-8″
2-550S162-33	2′-2″	—	—	—	—	—	—	—	—	—
2-550S162-43	3′-8″	3′-1″	2′-6″	—	—	2′-3″	—	—	—	—
2-550S162-54	4′-7″	4′-0″	3′-6″	3′-0″	2′-6″	3′-3″	2′-8″	2′-1″	—	—
2-550S162-68	5′-6″	4′-11″	4′-5″	3′-11″	3′-6″	4′-3″	3′-8″	3′-1″	2′-7″	2′-1″
2-550S162-97	7′-3″	6′-7″	6′-1″	5′-8″	5′-3″	5′-11″	5′-4″	4′-11″	4′-6″	4′-1″
2-800S162-33	2′-7″	—	—	—	—	—	—	—	—	—
2-800S162-43	4′-6″	3′-9″	3′-1″	2′-5″	—	2′-10″	—	—	—	—
2-800S162-54	5′-10″	5′-1″	4′-6″	3′-11″	3′-4″	4′-3″	3′-6″	2′-9″	—	—
2-800S162-68	7′-2″	6′-6″	5′-10″	5′-3″	4′-8″	5′-7″	4′-10″	4′-2″	3′-7″	2′-11″
2-800S162-97	9′-7″	8′-9″	8′-2″	7′-7″	7′-0″	7′-11″	7′-2″	6′-7″	6′-0″	5′-7″
2-1000S162-43	4′-8″	4′-1″	3′-6″	2′-9″	—	3′-3″	2′-2″	—	—	—
2-1000S162-54	6′-7″	5′-10″	5′-1″	4′-5″	3′-9″	4′-10″	4′-0″	3′-2″	2′-3″	—
2-1000S162-68	8′-3″	7′-5″	6′-8″	6′-0″	5′-5″	6′-5″	5′-7″	4′-9″	4′-1″	3′-5″
2-1000S162-97	11′-4″	10′-5″	9′-8″	9′-0″	8′-5″	9′-5″	8′-6″	7′-10″	7′-2″	6′-7″
2-1200S162-54	7′-3″	6′-5″	5′-7″	4′-10″	4′-2″	5′-4″	4′-4″	3′-5″	2′-5″	—
2-1200S162-68	9′-2″	8′-2″	7′-5″	6′-8″	6′-0″	7′-1″	6′-2″	5′-4″	4′-6″	3′-9″
2-1200S162-97	12′-10″	11′-9″	10′-11″	10′-2″	9′-6″	10′-7″	9′-8″	8′-10″	8′-2″	7′-6″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/Ceiling dead load is 12 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(4)
BOX-BEAM HEADER SPANS
Headers Supporting Roof and Ceiling Only (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	2′-7″	2′-2″	—	—	—	—	—	—	—	—
2-350S162-43	3′-8″	3′-3″	2′-10″	2′-6″	2′-1″	2′-8″	2′-3″	—	—	—
2-350S162-54	4′-8″	4′-2″	3′-9″	3′-5″	3′-1″	3′-7″	3′-2″	2′-9″	2′-5″	2′-0″
2-350S162-68	5′-7″	5′-2″	4′-9″	4′-4″	3′-11″	4′-7″	4′-1″	3′-7″	3′-2″	2′-10″
2-350S162-97	6′-2″	5′-11″	5′-8″	5′-6″	5′-4″	5′-8″	5′-5″	5′-3″	4′-11″	4′-7″
2-550S162-33	3′-11″	3′-4″	2′-10″	2′-4″	—	2′-7″	—	—	—	—
2-550S162-43	5′-4″	4′-10″	4′-4″	3′-10″	3′-5″	4′-2″	3′-7″	3′-1″	2′-7″	2′-1″
2-550S162-54	6′-11″	6′-3″	5′-9″	5′-3″	4′-9″	5′-6″	4′-11″	4′-5″	3′-11″	3′-5″
2-550S162-68	8′-0″	7′-6″	6′-11″	6′-5″	5′-11″	6′-9″	6′-1″	5′-6″	5′-0″	4′-7″
2-550S162-97	8′-11″	8′-6″	8′-2″	7′-11″	7′-8″	8′-1″	7′-9″	7′-6″	7′-1″	6′-7″
2-800S162-33	2′-8″	2′-4″	2′-1″	1′-11″	1′-9″	2′-0″	1′-9″	—	—	—
2-800S162-43	5′-10″	5′-2″	4′-7″	4′-2″	3′-10″	4′-5″	3′-11″	3′-6″	3′-0″	2′-6″
2-800S162-54	8′-0″	7′-3″	6′-8″	6′-1″	5′-7″	6′-5″	5′-9″	5′-1″	4′-7″	4′-0″
2-800S162-68	9′-9″	9′-0″	8′-3″	7′-8″	7′-1″	8′-0″	7′-3″	6′-7″	6′-0″	5′-6″
2-800S162-97	12′-1″	11′-7″	11′-2″	10′-8″	10′-2″	11′-0″	10′-4″	9′-9″	9′-2″	8′-7″
2-1000S162-43	4′-8″	4′-1″	3′-8″	3′-4″	3′-0″	3′-6″	3′-1″	2′-9″	2′-6″	2′-3″
2-1000S162-54	9′-1″	8′-2″	7′-3″	6′-7″	6′-0″	7′-0″	6′-2″	5′-6″	5′-0″	4′-6″
2-1000S162-68	11′-1″	10′-2″	9′-5″	8′-8″	8′-1″	9′-1″	8′-3″	7′-6″	6′-10″	6′-3″
2-1000S162-97	13′-9″	12′-11″	12′-2″	11′-7″	11′-1″	11′-11″	11′-3″	10′-7″	9′-11″	9′-4″
2-1200S162-54	7′-8″	6′-9″	6′-1″	5′-6″	5′-0″	5′-10″	5′-1″	4′-7″	4′-1″	3′-9″
2-1200S162-68	12′-3″	11′-3″	10′-4″	9′-7″	8′-11″	10′-1″	9′-1″	8′-3″	7′-6″	6′-10″
2-1200S162-97	15′-4″	14′-5″	13′-7″	12′-11″	12′-4″	13′-4″	12′-6″	11′-10″	11′-1″	10′-5″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/Ceiling dead load is 12 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(5)
BOX-BEAM HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	2′-2″	—	—	—	—	2′-1″	—	—	—	—
2-350S162-54	2′-11″	2′-5″	—	—	—	2′-10″	2′-4″	—	—	—
2-350S162-68	3′-8″	3′-2″	2′-9″	2′-4″	—	3′-7″	3′-1″	2′-8″	2′-3″	—
2-350S162-97	4′-11″	4′-5″	4′-2″	3′-8″	3′-5″	4′-10″	4′-5″	4′-0″	3′-8″	3′-4″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	3′-5″	2′-9″	2′-1″	—	—	3′-3″	2′-7″	—	—	—
2-550S162-54	4′-4″	3′-9″	3′-2″	2′-7″	2′-1″	4′-3″	3′-7″	3′-1″	2′-6″	—
2-550S162-68	5′-3″	4′-8″	4′-1″	3′-7″	3′-2″	5′-2″	4′-7″	4′-0″	3′-6″	3′-1″
2-550S162-97	7′-0″	6′-5″	5′-10″	5′-5″	5′-0″	6′-11″	6′-4″	5′-9″	5′-4″	4′-11″
2-800S162-33	2′-1″	—	—	—	—	—	—	—	—	—
2-800S162-43	4′-2″	3′-4″	2′-7″	—	—	4′-0″	3′-3″	2′-5″	—	—
2-800S162-54	5′-6″	4′-9″	4′-1″	3′-5″	2′-9″	5′-5″	4′-8″	3′-11″	3′-3″	2′-8″
2-800S162-68	6′-11″	6′-2″	5′-5″	4′-10″	4′-3″	6′-9″	6′-0″	5′-4″	4′-8″	4′-1″
2-800S162-97	9′-4″	8′-6″	7′-10″	7′-3″	6′-8″	9′-2″	8′-4″	7′-8″	7′-1″	6′-7″
2-1000S162-43	4′-4″	3′-9″	2′-11″	—	—	4′-3″	3′-8″	2′-9″	—	—
2-1000S162-54	6′-3″	5′-5″	4′-7″	3′-11″	3′-2″	6′-1″	5′-3″	4′-6″	3′-9″	3′-0″
2-1000S162-68	7′-11″	7′-0″	6′-3″	5′-6″	4′-10″	7′-9″	6′-10″	6′-1″	5′-4″	4′-9″
2-1000S162-97	11′-0″	10′-1″	9′-3″	8′-7″	8′-0″	10′-11″	9′-11″	9′-2″	8′-5″	7′-10″
2-1200S162-54	6′-11″	5′-11″	5′-1″	4′-3″	3′-5″	6′-9″	5′-9″	4′-11″	4′-1″	3′-3″
2-1200S162-68	8′-9″	7′-9″	6′-11″	6′-1″	5′-4″	8′-7″	7′-7″	6′-9″	5′-11″	5′-3″
2-1200S162-97	12′-4″	11′-5″	10′-6″	9′-8″	9′-0″	12′-3″	11′-3″	10′-4″	9′-6″	8′-10″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/Ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic dead load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(6)
BOX-BEAM HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	2′-4″	—	—	—	—	2′-3″	—	—	—	—
2-350S162-43	3′-4″	2′-11″	2′-6″	2′-1″	—	3′-3″	2′-10″	2′-5″	2′-0″	—
2-350S162-54	4′-4″	3′-10″	3′-5″	3′-1″	2′-9″	4′-3″	2′-9″	3′-4″	3′-0″	2′-8″
2-350S162-68	5′-0″	4′-9″	4′-7″	4′-2″	3′-9″	4′-11″	4′-8″	4′-6″	4′-1″	3′-9″
2-350S162-97	5′-6″	5′-3″	5′-1″	4′-11″	2′-9″	5′-5″	5′-2″	5′-0″	4′-10″	4′-8″
2-550S162-33	3′-6″	2′-11″	2′-4″	—	—	3′-5″	2′-10″	2′-3″	—	—
2-550S162-43	5′-0″	4′-5″	3′-11″	3′-5″	3′-0″	4′-11″	4′-4″	3′-10″	3′-4″	2′-11″
2-550S162-54	6′-6″	5′-10″	5′-3″	4′-9″	4′-4″	6′-4″	5′-9″	5′-2″	4′-8″	4′-3″
2-550S162-68	7′-2″	6′-10″	6′-5″	5′-11″	5′-6″	7′-0″	6′-9″	6′-4″	5′-10″	5′-4″
2-550S162-97	7′-11″	7′-7″	7′-3″	7′-0″	6′-10″	7′-9″	7′-5″	7′-2″	6′-11″	6′-9″
2-800S162-33	2′-5″	2′-2″	1′-11″	1′-9″	—	2′-5″	2′-1″	1′-10″	1′-8″	—
2-800S162-43	5′-5″	4′-9″	4′-3″	3′-9″	3′-5″	5′-3″	4′-8″	4′-1″	3′-9″	3′-5″
2-800S162-54	7′-6″	6′-9″	6′-2″	5′-7″	5′-0″	7′-5″	6′-8″	6′-0″	5′-5″	4′-11″
2-800S162-68	9′-3″	8′-5″	7′-8″	7′-1″	6′-6″	9′-1″	8′-3″	7′-7″	7′-0″	6′-5″
2-800S162-97	10′-9″	10′-3″	9′-11″	9′-7″	9′-3″	10′-7″	10′-1″	9′-9″	9′-5″	9′-1″
2-1000S162-43	4′-4″	3′-9″	3′-4″	3′-0″	2′-9″	4′-3″	3′-8″	3′-3″	2′-11″	2′-8″
2-1000S162-54	8′-6″	7′-6″	6′-8″	6′-0″	5′-5″	8′-4″	7′-4″	6′-6″	5′-10″	5′-4″
2-1000S162-68	10′-6″	9′-7″	8′-9″	8′-0″	7′-5″	10′-4″	9′-5″	8′-7″	7′-11″	7′-3″
2-1000S162-97	12′-11″	12′-4″	11′-8″	11′-1″	10′-6″	12′-9″	12′-2″	11′-6″	10′-11″	10′-5″
2-1200S162-54	7′-1″	6′-2″	5′-6″	5′-0″	4′-6″	6′-11″	6′-1″	5′-5″	4′-10″	4′-5″
2-1200S162-68	11′-7″	10′-7″	9′-8″	8′-11″	8′-2″	11′-5″	10′-5″	9′-6″	8′-9″	8′-0″
2-1200S162-97	14′-9″	13′-9″	13′-0″	12′-4″	11′-9″	14′-7″	13′-8″	12′-10″	12′-3″	11′-8″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(7)
BOX-BEAM HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	—	—	—	—	—	—	—	—	—	—
2-350S162-68	2′-8″	2′-3″	—	—	—	—	—	—	—	—
2-350S162-97	4′-0″	3′-7″	3′-3″	2′-11″	2′-7″	3′-4″	2′-11″	2′-6″	2′-2″	—
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	2′-0″	—	—	—	—	—	—	—	—	—
2-550S162-54	3′-1″	2′-6″	—	—	—	—	—	—	—	—
2-550S162-68	4′-1″	3′-6″	2′-11″	2′-5″	—	3′-1″	2′-5″	—	—	—
2-550S162-97	5′-10″	5′-3″	4′-10″	4′-5″	4′-0″	4′-11″	4′-5″	3′-11″	3′-6″	3′-2″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	2′-6″	—	—	—	—	—	—	—	—	—
2-800S162-54	4′-0″	3′-3″	2′-6″	—	—	2′-8″	—	—	—	—
2-800S162-68	5′-5″	4′-8″	4′-0″	3′-4″	2′-8″	4′-2″	3′-4″	2′-6″	—	—
2-800S162-97	7′-9″	7′-1″	6′-6″	5′-11″	5′-5″	6′-7″	5′-11″	5′-4″	4′-10″	4′-4″
2-1000S162-43	2′-10″	—	—	—	—	—	—	—	—	—
2-1000S162-54	4′-7″	3′-8″	2′-9″	—	—	3′-0″	—	—	—	—
2-1000S162-68	6′-2″	5′-4″	4′-7″	3′-10″	3′-1″	4′-9″	3′-10″	2′-11″	—	—
2-1000S162-97	9′-3″	8′-5″	7′-8″	7′-1″	6′-6″	7′-10″	7′-1″	6′-5″	5′-9″	5′-2″
2-1200S162-54	5′-0″	4′-0″	3′-1″	—	—	3′-4″	—	—	—	—
2-1200S162-68	6′-10″	5′-11″	5′-0″	4′-3″	3′-5″	5′-3″	4′-3″	3′-2″	—	—
2-1200S162-97	10′-5″	9′-6″	8′-8″	8′-0″	7′-4″	8′-10″	8′-0″	7′-3″	6′-6″	5′-10″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header

TABLE R603.6(8)
BOX-BEAM HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	2′-8″	—	—	—	—	—	—	—	—	—
2-350S162-54	3′-5″	3′-0″	2′-7″	2′-2″	—	2′-8″	2′-2″	—	—	—
2-350S162-68	4′-6″	4′-1″	3′-8″	3′-3″	2′-11″	3′-9″	3′-3″	2′-10″	2′-5″	2′-1″
2-350S162-97	5′-1″	4′-10″	4′-8″	4′-6″	4′-5″	4′-10″	4′-7″	4′-4″	4′-0″	3′-8″
2-550S162-33	2′-4″	—	—	—	—	—	—	—	—	—
2-550S162-43	3′-10″	3′-4″	2′-9″	2′-3″	—	2′-11″	2′-3″	—	—	—
2-550S162-54	5′-3″	3′-8″	4′-1″	3′-8″	3′-2″	4′-3″	3′-8″	3′-1″	2′-7″	2′-0″
2-550S162-68	6′-5″	5′-10″	5′-3″	4′-9″	4′-4″	5′-5″	4′-9″	4′-3″	3′-9″	3′-4″
2-550S162-97	7′-4″	7′-0″	6′-9″	6′-6″	6′-4″	6′-11″	6′-8″	6′-3″	5′-10″	5′-5″
2-800S162-33	1′-11″	1′-8″	—	—	—	—	—	—	—	—
2-800S162-43	4′-2″	3′-8″	3′-4″	2′-9″	2′-2″	3′-5″	2′-9″	—	—	—
2-800S162-54	6′-1″	5′-5″	4′-10″	4′-3″	3′-9″	4′-11″	4′-3″	3′-8″	3′-0″	2′-5″
2-800S162-68	7′-8″	6′-11″	6′-3″	5′-9″	5′-2″	6′-5″	5′-9″	5′-1″	4′-6″	4′-0″
2-800S162-97	9′-11″	9′-6″	9′-2″	8′-10″	8′-3″	9′-5″	8′-10″	8′-2″	7′-7″	7′-0″
2-1000S162-43	3′-4″	2′-11″	2′-7″	2′-5″	2′-2″	2′-8″	2′-5″	2′-2″	—	—
2-1000S162-54	6′-7″	5′-10″	5′-3″	4′-9″	4′-3″	5′-4″	4′-9″	4′-1″	3′-5″	2′-9″
2-1000S162-68	8′-8″	7′-10″	7′-2″	6′-6″	5′-11″	7′-4″	6′-6″	5′-9″	5′-1″	4′-6″
2-1000S162-97	11′-7″	10′-11″	10′-3″	9′-7″	9′-0″	10′-5″	9′-7″	8′-10″	8′-2″	7′-8″
2-1200S162-54	5′-6″	4′-10″	4′-4″	3′-11²	3′-7″	4′-5″	3′-11″	3′-6″	3′-2″	2′-11″
2-1200S162-68	9′-7″	8′-8″	7′-11″	7′-2″	6′-6″	8′-1″	7′-2″	6′-4″	5′-8″	5′-0″
2-1200S162-97	12′-11″	12′-2″	11′-6″	10′-8″	10′-0″	11′-8″	10′-9″	9′-11″	9′-2″	8′-6″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header

TABLE R603.6(9)
BOX-BEAM HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (33 ksi steel)[a]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	—	—	—	—	—	—	—	—	—	—
2-350S162-68	—	—	—	—	—	—	—	—	—	—
2-350S162-97	3′-1″	2′-8″	2′-3″	—	—	3′-1″	2′-7″	2′-2″	—	—
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	—	—	—	—	—	—	—	—	—	—
2-550S162-54	—	—	—	—	—	—	—	—	—	—
2-550S162-68	2′-9″	—	—	—	—	2′-8″	—	—	—	—
2-550S162-97	4′-8″	4′-1″	3′-7″	3′-2″	2′-9″	4′-7″	4′-0″	3′-6″	3′-1″	2′-8″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	—	—	—	—	—	—	—	—	—	—
2-800S162-54	2′-1″	—	—	—	—	—	—	—	—	—
2-800S162-68	3′-8″	2′-9″	—	—	—	3′-7″	2′-8″	—	—	—
2-800S162-97	6′-3″	5′-6″	4′-11″	4′-4″	3′-9″	6′-2″	5′-5″	4′-10″	4′-3″	3′-9″
2-1000S162-43	—	—	—	—	—	—	—	—	—	—
2-1000S162-54	2′-5″	—	—	—	—	2′-3″	—	—	—	—
2-1000S162-68	4′-3″	3′-2″	2′-0″	—	—	4′-2″	3′-1″	—	—	—
2-1000S162-97	7′-5″	6′-7″	5′-10″	5′-2″	4′-7″	7′-4″	6′-6″	5′-9″	5′-1″	4′-6″
2-1200S162-54	2′-7″	—	—	—	—	2′-6″	—	—	—	—
2-1200S162-68	4′-8″	3′-6″	2′-2″	—	—	4′-7″	3′-5″	2′-0″	—	—
2-1200S162-97	8′-5″	7′-5″	6′-7″	5′-10″	5′-2″	8′-3″	7′-4″	6′-6″	5′-9″	5′-1″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(10)
BOX-BEAM HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	2′-5″	—	—	—	—	2′-4″	—	—	—	—
2-350S162-68	3′-6″	3′-0″	2′-6″	2′-1″	—	3′-5″	2′-11″	2′-6″	2′-0″	—
2-350S162-97	4′-9″	4′-6″	4′-1″	3′-8″	3′-4″	4′-8″	4′-5″	4′-0″	3′-8″	3′-4″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	2′-7″	—	—	—	—	2′-6″	—	—	—	—
2-550S162-54	3′-11″	3′-3″	2′-8″	2′-0″	—	3′-10″	3′-3″	2′-7″	—	—
2-550S162-68	5′-1″	4′-5″	3′-10″	3′-3″	2′-9″	5′-0″	4′-4″	3′-9″	3′-3″	2′-9″
2-550S162-97	6′-10″	6′-5″	5′-10″	5′-5″	4′-11″	6′-9″	6′-4″	5′-10″	5′-4″	4′-11″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	3′-1″	2′-3″	—	—	—	3′-0″	2′-2″	—	—	—
2-800S162-54	4′-7″	3′-10″	3′-1″	2′-5″	—	4′-6″	3′-9″	3′-0″	2′-4″	—
2-800S162-68	6′-0″	5′-3″	4′-7″	3′-11″	3′-4″	6′-0″	5′-2″	4′-6″	3′-11″	3′-3″
2-800S162-97	9′-2″	8′-4″	7′-8″	7′-0″	6′-6″	9′-1″	8′-3″	7′-7″	7′-0″	6′-5″
2-1000S162-43	2′-6″	2′-2″	—	—	—	2′-6″	2′-2″	—	—	—
2-1000S162-54	5′-0″	4′-4″	3′-6″	2′-9″	—	4′-11″	4′-3″	3′-5″	2′-7″	—
2-1000S162-68	6′-10″	6′-0″	5′-3″	4′-6″	3′-10″	6′-9″	5′-11″	5′-2″	4′-5″	3′-9″
2-1000S162-97	10′-0″	9′-1″	8′-3″	7′-8″	7′-0″	9′-10″	9′-0″	8′-3″	7′-7″	7′-0″
2-1200S162-54	4′-2″	3′-7″	3′-3″	2′-11″	—	4′-1″	3′-7″	3′-2″	2′-10″	—
2-1200S162-68	7′-7″	6′-7″	5′-9″	5′-0″	4′-2″	7′-6″	6′-6″	5′-8″	4′-10″	4′-1″
2-1200S162-97	11′-2″	10′-1″	9′-3″	8′-6″	7′-10″	11′-0″	10′-0″	9′-2″	9′-2″	7′-9″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(11)
BOX-BEAM HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	—	—	—	—	—	—	—	—	—	—
2-350S162-68	—	—	—	—	—	—	—	—	—	—
2-350S162-97	2′-11″	2′-5″	2′-0″	—	—	2′-7″	2′-2″	—	—	—
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	—	—	—	—	—	—	—	—	—	—
2-550S162-54	—	—	—	—	—	—	—	—	—	—
2-550S162-68	2′-5″	—	—	—	—	—	—	—	—	—
2-550S162-97	4′-4″	3′-10″	3′-4″	2′-10″	2′-5″	4′-0″	3′-6″	3′-1″	2′-7″	2′-2″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	—	—	—	—	—	—	—	—	—	—
2-800S162-54	—	—	—	—	—	—	—	—	—	—
2-800S162-68	3′-3″	2′-3″	—	—	—	2′-8″	—	—	—	—
2-800S162-97	5′-11″	5′-2″	4′-6″	4′-0″	3′-5″	5′-6″	4′-10″	4′-3″	3′-8″	3′-2″
2-1000S162-43	—	—	—	—	—	—	—	—	—	—
2-1000S162-54	—	—	—	—	—	—	—	—	—	—
2-1000S162-68	3′-9″	2′-7″	—	—	—	3′-1″	—	—	—	—
2-1000S162-97	7′-0″	6′-2″	5′-5″	4′-9″	4′-2″	6′-6″	5′-9″	5′-1″	4′-5″	3′-10″
2-1200S162-54	—	—	—	—	—	—	—	—	—	—
2-1200S162-68	4′-2″	2′-10″	—	—	—	3′-5″	2′-0″	—	—	—
2-1200S162-97	7′-11″	7′-0″	6′-2″	5′-5″	4′-8″	7′-4″	6′-6″	5′-9″	5′-0″	4′-4″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(12)
BOX-BEAM HEADER SPANS[a,b,c]
Headers Supporting Two Floors, Roof and Ceiling (50 ksi steel)[a,b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	2′-2″	—	—	—	—	—	—	—	—	—
2-350S162-68	3′-3″	2′-9″	2′-3″	—	—	2′-11″	2′-5″	—	—	—
2-350S162-97	4′-6″	4′-3″	3′-10″	3′-6″	3′-2″	4′-3″	4′-0″	3′-7″	3′-3″	3′-0″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	2′-3″	—	—	—	—	—	—	—	—	—
2-550S162-54	3′-7″	2′-11″	2′-3″	—	—	3′-3″	2′-7″	—	—	—
2-550S162-68	4′-9″	2′-1″	3′-6″	3′-0″	2′-5″	4′-4″	3′-9″	3′-2″	2′-8″	2′-1″
2-550S162-97	6′-5″	6′-1″	5′-7″	5′-1″	4′-8″	6′-3″	5′-10″	5′-4″	4′-10″	4′-5″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	2′-8″	—	—	—	—	2′-2″	—	—	—	—
2-800S162-54	4′-3″	3′-5″	2′-8″	—	—	3′-9″	3′-0″	2′-3″	—	—
2-800S162-68	5′-8″	4′-11″	4′-2″	3′-7″	2′-11″	5′-3″	4′-6″	3′-10″	3′-3″	2′-7″
2-800S162-97	8′-9″	8′-0″	7′-3″	6′-8″	6′-2″	8′-4″	7′-7″	6′-11″	6′-4″	5′-10″
2-1000S162-43	2′-4″	2′-0″	—	—	—	2′-2″	—	—	—	—
2-1000S162-54	4′-8″	3′-11″	3′-1″	2′-2″	—	4′-3″	3′-5″	2′-7″	—	—
2-1000S162-68	6′-5″	5′-7″	4′-9″	4′-1″	3′-4″	5′-11″	5′-1″	4′-5″	3′-8″	2′-11″
2-1000S162-97	9′-6″	8′-8″	7′-11″	7′-3″	6′-8″	9′-0″	8′-3″	7′-6″	6′-11″	6′-4″
2-1200S162-54	3′-11″	3′-5″	3′-0″	2′-4″	—	3′-7″	3′-2″	2′-10″	—	—
2-1200S162-68	7′-1″	6′-2″	5′-3″	4′-6″	3′-8″	6′-6″	5′-8″	4′-10″	4′-0″	3′-3″
2-1200S162-97	10′-8″	9′-8″	8′-10″	8′-1″	7′-5″	10′-1″	9′-2″	8′-5″	7′-9″	7′-1″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(13)
BACK-TO-BACK HEADER SPANS
Headers Supporting Roof and Ceiling Only (33 ksi steel)[a,b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	2′-11″	2′-4″	—	—	—	2′-5″	—	—	—	—
2-350S162-43	4′-8″	3′-10″	3′-5″	3′-1″	2′-9″	3′-11″	3′-5″	3′-0″	2′-8″	2′-4″
2-350S162-54	5′-3″	4′-9″	4′-4″	4′-1″	3′-8″	4′-10″	4′-4″	4′-0″	3′-8″	3′-4″
2-350S162-68	6′-1″	5′-7″	5′-2″	4′-10″	4′-6″	5′-8″	5′-3″	4′-10″	4′-6″	4′-2″
2-350S162-97	7′-3″	6′-10″	6′-5″	6′-0″	5′-8″	6′-11″	6′-5″	6′-0″	5′-8″	5′-4″
2-550S162-33	4′-5″	3′-9″	3′-1″	2′-6″	—	3′-9″	3′-2″	2′-6″	—	—
2-550S162-43	6′-2″	5′-7″	5′-0″	4′-7″	4′-2″	5′-7″	5′-0″	4′-6″	4′-1″	3′-8″
2-550S162-54	7′-5″	6′-9″	6′-3″	5′-9″	5′-4″	6′-10″	6′-3″	5′-9″	5′-4″	4′-11″
2-550S162-68	6′-7″	7′-11″	7′-4″	6′-10″	6′-5″	8′-0″	7′-4″	6′-10″	6′-5″	6′-0″
2-550S162-97	10′-5″	9′-8″	9′-0″	8′-6″	8′-0″	9′-9″	9′-0″	8′-6″	8′-0″	7′-7″
2-800S162-33	4′-5″	3′-11″	3′-5″	3′-1″	2′-4″	3′-11″	3′-6″	3′-0″	2′-3″	—
2-800S162-43	7′-7″	6′-10″	6′-2″	5′-8″	5′-2″	6′-11″	6′-2″	5′-7″	5′-1″	4′-7″
2-800S162-54	9′-3″	8′-7″	7′-11″	7′-4″	6′-10″	8′-8″	7′-11″	7′-4″	6′-9″	6′-3″
2-800S162-68	10′-7″	9′-10″	9′-4″	8′-10″	8′-5″	9′-11″	9′-4″	8′-10″	8′-4″	7′-11″
2-800S162-97	13′-9″	12′-9″	12′-0″	11′-3″	10′-8″	12′-10″	12′-0″	11′-3″	10′-7″	10′-0″
2-1000S162-43	7′-10″	6′-10″	6′-1″	5′-6″	5′-0″	6′-11″	6′-1″	5′-5″	4′-11″	4′-6″
2-1000S162-54	10′-5″	9′-9″	9′-0″	8′-4″	7′-9″	9′-10″	9′-0″	8′-4″	7′-9″	7′-2″
2-1000S162-68	12′-1″	11′-3″	10′-8″	10′-1″	9′-7″	11′-4″	10′-8″	10′-1″	9′-7″	9′-1″
2-1000S162-97	15′-3″	14′-3″	13′-5″	12′-9″	12′-2″	14′-4″	13′-5″	12′-8″	12′-1″	11′-6″
2-1200S162-54	11′-6″	10′-9″	10′-0″	9′-0″	8′-2″	10′-10″	10′-0″	9′-0″	8′-1″	7′-4″
2-1200S162-68	13′-4″	12′-6″	11′-9″	11′-2″	10′-8″	12′-7″	11′-10″	11′-2″	10′-7″	10′-1″
2-1200S162-97	16′-8″	15′-7″	14′-8″	13′-11″	13′-3″	15′-8″	14′-8″	13′-11″	13′-2″	12′-7″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by header.

TABLE R603.6(14)
BACK-TO-BACK HEADER SPANS
Headers Supporting Roof and Ceiling Only (50 ksi steel)[a,b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	4′-2″	3′-8″	3′-3″	2′-10″	2′-6″	3′-8″	3′-3″	2′-10″	2′-5″	2′-1″
2-350S162-43	5′-5″	5′-0″	4′-6″	4′-2″	3′-10″	5′-0″	4′-7″	4′-2″	3′-10″	3′-6″
2-350S162-54	6′-2″	5′-10″	5′-8″	5′-4″	5′-0″	5′-11″	5′-8″	5′-4″	5′-0″	4′-8″
2-350S162-68	6′-7″	6′-3″	6′-0″	5′-10″	5′-8″	6′-4″	6′-1″	5′-10″	5′-8″	5′-6″
2-350S162-97	7′-3″	6′-11″	6′-8″	6′-5″	6′-3″	7′-0″	6′-8″	6′-5″	6′-3″	6′-0″
2-550S162-33	5′-10″	5′-3″	4′-8″	4′-3″	3′-9″	5′-3″	4′-9″	4′-2″	3′-9″	3′-3″
2-550S162-43	7′-9″	7′-2″	6′-7″	6′-1″	5′-8″	7′-3″	6′-7″	6′-1″	5′-8″	5′-3″
2-550S162-54	8′-9″	8′-5″	8′-1″	7′-9″	7′-5″	8′-6″	8′-1″	7′-9″	7′-5″	6′-11″
2-550S162-68	9′-5″	9′-0″	8′-8″	8′-4″	8′-1″	9′-1″	8′-8″	8′-4″	8′-1″	7′-10″
2-550S162-97	10′-5″	10′-0″	9′-7″	9′-3″	9′-0″	10′-0″	9′-7″	9′-3″	8′-11″	8′-8″
2-800S162-33	4′-5″	3′-11″	3′-5″	3′-1″	2′-10″	3′-11″	3′-6″	3′-1″	2′-9″	2′-6″
2-800S162-43	9′-1″	8′-5″	7′-8″	6′-11″	6′-3″	8′-6″	7′-8″	6′-10″	6′-2″	5′-8″
2-800S162-54	10′-10″	10′-2″	9′-7″	9′-1″	8′-8″	10′-2″	9′-7″	9′-0″	8′-7″	8′-1″
2-800S162-68	12′-8″	11′-10″	11′-2″	10′-7″	10′-1″	11′-11″	11′-2″	10′-7″	10′-0″	9′-7″
2-800S162-97	14′-2″	13′-6″	13′-0″	12′-7″	12′-2″	13′-8″	13′-1″	12′-7″	12′-2″	11′-9″
2-1000S162-43	7′-10″	6′-10″	6′-1″	5′-6″	5′-0″	6′-11″	6′-1″	5′-5″	4′-11″	4′-6″
2-1000S162-54	12′-3″	11′-5″	10′-9″	10′-3″	9′-9″	11′-6″	10′-9″	10′-2″	9′-8″	8′-11″
2-1000S162-68	14′-5″	13′-5″	12′-8″	12′-0″	11′-6″	13′-6″	12′-8″	12′-0″	11′-5″	10′-11″
2-1000S162-97	17′-1″	16′-4″	15′-8″	14′-11″	14′-3″	16′-5″	15′-9″	14′-10″	14′-1″	13′-6″
2-1200S162-54	12′-11″	11′-3″	10′-0″	9′-0″	8′-2″	11′-5″	10′-0″	9′-0″	8′-1″	7′-4″
2-1200S162-68	15′-11″	14′-10″	14′-0″	13′-4″	12′-8″	15′-0″	14′-0″	13′-3″	12′-7″	12′-0″
2-1200S162-97	19′-11″	18′-7″	17′-6″	16′-8″	15′-10″	18′-9″	17′-7″	16′-7″	15′-9″	15′-0″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header

TABLE R603.6(15)
BACK-TO-BACK HEADER SPANS
Headers Supporting Roof and Ceiling Only (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	2′-6″	—	—	—	—	—	—	—	—	—
2-350S162-54	3′-6″	3′-1″	2′-8″	2′-4″	2′-0″	2′-7″	2′-1″	—	—	—
2-350S162-68	4′-4″	3′-11″	3′-7″	3′-3″	2′-11″	3′-5″	3′-0″	2′-8″	2′-4″	2′-1″
2-350S162-97	5′-5″	5′-0″	4′-8″	4′-6″	4′-1″	4′-6″	4′-2″	3′-10″	3′-6″	3′-3″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	3′-10″	3′-3″	2′-9″	2′-2″	—	2′-6″	—	—	—	—
2-550S162-54	5′-1″	4′-7″	4′-1″	3′-8″	3′-4″	3′-11″	3′-5″	2′-11″	2′-6″	2′-0″
2-550S162-68	6′-2″	5′-8″	5′-2″	4′-9″	4′-5″	5′-0″	4′-6″	4′-1″	3′-9″	3′-4″
2-550S162-97	7′-9″	7′-2″	6′-8″	6′-3″	5′-11″	6′-6″	6′-0″	5′-7″	5′-2″	4′-10″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	4′-10″	4′-1″	3′-6″	2′-11″	2′-3″	3′-3″	2′-5″	—	—	—
2-800S162-54	6′-6″	5′-10″	5′-3″	4′-9″	4′-4″	5′-1″	4′-6″	3′-11″	3′-4″	2′-10″
2-800S162-68	8′-1″	7′-5″	6′-10″	6′-4″	5′-11″	6′-8″	6′-1″	5′-6″	5′-0″	4′-7″
2-800S162-97	10′-3″	9′-7″	8′-11″	8′-5″	7′-11″	8′-8″	8′-0″	7′-6″	7′-0″	6′-7″
2-1000S162-43	4′-8″	4′-1″	3′-8″	3′-4″	2′-8″	3′-6″	2′-10″	—	—	—
2-1000S162-54	7′-5″	6′-8″	6′-1″	5′-6″	5′-0″	5′-10″	5′-1″	4′-6″	3′-11″	3′-4″
2-1000S162-68	9′-4″	8′-7″	7′-11″	7′-4″	6′-10″	7′-8″	7′-0″	6′-4″	5′-10″	5′-4″
2-1000S162-97	11′-9″	11′-0″	10′-5″	9′-11″	9′-5″	10′-3″	9′-7″	8′-11″	8′-4″	7′-10″
2-1200S162-54	7′-8″	6′-9″	6′-1″	5′-6″	5′-0″	5′-10″	5′-1″	4′-7″	4′-1″	3′-9″
2-1200S162-68	10′-4″	9′-6″	8′-10″	8′-2″	7′-7″	8′-7″	7′-9″	7′-1″	6′-6″	6′-0″
2-1200S162-97	12′-10″	12′-1″	11′-5″	10′-10″	10′-4″	11′-2″	10′-6″	9′-11″	9′-5″	9′-0″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header

TABLE R603.6(16)
BACK-TO-BACK HEADER SPANS
Headers Supporting Roof and Ceiling Only (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	2′-3″	—	—	—	—	—	—	—	—	—
2-350S162-43	3′-8″	3′-3″	2′-10″	2′-6″	2′-2″	2′-8″	2′-3″	—	—	—
2-350S162-54	4′-9″	4′-4″	4′-0″	3′-8″	3′-8″	3′-10″	3′-5″	3′-1″	2′-9″	2′-5″
2-350S162-68	5′-7″	5′-4″	5′-2″	4′-11″	4′-7″	5′-1″	4′-8″	4′-3″	3′-11″	3′-8″
2-350S162-97	6′-2″	5′-11″	5′-8″	5′-6″	5′-4″	5′-8″	5′-5″	5′-3″	5′-0″	4′-11″
2-550S162-33	3′-6″	2′-10″	2′-3″	—	—	2′-0″	—	—	—	—
2-550S162-43	5′-5″	4′-10″	4′-4″	3′-11″	3′-6″	4′-2″	3′-8″	3′-2″	2′-8″	2′-3″
2-550S162-54	7′-2″	6′-6″	6′-0″	5′-7″	5′-2″	5′-10″	5′-3″	4′-10″	4′-5″	4′-0″
2-550S162-68	8′-0″	7′-8″	7′-3″	6′-11″	6′-6″	7′-2″	6′-7″	6′-1″	5′-8″	5′-4″
2-550S162-97	8′-11″	8′-6″	8′-2″	7′-11″	7′-8″	8′-1″	7′-9″	7′-6″	7′-2″	6′-11″
2-800S162-33	2′-8″	2′-4″	2′-1″	1′-11″	—	2′-0″	—	—	—	—
2-800S162-43	5′-10″	5′-2″	4′-7″	4′-2″	3′-10″	4′-5″	3′-11″	3′-6″	3′-2″	2′-9″
2-800S162-54	8′-4″	7′-8″	7′-1″	6′-7″	6′-1″	6′-10″	6′-3″	5′-8″	5′-2″	4′-9″
2-800S162-68	9′-9″	9′-2″	8′-8″	8′-3″	7′-10″	8′-6″	7′-11″	7′-4″	6′-10″	6′-5″
2-800S162-97	12′-1″	11′-7″	11′-2″	10′-8″	10′-2″	11′-0″	10′-4″	9′-9″	9′-3″	8′-10″
2-1000S162-43	4′-8″	4′-1″	2′-8″	3′-4″	3′-0″	3′-6″	10′-1″	2′-9″	2′-6″	2′-3″
2-1000S162-54	9′-3″	8′-2″	7′-3″	6′-7″	6′-0″	7′-0″	6′-2″	5′-6″	5′-0″	4′-6″
2-1000S162-68	11′-1″	10′-5″	9′-10″	9′-4″	8′-11″	9′-8″	9′-1″	8′-5″	7′-10″	7′-4″
2-1000S162-97	13′-9″	12′-11″	12′-2″	11′-7″	11′-1″	11′-11″	11′-3″	10′-7″	10′-1″	9′-7″
2-1200S162-54	7′-8″	6′-9″	6′-1″	5′-6″	5′-0″	5′-10″	5′-1″	4′-7″	4′-1″	3′-9″
2-1200S162-68	12′-3″	11′-6″	10′-11″	10′-4″	9′-11″	10′-8″	10′-0″	9′-2″	8′-4″	7′-7″
2-1200S162-97	15′-4″	14′-5″	13′-7″	12′-11″	12′-4″	13′-4″	12′-6″	11′-10″	11′-3″	10′-9″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(17)
BACK-TO-BACK HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	2′-2″	—	—	—	—	2′-1″	—	—	—	—
2-350S162-54	3′-3″	2′-9″	2′-5″	2′-0″	—	3′-2″	2′-9″	2′-4″	—	—
2-350S162-68	4′-4″	3′-8″	3′-3″	2′-11″	2′-8″	4′-0″	3′-7″	3′-2″	2′-11″	2′-7″
2-350S162-97	5′-2″	4′-9″	4′-4″	4′-1″	3′-9″	5′-1″	4′-8″	4′-4″	4′-0″	3′-9″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	3′-6″	2′-10″	2′-3″	—	—	3′-5″	2′-9″	2′-2″	—	—
2-550S162-54	4′-9″	4′-2″	3′-9″	3′-3″	2′-10″	4′-8″	4′-1″	3′-8″	3′-2″	2′-9″
2-550S162-68	5′-10″	5′-3″	4′-10″	4′-5″	4′-1″	5′-9″	5′-3″	4′-9″	4′-4″	4′-0″
2-550S162-97	7′-4″	6′-9″	6′-4″	5′-11″	5′-6″	7′-3″	6′-9″	6′-3″	5′-10″	5′-5″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	4′-4″	3′-8″	2′-11″	2′-3″	—	4′-3″	3′-6″	2′-10″	2′-1″	—
2-800S162-54	6′-1″	5′-5″	4′-10″	4′-4″	3′-10″	6′-0″	5′-4″	4′-9″	4′-3″	3′-9″
2-800S162-68	7′-8″	7′-0″	6′-5″	5′-11″	5′-5″	7′-7″	6′-11″	6′-4″	5′-10″	5′-4″
2-800S162-97	9′-10″	9′-1″	8′-5″	7′-11″	7′-5″	9′-8″	8′-11″	8′-4″	7′-10″	7′-4″
2-1000S162-43	4′-4″	3′-9″	3′-4″	2′-8″	—	4′-3″	3′-8″	3′-3″	2′-6″	—
2-1000S162-54	6′-11″	6′-2″	5′-6″	5′-0″	4′-5″	6′-10″	6′-1″	5′-5″	4′-10″	4′-4″
2-1000S162-68	8′-10″	8′-1″	7′-5″	6′-10″	6′-4″	8′-8″	7′-11″	7′-3″	6′-8″	6′-2″
2-1000S162-97	11′-3″	10′-7″	9′-11″	9′-5″	8′-10″	11′-2″	10′-5″	9′-10″	9′-3″	8′-9″
2-1200S162-54	7′-1″	6′-2″	5′-6″	5′-0″	4′-6″	6′-11″	6′-1″	5′-5″	4′-10″	4′-5″
2-1200S162-68	9′-10″	9′-0″	8′-3″	7′-7″	7′-0″	9′-8″	8′-10″	8′-1[11]	7′-6″	6′-11″
2-1200S162-97	12′-4″	11′-7″	10′-11″	10′-4″	9′-10″	12′-3″	11′-5″	10′-9″	10′-3″	9′-9″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header

TABLE R603.6(18)
BACK-TO-BACK HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	3′-4″	2′-11″	2′-6″	2′-2″	—	3′-3″	2′-10″	2′-5″	2′-1″	—
2-350S162-54	4′-6″	4′-1″	3′-8″	3′-4″	3′-0″	4′-5″	4′-0″	3′-7″	3′-3″	2′-11″
2-350S162-68	5′-0″	4′-9″	4′-7″	4′-5″	4′-3″	4′-11″	4′-8″	4′-6″	4′-4″	4′-2″
2-350S162-97	5′-6″	5′-3″	5′-1″	4′-11″	4′-9″	5′-5″	5′-2″	5′-0″	4′-10″	4′-8″
2-550S162-33	3′-1″	2′-5″	—	—	—	3′-0″	2′-3″	—	—	—
2-550S162-43	5′-1″	4′-6″	4′-0″	3′-6″	3′-1″	4′-11″	4′-5″	3′-11″	3′-5″	3′-0″
2-550S162-54	6′-8″	6′-2″	5′-7″	5′-2″	4′-9″	6′-6″	6′-0″	5′-6″	5′-1″	4′-8″
2-550S162-68	7′-2″	6′-10″	6′-7″	6′-4″	6′-1″	7′-0″	6′-9″	6′-6″	6′-3″	6′-0″
2-550S162-97	7′-11″	7′-7″	7′-3″	7′-0″	6′-10″	7′-9″	7′-5″	7′-2″	6′-11″	6′-9″
2-800S162-33	2′-5″	2′-2″	1′-11″	—	—	2′-5″	2′-1″	1′-10″	—	—
2-800S162-43	5′-5″	4′-9″	4′-3″	3′-9″	3′-5″	5′-3″	4′-8″	4′-1″	3′-9″	3′-5″
2-800S162-54	7′-11″	7′-2″	6′-7″	6′-1″	5′-7″	7′-9″	7′-1″	6′-6″	6′-0″	5′-6″
2-800S162-68	9′-5″	8′-9″	8′-3″	7′-9″	7′-4″	9′-3″	8′-8″	8′-2″	7′-8″	7′-3″
2-800S162-97	10′-9″	10′-3″	9′-11″	9′-7″	9′-3″	10′-7″	10′-1″	9′-9″	9′-5″	9′-1″
2-1000S162-43	4′-4″	3′-9″	3′-4″	3′-0″	2′-9″	4′-3″	3′-8″	3′-3″	2′-11″	2′-8″
2-1000S162-54	8′-6″	7′-5″	6′-8″	6′-0″	5′-5″	8′-4″	7′-4″	6′-6″	5′-10″	5′-4″
2-1000S162-68	10′-8″	10′-0″	9′-5″	8′-11″	8′-4″	10′-7″	9′-10″	9′-4″	8′-9″	8′-3″
2-1000S162-97	12′-11″	12′-4″	11′-8″	11′-1″	10′-6″	12′-9″	12′-2″	11′-6″	10′-11″	10′-5″
2-1200S162-54	7′-1″	6′-2″	5′-6″	5′-0″	4′-6″	6′-11″	6′-1″	5′-5″	4′-10″	4′-5″
2-1200S162-68	11′-9″	11′-0″	10′-5″	9′-10″	9′-1″	11′-8″	10′-11″	10′-3″	9′-9″	8′-11″
2-1200S162-97	14′-9″	13′-9″	13′-0″	12′-4″	11′-9″	14′-7″	13′-8″	12′-10″	12′-3″	11′-8″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(19)
BACK-TO-BACK HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	2′-4″	—	—	—	—	—	—	—	—	—
2-350S162-68	3′-3″	2′-10″	2′-6″	2′-2″	—	2′-7″	2′-2″	—	—	—
2-350S162-97	4′-4″	4′-0″	3′-8″	3′-4″	3′-1″	3′-9″	3′-4″	3′-1″	2′-9″	2′-6″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	2′-2″	—	—	—	—	—	—	—	—	—
2-550S162-54	3′-8″	3′-2″	2′-8″	2′-3″	—	2′-10″	2′-3″	—	—	—
2-550S162-68	4′-9″	4′-4″	3′-11″	3′-6″	3′-2″	4′-0″	3′-6″	3′-1″	2′-9″	2′-4″
2-550S162-97	6′-3″	5′-9″	5′-4″	5′-0″	4′-8″	5′-6″	5′-0″	4′-7″	4′-3″	3′-11″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	2′-11″	2′-0″	—	—	—	—	—	—	—	—
2-800S162-54	4′-9″	4′-2″	3′-7″	3′-1″	2′-7″	3′-9″	3′-1″	2′-5″	—	—
2-800S162-68	6′-4″	5′-9″	5′-3″	4′-9″	4′-4″	5′-4″	4′-9″	4′-3″	3′-10″	3′-4″
2-800S162-97	8′-5″	7′-9″	7′-3″	6′-9″	6′-4″	7′-4″	6′-9″	6′-3″	5′-10″	5′-5″
2-1000S162-43	3′-4″	2′-5″	—	—	—	—	—	—	—	—
2-1000S162-54	5′-6″	4′-10″	4′-2″	3′-7″	3′-0″	4′-4″	3′-7″	2′-11″	2′-2″	—
2-1000S162-68	7′-4″	6′-8″	6′-1″	5′-7″	5′-1″	6′-3″	5′-7″	5′-0″	4′-5″	4′-0″
2-1000S162-97	9′-11″	8′-3″	8′-7″	8′-1″	7′-7″	8′-9″	8′-1″	7′-6″	7′-0″	6′-6″
2-1200S162-54	5′-6″	4′-10″	4′-4″	3′-11″	3′-5″	4′-5″	3′-11″	3′-3″	2′-6″	—
2-1200S162-68	8′-2″	7′-5″	6′-9″	6′-3″	5′-8″	6′-11″	6′-3″	5′-7″	5′-0″	4′-6″
2-1200S162-97	10′-10″	10′-2″	9′-8″	9′-2″	8′-7″	9′-9″	9′-2″	8′-6″	7′-11″	7′-5″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(20)
BACK-TO-BACK HEADER SPANS
Headers Supporting One Floor, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	2′-6″	2′-0″	—	—	—	—	—	—	—	—
2-350S162-54	3′-8″	3′-3″	2′-11″	2′-7″	2′-3″	3′-0″	2′-7″	2′-2″	—	—
2-350S162-68	4′-7″	4′-5″	4′-1″	3′-9″	3′-6″	4′-2″	3′-9″	3′-5″	3′-1″	2′-10″
2-350S162-97	5′-1″	4′-10″	4′-8″	4′-6″	4′-5″	4′-10″	4′-7″	4′-5″	4′-3″	4′-1″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	3′-11″	3′-5″	2′-11″	2′-5″	—	3′-0″	2′-5″	—	—	—
2-550S162-54	5′-7″	5′-0″	4′-7″	4′-2″	3′-9″	4′-8″	4′-2″	3′-8″	3′-3″	2′-11″
2-550S162-68	6′-7″	6′-4″	5′-11″	5′-6″	5′-1″	6′-0″	5′-6″	5′-0″	4′-7″	4′-3″
2-550S162-97	7′-4″	7′-0″	6′-9″	6′-6″	6′-4″	6′-11″	6′-8″	6′-5″	6′-2″	6′-0″
2-800S162-33	1′-11″	—	—	—	—	—	—	—	—	—
2-800S162-43	4′-2″	3′-8″	3′-4″	3′-0″	2′-6″	3′-5″	3′-0″	2′-4″	—	—
2-800S162-54	6′-7″	5′-11″	5′-5″	4′-11″	4′-6″	5′-6″	4′-11″	4′-5″	3′-11″	3′-6″
2-800S162-68	8′-3″	7′-8″	7′-1″	6′-8″	6′-2″	7′-3″	6′-7″	6′-1″	5′-7″	5′-2″
2-800S162-97	9′-11″	9′-6″	9′-2″	8′-10″	8′-7″	9′-5″	9′-0″	8′-7″	8′-2″	7′-9″
2-1000S162-43	3′-4″	2′-11″	2′-7″	2′-5″	2′-2″	2′-8″	2′-5″	2′-2″	1′-11″	—
2-1000S162-54	6′-7″	5′-10″	5′-3″	4′-9″	4′-4″	5′-4″	4′-9″	4′-3″	3′-10″	3′-6″
2-1000S162-68	9′-4″	8′-9″	8′-1″	7′-7″	7′-1″	8′-3″	7′-7″	6′-11″	6′-5″	5′-11″
2-1000S162-97	11′-7″	10′-11″	10′-4″	9′-10″	9′-5″	10′-5″	9′-10″	9′-3″	8′-10″	8′-5″
2-1200S162-54	5′-6″	4′-10″	4′-4″	3′-11″	3′-7″	4′-5″	3′-11″	3′-6″	3′-2″	2′-11″
2-1200S162-68	10′-4″	9′-8″	8′-8″	7′-11″	7′-2″	8′-11″	7′-11″	7′-1″	6′-5″	5′-10″
2-1200S162-97	12′-11″	12′-2″	11′-6″	11′-0″	10′-6″	11′-8″	11′-0″	10′-5″	9′-10″	9′-5″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(21)
BACK-TO-BACK HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	—	—	—	—	—	—	—	—	—	—
2-350S162-68	2′-5″	—	—	—	—	2′-4″	—	—	—	—
2-350S162-97	3′-6″	3′-2″	2′-10″	2′-6″	2′-3″	3′-6″	3′-1″	2′-9″	2′-6″	2′-3″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	—	—	—	—	—	—	—	—	—	—
2-550S162-54	2′-6″	—	—	—	—	2′-5″	—	—	—	—
2-550S162-68	3′-9″	3′-3″	2′-9″	2′-4″	—	3′-8″	3′-2″	2′-9″	2′-4″	—
2-550S162-97	5′-3″	4′-9″	4′-4″	3′-11″	3′-8″	5′-2″	4′-8″	4′-3″	3′-11″	3′-7″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	—	—	—	—	—	—	—	—	—	—
2-800S162-54	3′-5″	2′-8″	—	—	—	3′-4″	2′-7″	—	—	—
2-800S162-68	5′-1″	4′-5″	3′-11″	3′-4″	2′-11″	5′-0″	4′-4″	3′-10″	3′-4″	2′-10″
2-800S162-97	7′-0″	6′-5″	5′-11″	5′-5″	5′-0″	7′-0″	6′-4″	5′-10″	5′-5″	5′-0″
2-1000S162-43	—	—	—	—	—	—	—	—	—	—
2-1000S162-54	3′-11″	3′-1″	2′-3″	—	—	3′-10″	3′-0″	2′-2″	—	—
2-1000S162-68	5′-10″	5′-2″	4′-6″	4′-0″	3′-5″	5′-9″	5′-1″	4′-6″	3′-11″	3′-4″
2-1000S162-97	8′-5″	7′-8″	7′-1″	6′-6″	6′-1″	8′-4″	7′-7″	7′-0″	6′-6″	6′-0″
2-1200S162-54	4′-2″	3′-6″	2′-7″	—	—	4′-1″	3′-5″	2′-6″	—	—
2-1200S162-68	6′-6″	5′-9″	5′-1″	4′-6″	3′-11″	6′-6″	5′-8″	5′-0″	4′-5″	3′-10″
2-1200S162-97	9′-5″	8′-8″	8′-0″	7′-5″	6′-11″	9′-5″	8′-7″	7′-11″	7′-4″	6′-10″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(22)
BACK-TO-BACK HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (20 psf)					GROUND SNOW LOAD (30 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	2′-9″	2′-3″	—	—	—	2′-8″	2′-3″	—	—	—
2-350S162-68	3′-11″	3′-6″	3′-2″	2′-10″	2′-6″	3′-11″	3′-6″	3′-1″	2′-9″	2′-6″
2-350S162-97	4′-9″	4′-6″	4′-4″	4′-1″	3′-10″	4′-8″	4′-6″	4′-4″	4′-1″	3′-9″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	2′-9″	2′-0″	—	—	—	2′-8″	—	—	—	—
2-550S162-54	4′-5″	3′-10″	3′-4″	2′-11″	2′-5″	4′-4″	3′-9″	3′-3″	2′-10″	2′-5″
2-550S162-68	5′-8″	5′-2″	4′-8″	4′-3″	3′-11″	5′-8″	5′-1″	4′-8″	4′-3″	3′-10″
2-550S162-97	6′-10″	6′-6″	6′-3″	6′-0″	5′-7″	6′-9″	6′-5″	6′-3″	5′-11″	5′-6″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	3′-2″	2′-7″	—	—	—	3′-1″	2′-6″	—	—	—
2-800S162-54	5′-2″	4′-7″	4′-0″	3′-6″	3′-0″	5′-2″	4′-6″	3′-11″	3′-5″	2′-11″
2-800S162-68	6′-11″	6′-3″	5′-8″	5′-2″	4′-9″	6′-10″	6′-2″	5′-7″	5′-2″	4′-8″
2-800S162-97	9′-3″	8′-8″	8′-3″	7′-9″	7′-4″	9′-2″	8′-8″	8′-2″	7′-9″	7′-4″
2-1000S162-43	2′-6″	2′-2″	2′-0″	—	—	2′-6″	2′-2″	1′-11″	—	—
2-1000S162-54	5′-0″	4′-4″	3′-11″	3′-6″	3′-2″	4′-11″	4′-4″	3′-10″	3′-6″	3′-2″
2-1000S162-68	7′-10″	7′-2″	6′-6″	5′-11″	5′-6″	7′-9″	7′-1″	6′-5″	5′-11″	5′-5″
2-1000S162-97	10′-1″	9′-5″	8′-11″	8′-6″	8′-0″	10′-0″	9′-5″	8′-10″	8′-5″	7′-11″
2-1200S162-54	—	—	—	—	—	—	—	—	—	—
2-1200S162-68	7′-4″	6′-8″	6′-1″	5′-6″	5′-1″	7′-3″	6′-7″	6′-0″	5′-6″	5′-0″
2-1200S162-97	9′-5″	8′-8″	8′-1″	7′-6″	7′-1″	9′-4″	8′-8″	8′-0″	7′-6″	7′-0″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(23)
BACK-TO-BACK HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (33 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	—	—	—	—	—	—	—	—	—	—
2-350S162-68	2′-2″	—	—	—	—	—	—	—	—	—
2-350S162-97	3′-3″	3′-0″	2′-8″	2′-4″	2′-1″	3′-1″	2′-9″	2′-6″	2′-2″	—
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	—	—	—	—	—	—	—	—	—	—
2-550S162-54	2′-2″	—	—	—	—	—	—	—	—	—
2-550S162-68	3′-6″	3′-0″	2′-6″	2′-1″	—	3′-2″	2′-9″	2′-3″	—	—
2-550S162-97	5′-0″	4′-6″	4′-1″	3′-9″	3′-5″	4′-8″	4′-3″	3′-11″	3′-7″	3′-3″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	—	—	—	—	—	—	—	—	—	—
2-800S162-54	3′-0″	2′-3″	—	—	—	2′-7″	—	—	—	—
2-800S162-68	4′-9″	4′-2″	3′-7″	3′-1″	2′-7″	4′-5″	3′-10″	3′-3″	2′-9″	2′-3″
2-800S162-97	6′-9″	6′-1″	5′-7″	5′-2″	4′-9″	6′-4″	5′-10″	5′-4″	4′-11″	4′-7″
2-1000S162-43	—	—	—	—	—	—	—	—	—	—
2-1000S162-54	3′-6″	2′-8″	—	—	—	3′-1″	2′-2″	—	—	—
2-1000S162-68	5′-6″	4′-10″	4′-2″	3′-7″	3′-1″	5′-1″	4′-6″	3′-10″	3′-4″	2′-9″
2-1000S162-97	8′-0″	7′-4″	6′-9″	6′-3″	5′-9″	7′-7″	7′-0″	6′-5″	5′-11″	5′-6″
2-1200S162-54	3′-11″	3′-0″	2′-0″	—	—	3′-5″	2′-6″	—	—	—
2-1200S162-68	6′-2″	5′-5″	4′-9″	4′-1″	3′-6″	5′-9″	5′-0″	4′-4″	3′-9″	3′-2″
2-1200S162-97	9′-1″	8′-4″	7′-8″	7′-1″	6′-7″	8′-8″	7′-11″	7′-4″	6′-9″	6′-3″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.6(24)
BACK-TO-BACK HEADER SPANS
Headers Supporting Two Floors, Roof and Ceiling (50 ksi steel)[a, b]

MEMBER DESIGNATION	GROUND SNOW LOAD (50 psf)					GROUND SNOW LOAD (70 psf)				
	Building width[c] (feet)					Building width[c] (feet)				
	24	28	32	36	40	24	28	32	36	40
2-350S162-33	—	—	—	—	—	—	—	—	—	—
2-350S162-43	—	—	—	—	—	—	—	—	—	—
2-350S162-54	2′-6″	2′-1″	—	—	—	2′-3″	—	—	—	—
2-350S162-68	3′-9″	3′-4″	2′-11″	2′-7″	2′-4″	3′-6″	3′-1″	2′-9″	2′-5″	2′-2″
2-350S162-97	4′-6″	4′-4″	4′-2″	3′-11″	3′-8″	4′-4″	4′-2″	4′-0″	3′-9″	3′-6″
2-550S162-33	—	—	—	—	—	—	—	—	—	—
2-550S162-43	2′-5″	—	—	—	—	—	—	—	—	—
2-550S162-54	4′-1″	3′-7″	3′-1″	2′-7″	2′-2″	3′-10″	3′-3″	2′-10″	2′-4″	—
2-550S162-68	5′-5″	4′-11″	4′-5″	4′-0″	3′-8″	5′-1″	4′-7″	4′-2″	3′-10″	3′-5″
2-550S162-97	6′-5″	6′-2″	5′-11″	5′-9″	5′-4″	6′-3″	6′-0″	5′-9″	5′-6″	5′-2″
2-800S162-33	—	—	—	—	—	—	—	—	—	—
2-800S162-43	2′-11″	2′-2″	—	—	—	2′-6″	—	—	—	—
2-800S162-54	4′-11″	4′-3″	3′-8″	3′-2″	2′-8″	4′-6″	3′-11″	3′-5″	2′-11″	2′-4″
2-800S162-68	6′-7″	5′-11″	5′-4″	4′-11″	4′-6″	6′-2″	5′-7″	5′-1″	4′-8″	4′-3″
2-800S162-97	8′-9″	8′-5″	7′-11″	7′-6″	7′-0″	8′-5″	8′-1″	7′-9″	7′-3″	6′-10″
2-1000S162-43	2′-4″	2′-1″	—	—	—	2′-2″	1′-11″	—	—	—
2-1000S162-54	4′-8″	4′-1″	3′-8″	3′-3″	3′-0″	4′-4″	3′-10″	3′-5″	3′-1″	2′-9″
2-1000S162-68	7′-6″	6′-9″	6′-2″	5′-8″	5′-2″	7′-1″	6′-5″	5′-10″	5′-4″	4′-11″
2-1000S162-97	9′-9″	9′-2″	8′-7″	8′-2″	7′-8″	9′-5″	8′-10″	8′-5″	7′-11″	7′-5″
2-1200S162-54	—	—	—	—	—	—	—	—	—	—
2-1200S162-68	7′-0″	6′-4″	5′-9″	5′-3″	4′-9″	6′-7″	6′-0″	5′-5″	5′-0″	4′-6″
2-1200S162-97	9′-1″	8′-4″	7′-9″	7′-3″	6′-9″	8′-8″	8′-0″	7′-6″	7′-0″	6′-7″

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

a. Deflection criterion: *L*/360 for live loads, *L*/240 for total loads.

b. Design load assumptions:
Second floor dead load is 10 psf.
Roof/ceiling dead load is 12 psf.
Second floor live load is 40 psf.
Third floor live load is 30 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the header.

TABLE R603.7(1)
TOTAL NUMBER OF JACK AND KING STUDS REQUIRED AT EACH END OF AN OPENING

SIZE OF OPENING (feet-inches)	24″ O.C. STUD SPACING		16″ O.C. STUD SPACING	
	No. of jack studs	No. of king studs	No. of jack studs	No. of king studs
Up to 3′-6″	1	1	1	1
> 3′-6″ to 5′-0″	1	2	1	2
> 5′-0″ to 5′-6″	1	2	2	2
> 5′-6″ to 8′-0″	1	2	2	2
> 8′-0″ to 10′-6″	2	2	2	3
> 10′-6″ to 12′-0″	2	2	3	3
> 12′-0″ to 13′-0″	2	3	3	3
> 13′-0″ to 14′-0″	2	3	3	4
> 14′-0″ to 16′-0″	2	3	3	4
> 16′-0″ to 18′-0″	3	3	4	4

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

TABLE R603.7(2)
HEADER TO KING STUD CONNECTION REQUIREMENTS[a, b, c, d]

HEADER SPAN (feet)	BASIC WIND SPEED (mph), EXPOSURE		
	85 B or Seismic Design Categories A, B, C, D_1 and D_2	85 C or less than 110 B	Less than 110 C
≤ 4′	4-No. 8 screws	4-No. 8 screws	6-No. 8 screws
> 4′ to 8′	4-No. 8 screws	4-No. 8 screws	8-No. 8 screws
> 8′ to 12′	4-No. 8 screws	6-No. 8 screws	10-No. 8 screws
> 12′to 16′	4-No. 8 screws	8-No. 8 screws	12-No. 8 screws

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

a. All screw sizes shown are minimum.

b. For headers located on the first floor of a two-story building or the first or second floor of a three-story building, the total number of screws is permitted to be reduced by 2 screws, but the total number of screws shall be no less than 4.

c. For roof slopes of 6:12 or greater, the required number of screws may be reduced by half, but the total number of screws shall be no less than four.

d. Screws can be replaced by an uplift connector which has a capacity of the number of screws multiplied by 164 pounds (e.g., 12-No. 8 screws can be replaced by an uplift connector whose capacity exceeds 12 × 164 pounds = 1,968 pounds).

TABLE R603.8
HEAD AND SILL TRACK SPAN
F_y = 33 ksi

BASIC WIND SPEED (mph)		ALLOWABLE HEAD AND SILL TRACK SPAN[a,b,c] (ft-in.)					
EXPOSURE		TRACK DESIGNATION					
B	C	350T125-33	350T125-43	350T125-54	550T125-33	550T125-43	550T125-54
85	—	5′-0″	5′-7″	6′-2″	5′-10″	6′-8″	7′-0″
90	—	4′-10″	5′-5″	6′-0″	5′-8″	6′-3″	6′-10″
100	85	4′-6″	5′-1″	5′-8″	5′-4″	5′-11″	6′-5″
110	90	4′-2″	4′-9″	5′-4″	5′-1″	5′-7″	6′-1″
120	100	3′-11″	4′-6″	5′-0″	4′-10″	5′-4″	5′-10″
130	110	3′-8″	4′-2″	4′-9″	4′-1″	5′-1″	5′-7″
140	120	3′-7″	4′-1″	4′-7″	3′-6″	4′-11″	5′-5″
150	130	3′-5″	3′-10″	4′-4″	2′-11″	4′-7″	5′-2″
—	140	3′-1″	3′-6″	4′-1″	2′-3″	4′-0″	4′-10″
—	150	2′-9″	3′-4″	3′-10″	2′-0″	3′-7″	4′-7″

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

a. Deflection limit: *L*/240.

b. Head and sill track spans are based on components and cladding wind speeds and 48 inch tributary span.

c. For openings less than 4 feet in height that have both a head track and sill track, the above spans are permitted to be multiplied by 1.75. For openings less than or equal to 6 feet in height that have both a head track and a sill track, the above spans are permitted to be multiplied by a factor of 1.5.

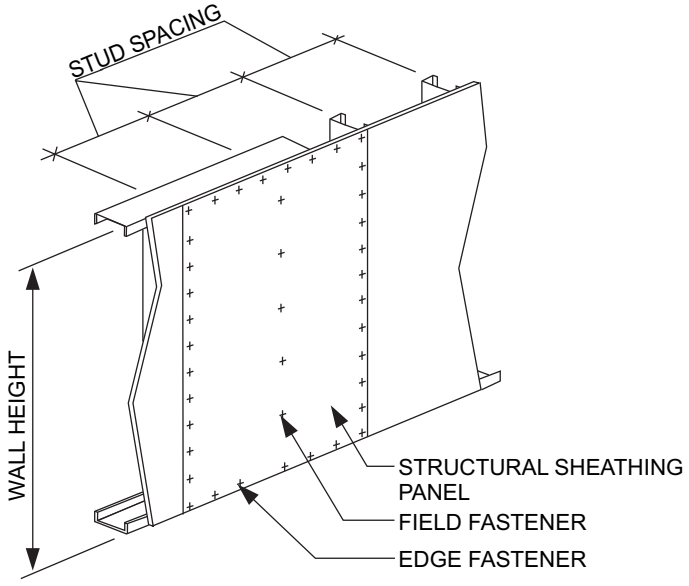
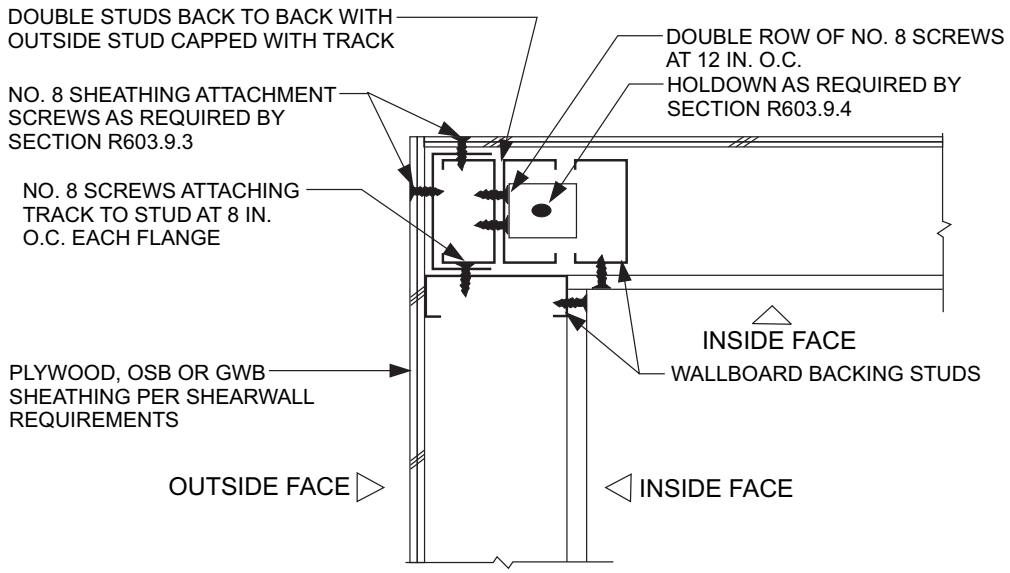


FIGURE R603.9
STRUCTURAL SHEATHING FASTENING PATTERN



For SI: 1 inch = 25.4 mm.

FIGURE R603.9.2
CORNER STUD HOLD DOWN DETAIL

TABLE R603.9.2(1)
MINIMUM PERCENTAGE OF FULL HEIGHT STRUCTURAL SHEATHING ON EXTERIOR WALLS[a,b]

WALL SUPPORTING	ROOF SLOPE	BASIC WIND SPEED AND EXPOSURE (mph)					
		85 B	90 B	100 B / 85 C	< 110 B / 90 C	100 C	< 110 C
Roof and ceiling only (One story or top floor of two or three story building)	3:12	8	9	9	12	16	20
	6:12	12	13	15	20	26	35
	9:12	21	23	25	30	50	58
	12:12	30	33	35	40	66	75
One story, roof and ceiling (First floor of a two-story building or second floor of a three story building)	3:12	24	27	30	35	50	66
	6:12	25	28	30	40	58	74
	9:12	35	38	40	55	74	91
	12:12	40	45	50	65	100	115
Two story, roof and ceiling (First floor of a three story building)	3:12	40	45	51	58	84	112
	6:12	38	43	45	60	90	113
	9:12	49	53	55	80	98	124
	12:12	50	57	65	90	134	155

For SI: 1 mile per hour = 0.447 m/s.

a. Linear interpolation is permitted.

b. For hip-roofed homes the minimum percentage of full height sheathing, based upon wind, is permitted to be multiplied by a factor of 0.95 for roof slopes not exceeding 7:12 and a factor of 0.9 for roof slopes greater than 7:12.

TABLE R603.9.2(2)
FULL HEIGHT SHEATHING LENGTH ADJUSTMENT FACTORS

PLAN ASPECT RATIO	LENGTH ADJUSTMENT FACTORS	
	Short wall	Long wall
1:1	1.0	1.0
1.5:1	1.5	0.67
2:1	2.0	0.50
3:1	3.0	0.33
4:1	4.0	0.25

R606.2 Thickness of masonry. The nominal thickness of masonry walls shall conform to the requirements of Sections R606.2.1 through R606.2.4.

R606.2.1 Minimum thickness. The minimum thickness of masonry bearing walls more than one *story* high shall be 8 inches (203 mm). *Solid masonry* walls of one-story *dwellings* and garages shall not be less than 6 inches (152 mm) in thickness when not greater than 9 feet (2743 mm) in height, provided that when gable construction is used, an additional 6 feet (1829 mm) is permitted to the peak of the gable. Masonry walls shall be laterally supported in either the horizontal or vertical direction at intervals as required by Section R606.9.

R606.2.2 Rubble stone masonry wall. The minimum thickness of rough, random or coursed rubble stone masonry walls shall be 16 inches (406 mm).

R606.2.3 Change in thickness. Where walls of masonry of hollow units or masonry-bonded hollow walls are decreased in thickness, a course of *solid masonry* shall be constructed between the wall below and the thinner wall above, or special units or construction shall be used to transmit the loads from face shells or wythes above to those below.

R606.2.4 Parapet walls. Unreinforced *solid masonry* parapet walls shall not be less than 8 inches (203 mm) thick and their height shall not exceed four times their thickness. Unreinforced hollow unit masonry parapet walls shall be not less than 8 inches (203 mm) thick, and their height shall not exceed three times their thickness. Masonry parapet walls in areas subject to wind loads of 30 pounds per square foot (1.44 kPa) located in Seismic Design Category D_1 or D_2, or on townhouses in Seismic Design Category C shall be reinforced in accordance with Section R606.12.

R606.3 Corbeled masonry. Corbeled masonry shall be in accordance with Sections R606.3.1 through R606.3.3.

R606.3.1 Units. *Solid masonry* units or masonry units filled with mortar or grout shall be used for corbeling.

R606.3.2 Corbel projection. The maximum projection of one unit shall not exceed one-half the height of the unit or one-third the thickness at right angles to the wall. The maximum corbeled projection beyond the face of the wall shall not exceed:

1. One-half of the wall thickness for multiwythe walls bonded by mortar or grout and wall ties or masonry headers, or
2. One-half the wythe thickness for single wythe walls, masonry-bonded hollow walls, multiwythe walls with open collar joints and veneer walls.

R606.3.3 Corbeled masonry supporting floor or roof-framing members. When corbeled masonry is used to support floor or roof-framing members, the top course of the corbel shall be a header course or the top course bed joint shall have ties to the vertical wall.

R606.4 Support conditions. Bearing and support conditions shall be in accordance with Sections R606.4.1 and R606.4.2.

R606.4.1 Bearing on support. Each masonry wythe shall be supported by at least two-thirds of the wythe thickness.

R606.4.2 Support at foundation. Cavity wall or masonry veneer construction may be supported on an 8-inch (203 mm) foundation wall, provided the 8-inch (203 mm) wall is corbeled to the width of the wall system above with masonry constructed of *solid masonry* units or masonry units filled with mortar or grout. The total horizontal projection of the corbel shall not exceed 2 inches (51 mm) with individual corbels projecting not more than one-third the thickness of the unit or one-half the height of the unit. The hollow space behind the corbeled masonry shall be filled with mortar or grout.

R606.5 Allowable stresses. Allowable compressive stresses in masonry shall not exceed the values prescribed in Table R606.5. In determining the stresses in masonry, the effects of all loads and conditions of loading and the influence of all forces affecting the design and strength of the several parts shall be taken into account.

R606.5.1 Combined units. In walls or other structural members composed of different kinds or grades of units, materials or mortars, the maximum stress shall not exceed the allowable stress for the weakest of the combination of units, materials and mortars of which the member is composed. The net thickness of any facing unit that is used to resist stress shall not be less than 1.5 inches (38 mm).

R606.6 Piers. The unsupported height of masonry piers shall not exceed ten times their least dimension. When structural clay tile or hollow concrete masonry units are used for isolated

piers to support beams and girders, the cellular spaces shall be filled solidly with concrete or Type M or S mortar, except that unfilled hollow piers may be used if their unsupported height is not more than four times their least dimension. Where hollow masonry units are solidly filled with concrete or Type M, S or N mortar, the allowable compressive stress shall be permitted to be increased as provided in Table R606.5.

TABLE R606.5
ALLOWABLE COMPRESSIVE STRESSES FOR EMPIRICAL DESIGN OF MASONRY

CONSTRUCTION; COMPRESSIVE STRENGTH OF UNIT, GROSS AREA	ALLOWABLE COMPRESSIVE STRESSES[a] GROSS CROSS-SECTIONAL AREA[b]	
	Type M or S mortar	Type N mortar
Solid masonry of brick and other solid units of clay or shale; sand-lime or concrete brick:		
8,000+ psi	350	300
4,500 psi	225	200
2,500 psi	160	140
1,500 psi	115	100
Grouted[c] masonry, of clay or shale; sand-lime or concrete:		
4,500+ psi	225	200
2,500 psi	160	140
1,500 psi	115	100
Solid masonry of solid concrete masonry units:		
3,000+ psi	225	200
2,000 psi	160	140
1,200 psi	115	100
Masonry of hollow load-bearing units:		
2,000+ psi	140	120
1,500 psi	115	100
1,000 psi	75	70
700 psi	60	55
Hollow walls (cavity or masonry bonded[d]) solid units:		
2,500+ psi	160	140
1,500 psi	115	100
Hollow units	75	70
Stone ashlar masonry:		
Granite	720	640
Limestone or marble	450	400
Sandstone or cast stone	360	320
Rubble stone masonry:		
Coarse, rough or random	120	100

For SI: 1 pound per square inch = 6.895 kPa.

a. Linear interpolation shall be used for determining allowable stresses for masonry units having compressive strengths that are intermediate between those given in the table.

b. Gross cross-sectional area shall be calculated on the actual rather than nominal dimensions.

c. See Section R608.

d. Where floor and roof loads are carried upon one wythe, the gross cross-sectional area is that of the wythe under load; if both wythes are loaded, the gross cross-sectional area is that of the wall minus the area of the cavity between the wythes. Walls bonded with metal ties shall be considered as cavity walls unless the collar joints are filled with mortar or grout.

R606.6.1 Pier cap. Hollow piers shall be capped with 4 inches (102 mm) of *solid masonry* or concrete or shall have cavities of the top course filled with concrete or grout or other *approved* methods.

R606.7 Chases. Chases and recesses in masonry walls shall not be deeper than one-third the wall thickness, and the maximum length of a horizontal chase or horizontal projection shall not exceed 4 feet (1219 mm), and shall have at least 8 inches (203 mm) of masonry in back of the chases and recesses and between adjacent chases or recesses and the jambs of openings. Chases and recesses in masonry walls shall be designed and constructed so as not to reduce the required strength or required fire resistance of the wall and in no case shall a chase or recess be permitted within the required area of a pier. Masonry directly above chases or recesses wider than 12 inches (305 mm) shall be supported on noncombustible lintels.

R606.8 Stack bond. In unreinforced masonry where masonry units are laid in stack bond, longitudinal reinforcement consisting of not less than two continuous wires each with a minimum aggregate cross-sectional area of 0.017 square inch (11 mm^2) shall be provided in horizontal bed joints spaced not more than 16 inches (406 mm) on center vertically.

R606.9 Lateral support. Masonry walls shall be laterally supported in either the horizontal or the vertical direction. The maximum spacing between lateral supports shall not exceed the distances in Table R606.9. Lateral support shall be provided by cross walls, pilasters, buttresses or structural frame members when the limiting distance is taken horizontally, or by floors or roofs when the limiting distance is taken vertically.

TABLE R606.9
SPACING OF LATERAL SUPPORT FOR MASONRY WALLS

CONSTRUCTION	MAXIMUM WALL LENGTH TO THICKNESS OR WALL HEIGHT TO THICKNESS[a,b]
Bearing walls:	
Solid or solid grouted	20
All other	18
Nonbearing walls:	
Exterior	18
Interior	36

For SI: 1 foot = 304.8 mm.

a. Except for cavity walls and cantilevered walls, the thickness of a wall shall be its nominal thickness measured perpendicular to the face of the wall. For cavity walls, the thickness shall be determined as the sum of the nominal thicknesses of the individual wythes. For cantilever walls, except for parapets, the ratio of height to nominal thickness shall not exceed 6 for solid masonry, or 4 for hollow masonry. For parapets, see Section R606.2.4.

b. An additional unsupported height of 6 feet is permitted for gable end walls.

R606.9.1 Horizontal lateral support. Lateral support in the horizontal direction provided by intersecting masonry walls shall be provided by one of the methods in Section R606.9.1.1 or Section R606.9.1.2.

R606.9.1.1 Bonding pattern. Fifty percent of the units at the intersection shall be laid in an overlapping

masonry bonding pattern, with alternate units having a bearing of not less than 3 inches (76 mm) on the unit below.

R606.9.1.2 Metal reinforcement. Interior nonloadbearing walls shall be anchored at their intersections, at vertical intervals of not more than 16 inches (406 mm) with joint reinforcement of at least 9 gage [0.148 in. (4mm)], or $^1/_4$ inch (6 mm) galvanized mesh hardware cloth. Intersecting masonry walls, other than interior nonloadbearing walls, shall be anchored at vertical intervals of not more than 8 inches (203 mm) with joint reinforcement of at least 9 gage and shall extend at least 30 inches (762 mm) in each direction at the intersection. Other metal ties, joint reinforcement or anchors, if used, shall be spaced to provide equivalent area of anchorage to that required by this section.

R606.9.2 Vertical lateral support. Vertical lateral support of masonry walls in Seismic Design Category A, B or C shall be provided in accordance with one of the methods in Section R606.9.2.1 or Section R606.9.2.2.

R606.9.2.1 Roof structures. Masonry walls shall be anchored to roof structures with metal strap anchors spaced in accordance with the manufacturer's instructions, $^1/_2$-inch (13 mm) bolts spaced not more than 6 feet (1829 mm) on center, or other *approved* anchors. Anchors shall be embedded at least 16 inches (406 mm) into the masonry, or be hooked or welded to bond beam reinforcement placed not less than 6 inches (152 mm) from the top of the wall.

R606.9.2.2 Floor diaphragms. Masonry walls shall be anchored to floor *diaphragm* framing by metal strap anchors spaced in accordance with the manufacturer's instructions, $^1/_2$-inch-diameter (13 mm) bolts spaced at intervals not to exceed 6 feet (1829 mm) and installed as shown in Figure R606.11(1), or by other *approved* methods.

R606.10 Lintels. Masonry over openings shall be supported by steel lintels, reinforced concrete or masonry lintels or masonry arches, designed to support load imposed.

R606.11 Anchorage. Masonry walls shall be anchored to floor and roof systems in accordance with the details shown in Figure R606.11(1), R606.11(2) or R606.11(3). Footings may be considered as points of lateral support.

R606.12 Seismic requirements. The seismic requirements of this section shall apply to the design of masonry and the construction of masonry building elements located in Seismic Design Category D_1 or D_2. Townhouses in Seismic Design Category C shall comply with the requirements of Section R606.12.2. These requirements shall not apply to glass unit masonry conforming to Section R610 or masonry veneer conforming to Section R703.7.

R606.12.1 General. Masonry structures and masonry elements shall comply with the requirements of Sections R606.12.2 through R606.12.4 based on the seismic design category established in Table R301.2(1). Masonry structures and masonry elements shall comply with the requirements of Section R606.12 and Figures R606.11(1), R606.11(2) and R606.11(3) or shall be designed in accordance with TMS 402/ACI 530/ASCE 5.

R606.12.1.1 Floor and roof diaphragm construction. Floor and roof *diaphragms* shall be constructed of wood structural panels attached to wood framing in accordance with Table R602.3(1) or to cold-formed steel floor framing in accordance with Table R505.3.1(2) or to cold-formed steel roof framing in accordance with Table R804.3. Additionally, sheathing panel edges perpendicular to framing members shall be backed by blocking, and sheathing shall be connected to the blocking with fasteners at the edge spacing. For Seismic Design Categories C, D_1 and D_2, where the width-to-thickness dimension of the *diaphragm* exceeds 2-to-1, edge spacing of fasteners shall be 4 inches (102 mm) on center.

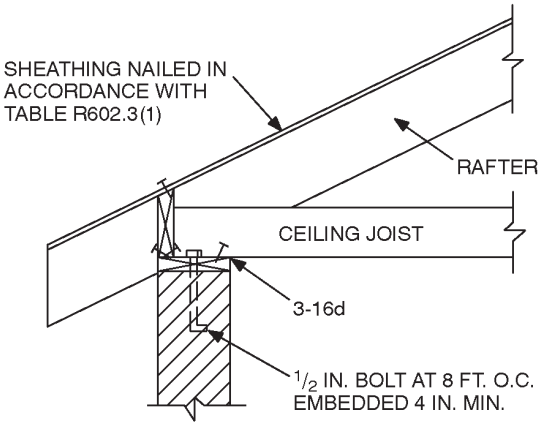
R606.12.2 Seismic Design Category C. Townhouses located in Seismic Design Category C shall comply with the requirements of this section.

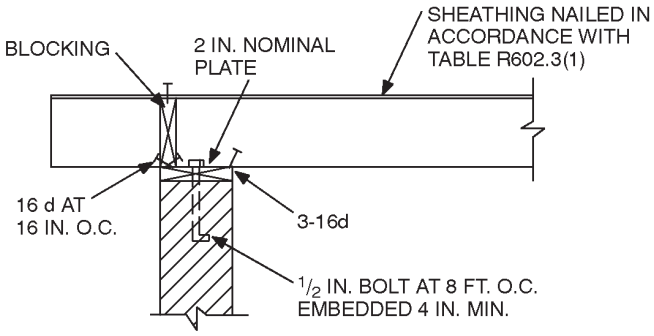
R606.12.2.1 Minimum length of wall without openings. Table R606.12.2.1 shall be used to determine the minimum required solid wall length without openings at each masonry exterior wall. The provided percentage of solid wall length shall include only those wall segments that are 3 feet (914 mm) or longer. The maximum clear distance between wall segments included in determining the solid wall length shall not exceed 18 feet (5486 mm). Shear wall segments required to meet the minimum wall length shall be in accordance with Section R606.12.2.2.3.

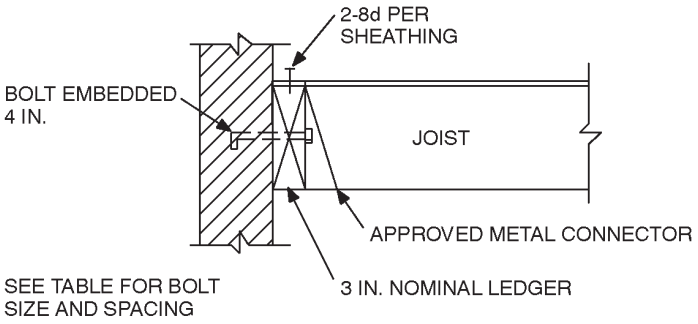
R606.12.2.2 Design of elements not part of the lateral force-resisting system.

R606.12.2.2.1 Load-bearing frames or columns. Elements not part of the lateral-force-resisting system shall be analyzed to determine their effect on the response of the system. The frames or columns shall be adequate for vertical load carrying capacity and induced moment caused by the design *story* drift.

R606.12.2.2.2 Masonry partition walls. Masonry partition walls, masonry screen walls and other masonry elements that are not designed to resist vertical or lateral loads, other than those induced by their own weight, shall be isolated from the structure so that vertical and lateral forces are not imparted to these elements. Isolation joints and connectors between these elements and the structure shall be designed to accommodate the design *story* drift.

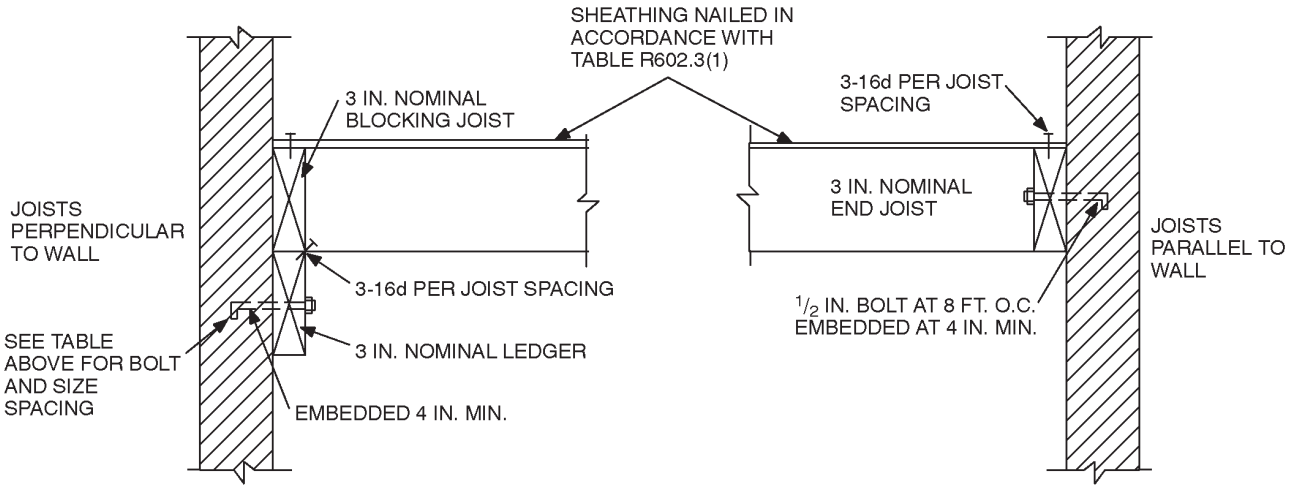






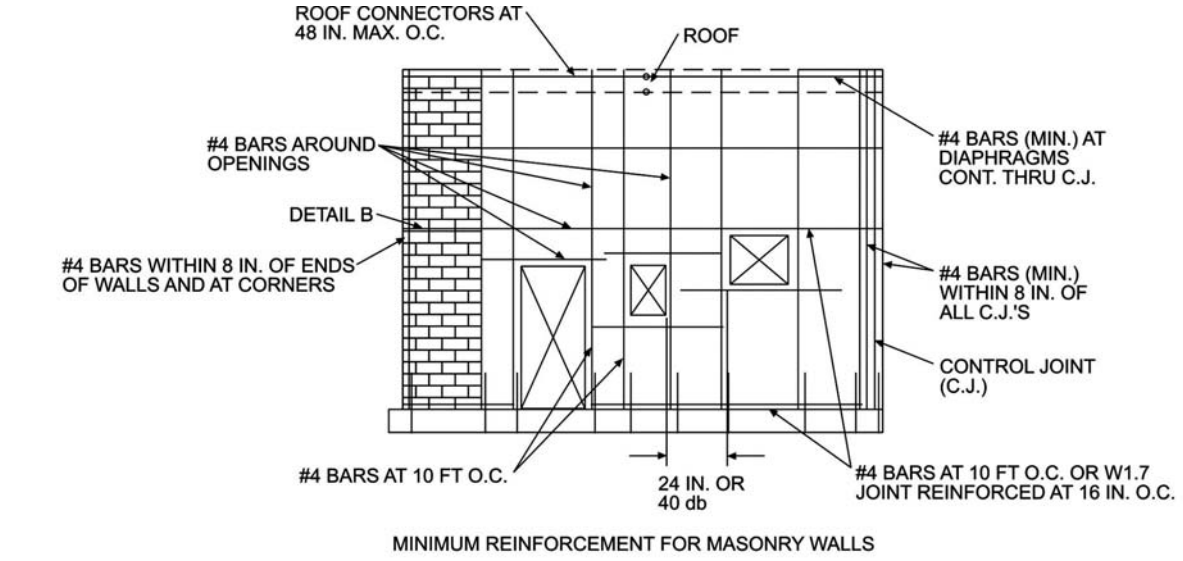
LEDGER BOLT SIZE AND SPACING

JOIST SPAN	BOLT SIZE AND SPACING	
	ROOF	FLOOR
10 FT.	1/2 AT 2 FT. 6 IN. 7/8 AT 3 FT. 6 IN.	1/2 AT 2 FT. 0 IN. 7/8 AT 2 FT. 9 IN.
10–15 FT.	1/2 AT 1 FT. 9 IN. 7/8 AT 2 FT. 6 IN.	1/2 AT 1 FT. 4 IN. 7/8 AT 2 FT. 0 IN.
15-20 FT.	1/2 AT 1 FT. 3 IN. 7/8 AT 2 FT. 0 IN.	1/2 AT 1 FT. 0 IN. 7/8 AT 1 FT. 6 IN.

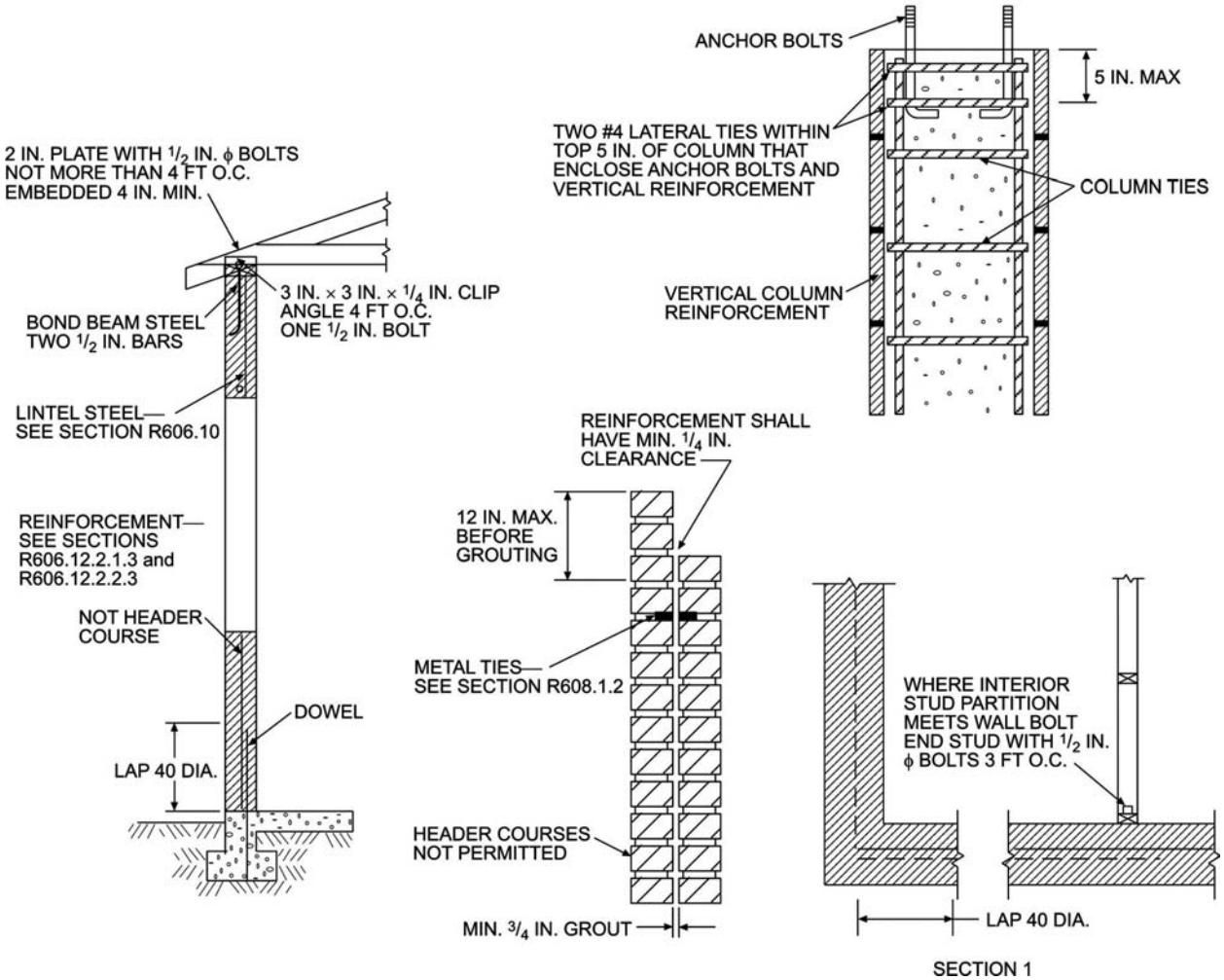


NOTE: Where bolts are located in hollow masonry, the cells in the courses receiving the bolt shall be grouted solid.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0.479kPa.

FIGURE R606.11(1)
ANCHORAGE REQUIREMENTS FOR MASONRY WALLS LOCATED IN SEISMIC DESIGN CATEGORY A, B OR C AND WHERE WIND LOADS ARE LESS THAN 30 PSF



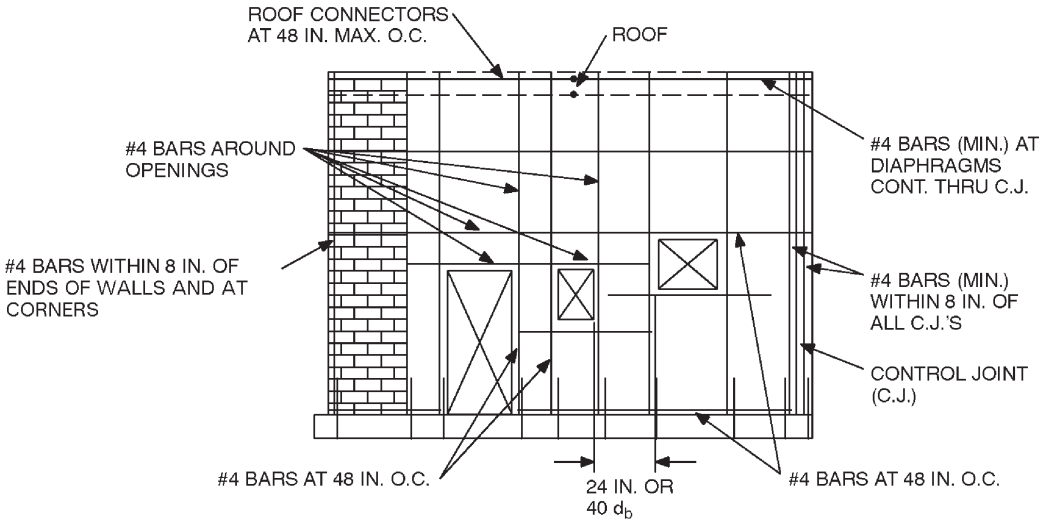
MINIMUM REINFORCEMENT FOR MASONRY WALLS



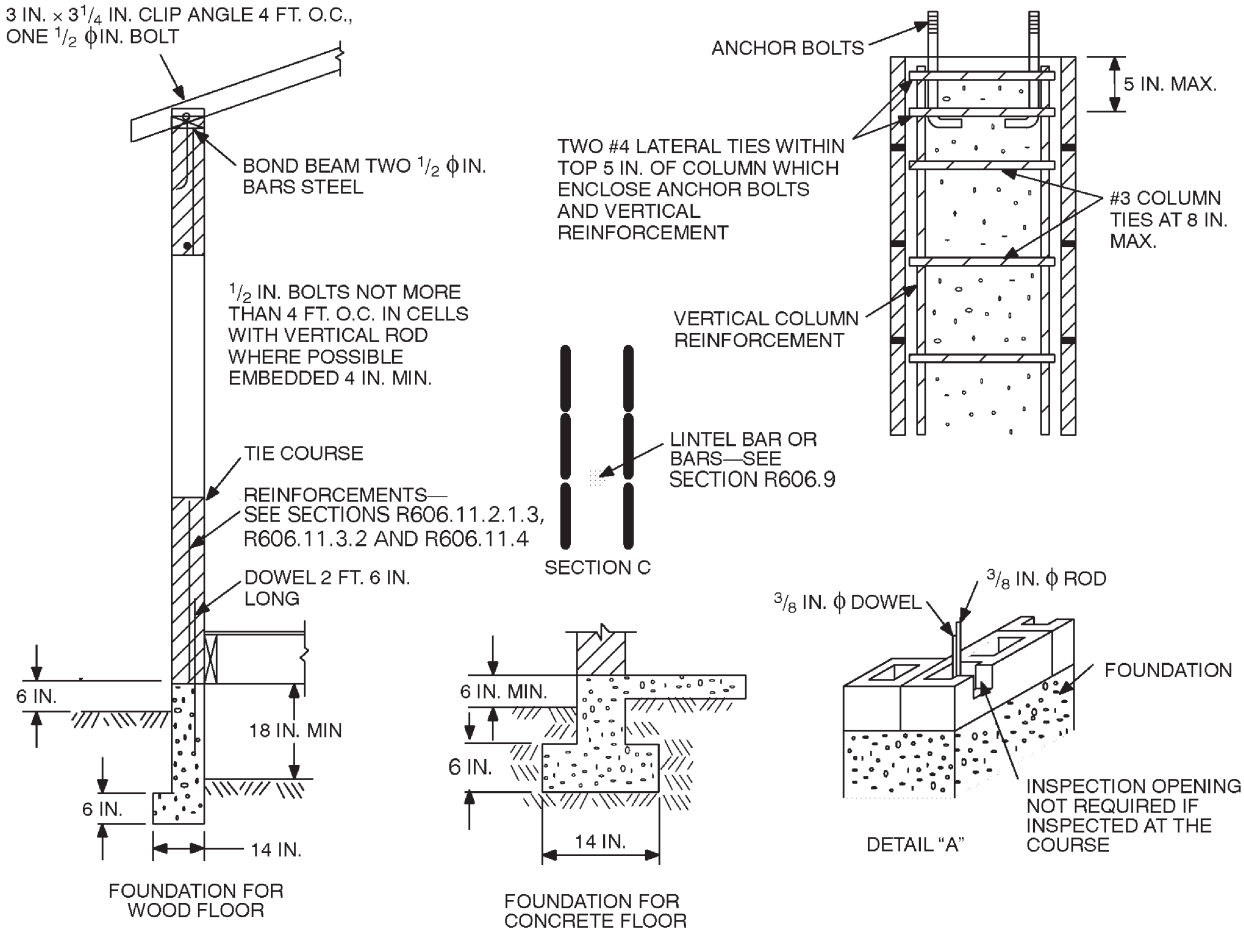
SECTION 1

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

FIGURE R606.11(2)
REQUIREMENTS FOR REINFORCED GROUTED MASONRY CONSTRUCTION IN SEISMIC DESIGN CATEGORY C



MINIMUM REINFORCEMENT FOR MASONRY WALLS



NOTE: A full bed joint must be provided. All cells containing vertical bars are to be filled to the top of wall and provide inspection opening as shown on detail "A." Horizontal bars are to be laid as shown on detail "B." Lintel bars are to be laid as shown on Section C.

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

FIGURE R606.11(3)
REQUIREMENTS FOR REINFORCED MASONRY CONSTRUCTION IN SEISMIC DESIGN CATEGORY D_1, OR D_2

R606.12.2.2.3 Reinforcement requirements for masonry elements. Masonry elements listed in Section R606.12.2.2.2 shall be reinforced in either the horizontal or vertical direction as shown in Figure R606.11(2) and in accordance with the following:

1. Horizontal reinforcement. Horizontal joint reinforcement shall consist of at least two longitudinal W1.7 wires spaced not more than 16 inches (406 mm) for walls greater than 4 inches (102 mm) in width and at least one longitudinal W1.7 wire spaced not more than 16 inches (406 mm) for walls not exceeding 4 inches (102 mm) in width; or at least one No. 4 bar spaced not more than 48 inches (1219 mm). Where two longitudinal wires of joint reinforcement are used, the space between these wires shall be the widest that the mortar joint will accommodate. Horizontal reinforcement shall be provided within 16 inches (406 mm) of the top and bottom of these masonry elements.
2. Vertical reinforcement. Vertical reinforcement shall consist of at least one No. 4 bar spaced not more than 48 inches (1219 mm). Vertical reinforcement shall be located within 16 inches (406 mm) of the ends of masonry walls.

R606.12.2.3 Design of elements part of the lateral-force-resisting system.

R606.12.2.3.1 Connections to masonry shear walls. Connectors shall be provided to transfer forces between masonry walls and horizontal elements in accordance with the requirements of Section 1.7.4 of TMS 402/ACI 530/ASCE 5. Connectors shall be designed to transfer horizontal design forces acting either perpendicular or parallel to the wall, but not less than 200 pounds per linear foot (2919 N/m) of wall. The maximum spacing between connectors shall be 4 feet (1219 mm). Such anchorage mechanisms shall not induce tension stresses perpendicular to grain in ledgers or nailers.

R606.12.2.3.2 Connections to masonry columns. Connectors shall be provided to transfer forces between masonry columns and horizontal elements in accordance with the requirements of Section 1.7.4 of TMS 402/ACI 530/ASCE 5. Where anchor bolts are used to connect horizontal elements to the tops of columns, the bolts shall be placed within lateral ties. Lateral ties shall enclose both the vertical bars in the column and the anchor bolts. There shall be a minimum of two No. 4 lateral ties provided in the top 5 inches (127 mm) of the column.

R606.12.2.3.3 Minimum reinforcement requirements for masonry shear walls. Vertical reinforcement of at least one No. 4 bar shall be provided at corners, within 16 inches (406 mm) of each side of openings, within 8 inches (203 mm) of each side of movement joints, within 8 inches (203 mm) of the ends of walls, and at a maximum spacing of 10 feet (3048 mm).

Horizontal joint reinforcement shall consist of at least two wires of W1.7 spaced not more than 16 inches (406 mm); or bond beam reinforcement of at least one No. 4 bar spaced not more than 10 feet (3048 mm) shall be provided. Horizontal reinforcement shall also be provided at the bottom and top of wall openings and shall extend not less than 24 inches (610 mm) nor less than 40 bar diameters past the opening; continuously at structurally connected roof and floor levels; and within 16 inches (406 mm) of the top of walls.

R606.12.3 Seismic Design Category D_1. Structures in Seismic Design Category D_1 shall comply with the requirements of Seismic Design Category C and the additional requirements of this section.

R606.12.3.1 Design requirements. Masonry elements other than those covered by Section R606.12.2.2.2 shall be designed in accordance with the requirements of Chapter 1 and Sections 2.1 and 2.3 of TMS 402/ACI 530/ASCE 5 and shall meet the minimum reinforcement requirements contained in Sections R606.12.3.2 and R606.12.3.2.1.

Exception: Masonry walls limited to one *story* in height and 9 feet (2743 mm) between lateral supports need not be designed provided they comply with the minimum reinforcement requirements of Sections R606.12.3.2 and R606.12.3.2.1.

TABLE R606.12.2.1
MINIMUM SOLID WALL LENGTH ALONG EXTERIOR WALL LINES

SESIMIC DESIGN CATEGORY	MINIMUM SOLID WALL LENGTH (percent)[a]		
	One Story or Top Story of Two Story	Wall Supporting Light-framed Second Story and Roof	Wall Supporting Masonry Second Story and Roof
Townhouses in C	20	25	35
D_1	25	NP	NP
D_2	30	NP	NP

NP = Not permitted , except with design in accordance with the *International Building Code.*

a. For all walls, the minimum required length of solid walls shall be based on the table percent multiplied by the dimension, parallel to the wall direction under consideration, of a rectangle inscribing the overall building plan.

R606.12.3.2 Minimum reinforcement requirements for masonry walls. Masonry walls other than those covered by Section R606.12.2.2.3 shall be reinforced in both the vertical and horizontal direction. The sum of the cross-sectional area of horizontal and vertical reinforcement shall be at least 0.002 times the gross cross-sectional area of the wall, and the minimum cross-sectional area in each direction shall be not less than 0.0007 times the gross cross-sectional area of the wall. Reinforcement shall be uniformly distributed. Table R606.12.3.2 shows the minimum reinforcing bar sizes required for varying thicknesses of masonry walls. The maximum spacing of reinforcement shall be 48 inches (1219 mm) provided that the walls are solid grouted and constructed of hollow open-end units, hollow units laid with full head joints or two wythes of solid units. The maximum spacing of reinforcement shall be 24 inches (610 mm) for all other masonry.

R606.12.3.2.1 Shear wall reinforcement requirements. The maximum spacing of vertical and horizontal reinforcement shall be the smaller of one-third the length of the shear wall, one-third the height of the shear wall, or 48 inches (1219 mm). The minimum cross-sectional area of vertical reinforcement shall be one-third of the required shear reinforcement. Shear reinforcement shall be anchored around vertical reinforcing bars with a standard hook.

R606.12.3.3 Minimum reinforcement for masonry columns. Lateral ties in masonry columns shall be spaced not more than 8 inches (203 mm) on center and shall be at least $^3/_8$ inch (9.5 mm) diameter. Lateral ties shall be embedded in grout.

R606.12.3.4 Material restrictions. Type N mortar or masonry cement shall not be used as part of the lateral-force-resisting system.

R606.12.3.5 Lateral tie anchorage. Standard hooks for lateral tie anchorage shall be either a 135-degree (2.4 rad) standard hook or a 180-degree (3.2 rad) standard hook.

R606.12.4 Seismic Design Category D_2. All structures in Seismic Design Category D_2 shall comply with the requirements of Seismic Design Category D_1 and to the additional requirements of this section.

R606.12.4.1 Design of elements not part of the lateral-force-resisting system. Stack bond masonry that is not part of the lateral-force-resisting system shall have a horizontal cross-sectional area of reinforcement of at least 0.0015 times the gross cross-sectional area of masonry. Table R606.12.4.1 shows minimum reinforcing bar sizes for masonry walls. The maximum spacing of horizontal reinforcement shall be 24 inches (610 mm). These elements shall be solidly grouted and shall be constructed of hollow open-end units or two wythes of solid units.

TABLE R606.12.4.1
MINIMUM REINFORCING FOR STACKED BONDED MASONRY WALLS IN SEISMIC DESIGN CATEGORY D_2

NOMINAL WALL THICKNESS (inches)	MINIMUM BAR SIZE SPACED AT 24 INCHES
6	#4
8	#5
10	#5
12	#6

For SI: 1 inch = 25.4 mm.

R606.12.4.2 Design of elements part of the lateral-force-resisting system. Stack bond masonry that is part of the lateral-force-resisting system shall have a horizontal cross-sectional area of reinforcement of at least 0.0025 times the gross cross-sectional area of masonry. Table R606.12.4.2 shows minimum reinforcing bar sizes for masonry walls. The maximum spacing of horizontal reinforcement shall be 16 inches (406 mm). These elements shall be solidly grouted and shall be constructed of hollow open-end units or two wythes of solid units.

TABLE R606.12.4.2
MINIMUM REINFORCING FOR STACKED BONDED MASONRY WALLS IN SEISMIC DESIGN CATEGORY D_2

NOMINAL WALL THICKNESS (inches)	MINIMUM BAR SIZE SPACED AT 16 INCHES
6	#4
8	#5
10	#5
12	#6

For SI: 1 inch = 25.4 mm.

TABLE R606.12.3.2
MINIMUM DISTRIBUTED WALL REINFORCEMENT FOR BUILDING ASSIGNED TO SEISMIC DESIGN CATEGORY D_0 or D_1

NOMINAL WALL THICKNESS (inches)	MINIMUM SUM OF THE VERTICAL AND HORIZONTAL REINFORCEMENT AREAS[a] (square inches per foot)	MINIMUM REINFORCEMENT AS DISTRIBUTED IN BOTH HORIZONTAL AND VERTICAL DIRECTIONS[b] (square inches per foot)	MINIMUM BAR SIZE FOR REINFORCEMENT SPACED AT 48 INCHES
6	0.135	0.047	#4
8	0.183	0.064	#5
10	0.231	0.081	#6
12	0.279	0.098	#6

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square inch per foot = 2064 mm^2/m.

a. Based on the minimum reinforcing ratio of 0.002 times the gross cross-sectional area of the wall.

b. Based on the minimum reinforcing ratio each direction of 0.0007 times the gross cross-sectional area of the wall.

R606.13 Protection for reinforcement. Bars shall be completely embedded in mortar or grout. Joint reinforcement embedded in horizontal mortar joints shall not have less than $^5/_8$-inch (15.9 mm) mortar coverage from the exposed face. All other reinforcement shall have a minimum coverage of one bar diameter over all bars, but not less than $^3/_4$ inch (19 mm), except where exposed to weather or soil, in which case the minimum coverage shall be 2 inches (51 mm).

R606.14 Beam supports. Beams, girders or other concentrated loads supported by a wall or column shall have a bearing of at least 3 inches (76 mm) in length measured parallel to the beam upon *solid masonry* not less than 4 inches (102 mm) in thickness, or upon a metal bearing plate of adequate design and dimensions to distribute the load safely, or upon a continuous reinforced masonry member projecting not less than 4 inches (102 mm) from the face of the wall.

R606.14.1 Joist bearing. Joists shall have a bearing of not less than $1^1/_2$ inches (38 mm), except as provided in Section R606.14, and shall be supported in accordance with Figure R606.11(1).

R606.15 Metal accessories. Joint reinforcement, anchors, ties and wire fabric shall conform to the following: ASTM A 82 for wire anchors and ties; ASTM A 36 for plate, headed and bent-bar anchors; ASTM A 510 for corrugated sheet metal anchors and ties; ASTM A 951 for joint reinforcement; ASTM B 227 for copper-clad steel wire ties; or ASTM A 167 for stainless steel hardware.

R606.15.1 Corrosion protection. Minimum corrosion protection of joint reinforcement, anchor ties and wire fabric for use in masonry wall construction shall conform to Table R606.15.1.

TABLE R606.15.1
MINIMUM CORROSION PROTECTION

MASONRY METAL ACCESSORY	STANDARD
Joint reinforcement, interior walls	ASTM A 641, Class 1
Wire ties or anchors in exterior walls completely embedded in mortar or grout	ASTM A 641, Class 3
Wire ties or anchors in exterior walls not completely embedded in mortar or grout	ASTM A 153, Class B-2
Joint reinforcement in exterior walls or interior walls exposed to moist environment	ASTM A 153, Class B-2
Sheet metal ties or anchors exposed to weather	ASTM A 153, Class B-2
Sheet metal ties or anchors completely embedded in mortar or grout	ASTM A 653, Coating Designation G60
Stainless steel hardware for any exposure	ASTM A 167, Type 304

SECTION R607
UNIT MASONRY

R607.1 Mortar. Mortar for use in masonry construction shall comply with ASTM C 270. The type of mortar shall be in accordance with Sections R607.1.1, R607.1.2 and R607.1.3 and shall meet the proportion specifications of Table R607.1 or the property specifications of ASTM C 270.

R607.1.1 Foundation walls. Masonry foundation walls constructed as set forth in Tables R404.1.1(1) through R404.1.1(4) and mortar shall be Type M or S.

R607.1.2 Masonry in Seismic Design Categories A, B and C. Mortar for masonry serving as the lateral-force-resisting system in Seismic Design Categories A, B and C shall be Type M, S or N mortar.

R607.1.3 Masonry in Seismic Design Categories D_1 and D_2. Mortar for masonry serving as the lateral-force- resisting system in Seismic Design Categories D_1 and D_2 shall be Type M or S portland cement-lime or mortar cement mortar.

R607.2 Placing mortar and masonry units.

R607.2.1 Bed and head joints. Unless otherwise required or indicated on the project drawings, head and bed joints shall be $^3/_8$ inch (10 mm) thick, except that the thickness of the bed joint of the starting course placed over foundations shall not be less than $^1/_4$ inch (7 mm) and not more than $^3/_4$ inch (19 mm).

R607.2.1.1 Mortar joint thickness tolerance. Mortar joint thickness for load-bearing masonry shall be within the following tolerances from the specified dimensions:

1. Bed joint: + $^1/_8$ inch (3 mm).
2. Head joint: - $^1/_4$ inch (7 mm), + $^3/_8$ inch (10 mm).
3. Collar joints: - $^1/_4$ inch (7 mm), + $^3/_8$ inch (10 mm).

R607.2.2 Masonry unit placement. The mortar shall be sufficiently plastic and units shall be placed with sufficient pressure to extrude mortar from the joint and produce a tight joint. Deep furrowing of bed joints that produces voids shall not be permitted. Any units disturbed to the extent that initial bond is broken after initial placement shall be removed and relaid in fresh mortar. Surfaces to be in contact with mortar shall be clean and free of deleterious materials.

R607.2.2.1 Solid masonry. *Solid masonry* units shall be laid with full head and bed joints and all interior vertical joints that are designed to receive mortar shall be filled.

R607.2.2.2 Hollow masonry. For hollow masonry units, head and bed joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell.

R607.3 Installation of wall ties. The installation of wall ties shall be as follows:

1. The ends of wall ties shall be embedded in mortar joints. Wall tie ends shall engage outer face shells of hollow units by at least $^1/_2$ inch (13 mm). Wire wall ties shall be embedded at least $1^1/_2$ inches (38 mm) into the mortar bed of *solid masonry* units or solid grouted hollow units.
2. Wall ties shall not be bent after being embedded in grout or mortar.

TABLE R607.1
MORTAR PROPORTIONS[a, b]

		PROPORTIONS BY VOLUME (cementitious materials)								
			Mortar cement			Masonry cement				
MORTAR	TYPE	Portland cement or blended cement	M	S	N	M	S	N	Hydrated lime[c] or lime putty	Aggregate ratio (measured in damp, loose conditions)
Cement-lime	M	1	—	—	—	—	—	—	1/4	Not less than 2 1/4 and not more than 3 times the sum of separate volumes of lime, if used, and cement
	S	1	—	—	—	—	—	—	over 1/4 to 1/2	
	N	1	—	—	—	—	—	—	over 1/2 to 1 1/4	
	O	1	—	—	—	—	—	—	over 1 1/4 to 2 1/2	
Mortar cement	M	1	—	—	1	—	—	—	—	
	M	—	1	—	—	—	—	—		
	S	1/2	—	—	1	—	—	—		
	S	—	—	1	—	—	—	—		
	N	—	—	—	1	—	—	—		
	O	—	—	—	1	—	—	—		
Masonry cement	M	1				—	—	1	—	
	M	—				1	—	—		
	S	1/2				—	—	1		
	S	—				—	1	—		
	N	—				—	—	1		
	O	—				—	—	1		

For SI: 1 cubic foot = 0.0283 m^3, 1 pound = 0.454 kg.

a. For the purpose of these specifications, the weight of 1 cubic foot of the respective materials shall be considered to be as follows:

Portland Cement	94 pounds	Masonry Cement	Weight printed on bag
Mortar Cement	Weight printed on bag	Hydrated Lime	40 pounds
Lime Putty (Quicklime)	80 pounds	Sand, damp and loose	80 pounds of dry sand

b. Two air-entraining materials shall not be combined in mortar.

c. Hydrated lime conforming to the requirements of ASTM C 270.

SECTION R608
MULTIPLE WYTHE MASONRY

R608.1 General. The facing and backing of multiple wythe masonry walls shall be bonded in accordance with Section R608.1.1, R608.1.2 or R608.1.3. In cavity walls, neither the facing nor the backing shall be less than 3 inches (76 mm) nominal in thickness and the cavity shall not be more than 4 inches (102 mm) nominal in width. The backing shall be at least as thick as the facing.

Exception: Cavities shall be permitted to exceed the 4-inch (102 mm) nominal dimension provided tie size and tie spacing have been established by calculation.

R608.1.1 Bonding with masonry headers. Bonding with solid or hollow masonry headers shall comply with Sections R608.1.1.1 and R608.1.1.2.

R608.1.1.1 Solid units. Where the facing and backing (adjacent wythes) of *solid masonry* construction are bonded by means of masonry headers, no less than 4 percent of the wall surface of each face shall be composed of headers extending not less than 3 inches (76 mm) into the backing. The distance between adjacent full-length headers shall not exceed 24 inches (610 mm) either vertically or horizontally. In walls in which a single header does not extend through the wall, headers from the opposite sides shall overlap at least 3 inches (76 mm), or headers from opposite sides shall be covered with another header course overlapping the header below at least 3 inches (76 mm).

R608.1.1.2 Hollow units. Where two or more hollow units are used to make up the thickness of a wall, the stretcher courses shall be bonded at vertical intervals not exceeding 34 inches (864 mm) by lapping at least 3 inches (76 mm) over the unit below, or by lapping at vertical intervals not exceeding 17 inches (432 mm) with units that are at least 50 percent thicker than the units below.

R608.1.2 Bonding with wall ties or joint reinforcement. Bonding with wall ties or joint reinforcement shall comply with Sections R608.1.2.1 through R608.1.2.3.

R608.1.2.1 Bonding with wall ties. Bonding with wall ties, except as required by Section R610, where the facing and backing (adjacent wythes) of masonry walls are bonded with 3/16-inch-diameter (5 mm) wall ties embedded in the horizontal mortar joints, there shall be at least one metal tie for each 4.5 square feet (0.418 m^2) of wall area. Ties in alternate courses shall be staggered. The maximum vertical distance between ties shall not exceed 24 inches (610 mm), and the maximum horizontal distance shall not exceed 36 inches (914 mm). Rods or ties bent to rectangular shape shall be used with hollow masonry units laid with the cells vertical. In other walls, the ends of ties shall be bent to 90-degree (0.79 rad) angles to provide hooks no less than 2 inches (51 mm) long. Additional bonding ties shall be provided at all openings, spaced not more than 3 feet (914 mm) apart around the perimeter and within 12 inches (305 mm) of the opening.

R608.1.2.2 Bonding with adjustable wall ties. Where the facing and backing (adjacent wythes) of masonry are bonded with adjustable wall ties, there shall be at least one tie for each 2.67 square feet (0.248 m^2) of wall area. Neither the vertical nor the horizontal spacing of the adjustable wall ties shall exceed 24 inches (610 mm). The maximum vertical offset of bed joints from one wythe to the other shall be 1.25 inches (32 mm). The maximum clearance between connecting parts of the ties shall be $^1/_{16}$ inch (2 mm). When pintle legs are used, ties shall have at least two $^3/_{16}$-inch-diameter (5 mm) legs.

R608.1.2.3 Bonding with prefabricated joint reinforcement. Where the facing and backing (adjacent wythes) of masonry are bonded with prefabricated joint reinforcement, there shall be at least one cross wire serving as a tie for each 2.67 square feet (0.248 m^2) of wall area. The vertical spacing of the joint reinforcement shall not exceed 16 inches (406 mm). Cross wires on prefabricated joint reinforcement shall not be smaller than No. 9 gage. The longitudinal wires shall be embedded in the mortar.

R608.1.3 Bonding with natural or cast stone. Bonding with natural and cast stone shall conform to Sections R608.1.3.1 and R608.1.3.2.

R608.1.3.1 Ashlar masonry. In ashlar masonry, bonder units, uniformly distributed, shall be provided to the extent of not less than 10 percent of the wall area. Such bonder units shall extend not less than 4 inches (102 mm) into the backing wall.

R608.1.3.2 Rubble stone masonry. Rubble stone masonry 24 inches (610 mm) or less in thickness shall have bonder units with a maximum spacing of 3 feet (914 mm) vertically and 3 feet (914 mm) horizontally, and if the masonry is of greater thickness than 24 inches (610 mm), shall have one bonder unit for each 6 square feet (0.557 m^2) of wall surface on both sides.

R608.2 Masonry bonding pattern. Masonry laid in running and stack bond shall conform to Sections R608.2.1 and R608.2.2.

R608.2.1 Masonry laid in running bond. In each wythe of masonry laid in running bond, head joints in successive courses shall be offset by not less than one-fourth the unit length, or the masonry walls shall be reinforced longitudinally as required in Section R608.2.2.

R608.2.2 Masonry laid in stack bond. Where unit masonry is laid with less head joint offset than in Section R608.2.1, the minimum area of horizontal reinforcement placed in mortar bed joints or in bond beams spaced not more than 48 inches (1219 mm) apart, shall be 0.0007 times the vertical cross-sectional area of the wall.

SECTION R609
GROUTED MASONRY

R609.1 General. Grouted multiple-wythe masonry is a form of construction in which the space between the wythes is solidly filled with grout. It is not necessary for the cores of masonry units to be filled with grout. Grouted hollow unit masonry is a form of construction in which certain cells of hollow units are continuously filled with grout.

R609.1.1 Grout. Grout shall consist of cementitious material and aggregate in accordance with ASTM C 476 and the proportion specifications of Table R609.1.1. Type M or Type S mortar to which sufficient water has been added to produce pouring consistency can be used as grout.

R609.1.2 Grouting requirements. Maximum pour heights and the minimum dimensions of spaces provided for grout placement shall conform to Table R609.1.2. If the work is stopped for one hour or longer, the horizontal construction joints shall be formed by stopping all tiers at the same elevation and with the grout 1 inch (25 mm) below the top.

R609.1.3 Grout space (cleaning). Provision shall be made for cleaning grout space. Mortar projections that project more than 0.5 inch (13 mm) into grout space and any other foreign matter shall be removed from grout space prior to inspection and grouting.

R609.1.4 Grout placement. Grout shall be a plastic mix suitable for pumping without segregation of the constituents and shall be mixed thoroughly. Grout shall be placed by pumping or by an *approved* alternate method and shall be placed before any initial set occurs and in no case more than $1^1/_2$ hours after water has been added. Grouting shall be done in a continuous pour, in lifts not exceeding 5 feet (1524 mm). It shall be consolidated by puddling or mechanical vibrating during placing and reconsolidated after excess moisture has been absorbed but before plasticity is lost.

R609.1.4.1 Grout pumped through aluminum pipes. Grout shall not be pumped through aluminum pipes.

R609.1.5 Cleanouts. Where required by the *building official*, cleanouts shall be provided as specified in this section. The cleanouts shall be sealed before grouting and after inspection.

TABLE R609.1.1
GROUT PROPORTIONS BY VOLUME FOR MASONRY CONSTRUCTION

TYPE	PORTLAND CEMENT OR BLENDED CEMENT SLAG CEMENT	HYDRATED LIME OR LIME PUTTY	AGGREGATE MEASURED IN A DAMP, LOOSE CONDITION	
			Fine	Coarse
Fine	1	0 to 1/10	$2^1/_4$ to 3 times the sum of the volume of the cementitious materials	—
Coarse	1	0 to 1/10	$2^1/_4$ to 3 times the sum of the volume of the cementitious materials	1 to 2 times the sum of the volumes of the cementitious materials

TABLE R609.1.2
GROUT SPACE DIMENSIONS AND POUR HEIGHTS

GROUT TYPE	GROUT POUR MAXIMUM HEIGHT (feet)	MINIMUM WIDTH OF GROUT SPACES[a,b] (inches)	MINIMUM GROUT[b,c] SPACE DIMENSIONS FOR GROUTING CELLS OF HOLLOW UNITS (inches x inches)
Fine	1	0.75	1.5 × 2
	5	2	2 × 3
	12	2.5	2.5 × 3
	24	3	3 × 3
Coarse	1	1.5	1.5 × 3
	5	2	2.5 × 3
	12	2.5	3 × 3
	24	3	3 × 4

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

a. For grouting between masonry wythes.

b. Grout space dimension is the clear dimension between any masonry protrusion and shall be increased by the horizontal projection of the diameters of the horizontal bars within the cross section of the grout space.

c. Area of vertical reinforcement shall not exceed 6 percent of the area of the grout space.

R609.1.5.1 Grouted multiple-wythe masonry. Cleanouts shall be provided at the bottom course of the exterior wythe at each pour of grout where such pour exceeds 5 feet (1524 mm) in height.

R609.1.5.2 Grouted hollow unit masonry. Cleanouts shall be provided at the bottom course of each cell to be grouted at each pour of grout, where such pour exceeds 4 feet (1219 mm) in height.

R609.2 Grouted multiple-wythe masonry. Grouted multiple-wythe masonry shall conform to all the requirements specified in Section R609.1 and the requirements of this section.

R609.2.1 Bonding of backup wythe. Where all interior vertical spaces are filled with grout in multiple-wythe construction, masonry headers shall not be permitted. Metal wall ties shall be used in accordance with Section R608.1.2 to prevent spreading of the wythes and to maintain the vertical alignment of the wall. Wall ties shall be installed in accordance with Section R608.1.2 when the backup wythe in multiple-wythe construction is fully grouted.

R609.2.2 Grout spaces. Fine grout shall be used when interior vertical space to receive grout does not exceed 2 inches (51 mm) in thickness. Interior vertical spaces exceeding 2 inches (51 mm) in thickness shall use coarse or fine grout.

R609.2.3 Grout barriers. Vertical grout barriers or dams shall be built of *solid masonry* across the grout space the entire height of the wall to control the flow of the grout horizontally. Grout barriers shall not be more than 25 feet (7620 mm) apart. The grouting of any section of a wall between control barriers shall be completed in one day with no interruptions greater than one hour.

R609.3 Reinforced grouted multiple-wythe masonry. Reinforced grouted multiple-wythe masonry shall conform to all the requirements specified in Sections R609.1 and R609.2 and the requirements of this section.

R609.3.1 Construction. The thickness of grout or mortar between masonry units and reinforcement shall not be less than $^1/_4$ inch (7 mm), except that $^1/_4$-inch (7 mm) bars may be laid in horizontal mortar joints at least $^1/_2$ inch (13 mm) thick, and steel wire reinforcement may be laid in horizontal mortar joints at least twice the thickness of the wire diameter.

R609.4 Reinforced hollow unit masonry. Reinforced hollow unit masonry shall conform to all the requirements of Section R609.1 and the requirements of this section.

R609.4.1 Construction. Requirements for construction shall be as follows:

1. Reinforced hollow-unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. Walls and cross webs forming cells to be filled shall be full-bedded in mortar to prevent leakage of grout. Head and end joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells. Bond shall be provided by lapping units in successive vertical courses.
2. Cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell of dimensions prescribed in Table R609.1.2.
3. Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 200 diameters of the reinforcement.
4. Cells containing reinforcement shall be filled solidly with grout. Grout shall be poured in lifts of 8-foot (2438 mm) maximum height. When a total grout pour exceeds 8 feet (2438 mm) in height, the grout shall be placed in lifts not exceeding 5 feet (1524 mm) and special inspection during grouting shall be required.
5. Horizontal steel shall be fully embedded by grout in an uninterrupted pour.

SECTION R610
GLASS UNIT MASONRY

R610.1 General. Panels of glass unit masonry located in load-bearing and nonload-bearing exterior and interior walls shall be constructed in accordance with this section.

R610.2 Materials. Hollow glass units shall be partially evacuated and have a minimum average glass face thickness of $^3/_{16}$ inch (5 mm). The surface of units in contact with mortar shall be treated with a polyvinyl butyral coating or latex-based paint. The use of reclaimed units is prohibited.

R610.3 Units. Hollow or solid glass block units shall be standard or thin units.

R610.3.1 Standard units. The specified thickness of standard units shall be at least $3^7/_8$ inches (98 mm).

R610.3.2 Thin units. The specified thickness of thin units shall be at least $3^1/_8$ inches (79 mm) for hollow units and at least 3 inches (76 mm) for solid units.

R610.4 Isolated panels. Isolated panels of glass unit masonry shall conform to the requirements of this section.

R610.4.1 Exterior standard-unit panels. The maximum area of each individual standard-unit panel shall be 144 square feet (13.4 m^2) when the design wind pressure is 20 psf (958 Pa). The maximum area of such panels subjected to design wind pressures other than 20 psf (958 Pa) shall be in accordance with Figure R610.4.1. The maximum panel dimension between structural supports shall be 25 feet (7620 mm) in width or 20 feet (6096 mm) in height.

R610.4.2 Exterior thin-unit panels. The maximum area of each individual thin-unit panel shall be 85 square feet (7.9 m^2). The maximum dimension between structural supports shall be 15 feet (4572 mm) in width or 10 feet (3048 mm) in height. Thin units shall not be used in applications where the design wind pressure as stated in Table R301.2(1) exceeds 20 psf (958 Pa).

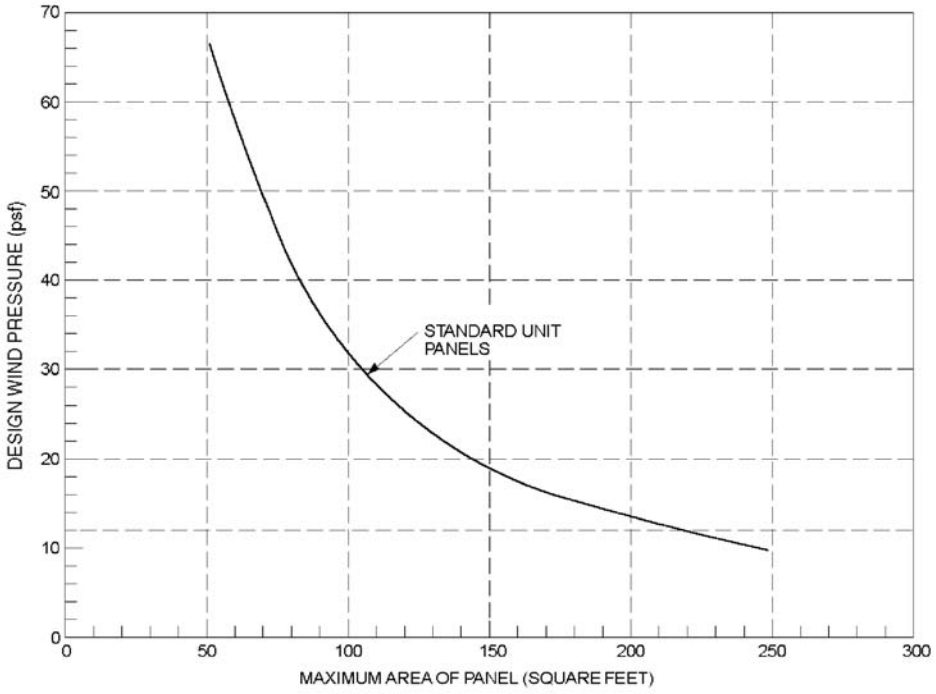
R610.4.3 Interior panels. The maximum area of each individual standard-unit panel shall be 250 square feet (23.2 m^2). The maximum area of each thin-unit panel shall be 150 square feet (13.9 m^2). The maximum dimension between structural supports shall be 25 feet (7620 mm) in width or 20 feet (6096 mm) in height.

R610.4.4 Curved panels. The width of curved panels shall conform to the requirements of Sections R610.4.1, R610.4.2 and R610.4.3, except additional structural supports shall be provided at locations where a curved section joins a straight section, and at inflection points in multicurved walls.

R610.5 Panel support. Glass unit masonry panels shall conform to the support requirements of this section.

R610.5.1 Deflection. The maximum total deflection of structural members that support glass unit masonry shall not exceed $^1/_{600}$.

R610.5.2 Lateral support. Glass unit masonry panels shall be laterally supported along the top and sides of the panel. Lateral supports for glass unit masonry panels shall be designed to resist a minimum of 200 pounds per lineal feet (2918 N/m) of panel, or the actual applied loads, whichever is greater. Except



For SI: 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kPa.

FIGURE R610.4.1
GLASS UNIT MASONRY DESIGN WIND LOAD RESISTANCE

for single unit panels, lateral support shall be provided by panel anchors along the top and sides spaced a maximum of 16 inches (406 mm) on center or by channel-type restraints. Single unit panels shall be supported by channel-type restraints.

Exceptions:

1. Lateral support is not required at the top of panels that are one unit wide.
2. Lateral support is not required at the sides of panels that are one unit high.

R610.5.2.1 Panel anchor restraints. Panel anchors shall be spaced a maximum of 16 inches (406 mm) on center in both jambs and across the head. Panel anchors shall be embedded a minimum of 12 inches (305 mm) and shall be provided with two fasteners so as to resist the loads specified in Section R610.5.2.

R610.5.2.2 Channel-type restraints. Glass unit masonry panels shall be recessed at least 1 inch (25 mm) within channels and chases. Channel-type restraints shall be oversized to accommodate expansion material in the opening, packing and sealant between the framing restraints, and the glass unit masonry perimeter units.

R610.6 Sills. Before bedding of glass units, the sill area shall be covered with a water base asphaltic emulsion coating. The coating shall be a minimum of $^1/_8$ inch (3 mm) thick.

R610.7 Expansion joints. Glass unit masonry panels shall be provided with expansion joints along the top and sides at all structural supports. Expansion joints shall be a minimum of $^3/_8$ inch (10 mm) in thickness and shall have sufficient thickness to accommodate displacements of the supporting structure. Expansion joints shall be entirely free of mortar and other debris and shall be filled with resilient material.

R610.8 Mortar. Glass unit masonry shall be laid with Type S or N mortar. Mortar shall not be retempered after initial set. Mortar unused within $1^1/_2$ hours after initial mixing shall be discarded.

R610.9 Reinforcement. Glass unit masonry panels shall have horizontal joint reinforcement spaced a maximum of 16 inches (406 mm) on center located in the mortar bed joint. Horizontal joint reinforcement shall extend the entire length of the panel but shall not extend across expansion joints. Longitudinal wires shall be lapped a minimum of 6 inches (152 mm) at splices. Joint reinforcement shall be placed in the bed joint immediately below and above openings in the panel. The reinforcement shall have not less than two parallel longitudinal wires of size W1.7 or greater, and have welded cross wires of size W1.7 or greater.

R610.10 Placement. Glass units shall be placed so head and bed joints are filled solidly. Mortar shall not be furrowed. Head and bed joints of glass unit masonry shall be $^1/_4$ inch (6.4 mm) thick, except that vertical joint thickness of radial panels shall not be less than $^1/_8$ inch (3 mm) or greater than $^5/_8$ inch (16 mm). The bed joint thickness tolerance shall be minus $^1/_{16}$ inch (1.6 mm) and plus $^1/_8$ inch (3 mm). The head joint thickness tolerance shall be plus or minus $^1/_8$ inch (3 mm).

SECTION R611
EXTERIOR CONCRETE WALL CONSTRUCTION

R611.1 General. Exterior concrete walls shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of PCA 100 or ACI 318. When PCA 100, ACI 318 or the provisions of this section are used to design concrete walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.

R611.1.1 Interior construction. These provisions are based on the assumption that interior walls and partitions, both load-bearing and nonload-bearing, floors and roof/ceiling assemblies are constructed of *light-framed construction* complying with the limitations of this code and the additional limitations of Section R611.2. Design and construction of light-framed assemblies shall be in accordance with the applicable provisions of this code. Where second-story exterior walls are of *light-framed construction*, they shall be designed and constructed as required by this code.

Aspects of concrete construction not specifically addressed by this code, including interior concrete walls, shall comply with ACI 318.

R611.1.2 Other concrete walls. Exterior concrete walls constructed in accordance with this code shall comply with the shapes and minimum concrete cross-sectional dimensions of Table R611.3. Other types of forming systems resulting in concrete walls not in compliance with this section shall be designed in accordance with ACI 318.

R611.2 Applicability limits. The provisions of this section shall apply to the construction of exterior concrete walls for buildings not greater than 60 feet (18 288 mm) in plan dimensions, floors with clear spans not greater than 32 feet (9754 mm) and roofs with clear spans not greater than 40 feet (12 192 mm). Buildings shall not exceed 35 feet (10 668 mm) in mean roof height or two stories in height above-grade. Floor/ceiling dead loads shall not exceed 10 pounds per square foot (479 Pa), roof/ceiling dead loads shall not exceed 15 pounds per square foot (718 Pa) and *attic* live loads shall not exceed 20 pounds per square foot (958 Pa). Roof overhangs shall not exceed 2 feet (610 mm) of horizontal projection beyond the exterior wall and the dead load of the overhangs shall not exceed 8 pounds per square foot (383 Pa).

Walls constructed in accordance with the provisions of this section shall be limited to buildings subjected to a maximum design wind speed of 130 miles per hour (58 m/s) Exposure B, 110 miles per hour (49 m/s) Exposure C and 100 miles per hour (45 m/s) Exposure D. Walls constructed in accordance with the provisions of this section shall be limited to detached one- and two-family *dwellings* and townhouses assigned to Seismic Design Category A or B, and detached one- and two-family *dwellings* assigned to Seismic Design Category C.

Buildings that are not within the scope of this section shall be designed in accordance with PCA 100 or ACI 318.

R611.3 Concrete wall systems. Concrete walls constructed in accordance with these provisions shall comply with the shapes and minimum concrete cross-sectional dimensions of Table R611.3.

R611.3.1 Flat wall systems. Flat concrete wall systems shall comply with Table R611.3 and Figure R611.3(1) and have a minimum nominal thickness of 4 inches (102 mm).

R611.3.2 Waffle-grid wall systems. Waffle-grid wall systems shall comply with Table R611.3 and Figure R611.3(2). and shall have a minimum nominal thickness of 6 inches (152 mm) for the horizontal and vertical concrete members (cores). The core and web dimensions shall comply with Table R611. 3. The maximum weight of waffle-grid walls shall comply with Table R611.3.

R611.3.3 Screen-grid wall systems. Screen-grid wall systems shall comply with Table R611.3 and Figure R611.3(3) and shall have a minimum nominal thickness of 6 inches (152 mm) for the horizontal and vertical concrete members (cores). The core dimensions shall comply with Table R611.3. The maximum weight of screen-grid walls shall comply with Table R611.3.

R611.4 Stay-in-place forms. Stay-in-place concrete forms shall comply with this section.

R611.4.1 Surface burning characteristics. The flame spread index and smoke-developed index of forming material, other than foam plastic, left exposed on the interior shall comply with Section R302.9. The surface burning characteristics of foam plastic used in insulating concrete forms shall comply with Section R316.3.

R611.4.2 Interior covering. Stay-in-place forms constructed of rigid foam plastic shall be protected on the interior of the building as required by Sections R316.4 and R702.3.4. Where gypsum board is used to protect the foam plastic, it shall be installed with a mechanical fastening system. Use of adhesives is permitted in addition to mechanical fasteners.

R611.4.3 Exterior wall covering. Stay-in-place forms constructed of rigid foam plastics shall be protected from sunlight and physical damage by the application of an *approved* exterior wall covering complying with this code. Exterior surfaces of other stay-in-place forming systems shall be protected in accordance with this code.

Requirements for installation of masonry veneer, stucco and other finishes on the exterior of concrete walls and other construction details not covered in this section shall comply with the requirements of this code.

R611.5 Materials. Materials used in the construction of concrete walls shall comply with this section.

R611.5.1 Concrete and materials for concrete. Materials used in concrete, and the concrete itself, shall conform to requirements of this section, or ACI 318.

TABLE R611.3
DIMENSIONAL REQUIREMENTS FOR WALLS[a,b]

WALL TYPE AND NOMINAL THICKNESS	MAXIMUM WALL WEIGHT[c] (psf)	MINIMUM WIDTH, W, OF VERTICAL CORES (inches)	MINIMUM THICKNESS, T, OF VERTICAL CORES (inches)	MAXIMUM SPACING OF VERTICAL CORES (inches)	MAXIMUM SPACING OF HORIZONTAL CORES (inches)	MINIMUM WEB THICKNESS (inches)
4″ Flat[d]	50	N/A	N/A	N/A	N/A	N/A
6″ Flat[d]	75	N/A	N/A	N/A	N/A	N/A
8″ Flat[d]	100	N/A	N/A	N/A	N/A	N/A
10″ Flat[d]	125	N/A	N/A	N/A	N/A	N/A
6″ Waffle-grid	56	8[e]	5.5[e]	12	16	2
8″ Waffle-grid	76	8[f]	8[f]	12	16	2
6″ Screen-grid	53	6.25[g]	6.25[g]	12	12	N/A

For SI: 1 inch = 25.4 mm; 1 pound per square foot = 0.0479 kPa, 1 pound per cubic foot = 2402.77 kg/m^3, 1 square inch = 645.16 mm^2.

a. Width "W," thickness "T," spacing and web thickness, refer to Figures R611.3(2) and R611.3(3).

b. N/A indicates not applicable.

c. Wall weight is based on a unit weight of concrete of 150 pcf. For flat walls the weight is based on the nominal thickness. The tabulated values do not include any allowance for interior and exterior finishes.

d. Nominal wall thickness. The actual as-built thickness of a flat wall shall not be more than $^1/_2$-inch less or more than $^1/_4$-inch more than the nominal dimension indicated.

e. Vertical core is assumed to be elliptical-shaped. Another shape core is permitted provided the minimum thickness is 5 inches, the moment of inertia, *I*, about the centerline of the wall (ignoring the web) is not less than 65 in^4, and the area, *A*, is not less than 31.25 in^2. The width used to calculate *A* and *I* shall not exceed 8 inches.

f. Vertical core is assumed to be circular. Another shape core is permitted provided the minimum thickness is 7 inches, the moment of inertia, *I*, about the centerline of the wall (ignoring the web) is not less than 200 in^4, and the area, *A*, is not less than 49 in^2. The width used to calculate *A* and *I* shall not exceed 8 inches.

g. Vertical core is assumed to be circular. Another shape core is permitted provided the minimum thickness is 5.5 inches, the moment of inertia, *I*, about the centerline of the wall is not less than 76 in^4, and the area, *A*, is not less than 30.25 in^2. The width used to calculate *A* and *I* shall not exceed 6.25 inches.

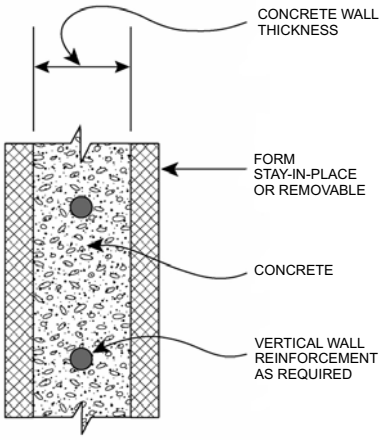
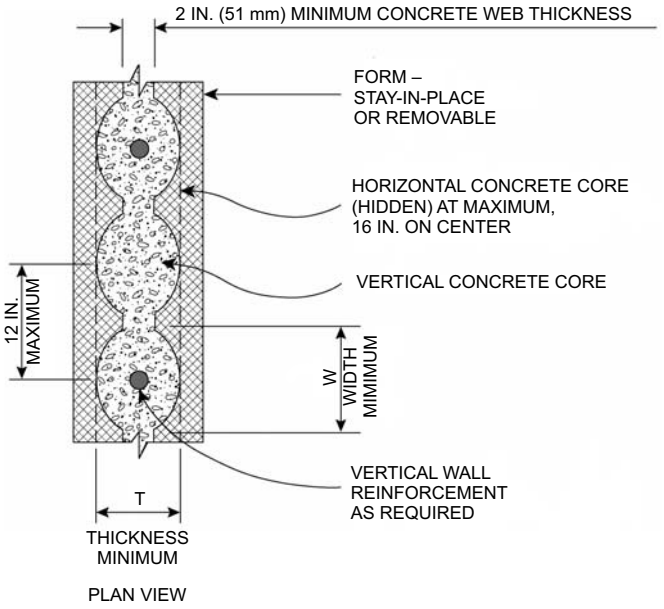
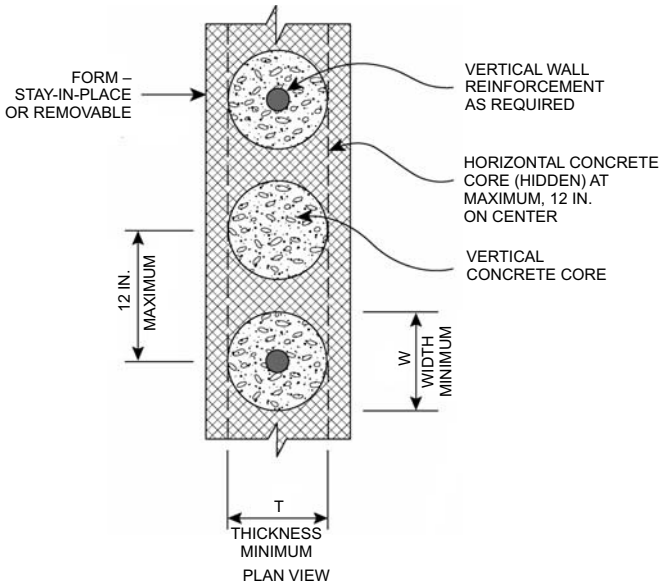


FIGURE R611.3(1)
FLAT WALL SYSTEM



For SI: 1 inch = 25.4 mm.

FIGURE R611.3(2)
WAFFLE-GRID WALL SYSTEM



For SI: 1 inch = 25.4 mm.

FIGURE R611.3(3)
SCREEN-GRID WALL SYSTEM

R611.5.1.1 Concrete mixing and delivery. Mixing and delivery of concrete shall comply with ASTM C 94 or ASTM C 685.

R611.5.1.2 Maximum aggregate size. The nominal maximum size of coarse aggregate shall not exceed one-fifth the narrowest distance between sides of forms, or three-fourths the clear spacing between reinforcing bars or between a bar and the side of the form.

Exception: When *approved*, these limitations shall not apply where removable forms are used and workability and methods of consolidation permit concrete to be placed without honeycombs or voids.

R611.5.1.3 Proportioning and slump of concrete. Proportions of materials for concrete shall be established to provide workability and consistency to permit concrete to be worked readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding. Slump of concrete placed in removable forms shall not exceed 6 inches (152 mm).

Exception: When *approved*, the slump is permitted to exceed 6 inches (152 mm) for concrete mixtures that are resistant to segregation, and are in accordance with the form manufacturer's recommendations.

Slump of concrete placed in stay-in-place forms shall exceed 6 inches (152 mm). Slump of concrete shall be determined in accordance with ASTM C 143.

R611.5.1.4 Compressive strength. The minimum specified compressive strength of concrete, f'_c, shall comply with Section R402.2 and shall be not less than 2,500 pounds per square inch (17.2 MPa) at 28 days.

R611.5.1.5 Consolidation of concrete. Concrete shall be consolidated by suitable means during placement and shall be worked around embedded items and reinforcement and into corners of forms. Where stay-in-place forms are used, concrete shall be consolidated by internal vibration.

Exception: When *approved*, self-consolidating concrete mixtures with slumps equal to or greater than 8 inches (203 mm) that are specifically designed for placement without internal vibration need not be internally vibrated.

R611.5.2 Steel reinforcement and anchor bolts.

R611.5.2.1 Steel reinforcement. Steel reinforcement shall comply with ASTM A 615, A 706, or A 996. ASTM A 996 bars produced from rail steel shall be Type R.

R611.5.2.2 Anchor bolts. Anchor bolts for use with connection details in accordance with Figures R611.9(1) through R611.9(12) shall be bolts with heads complying with ASTM A 307 or ASTM F 1554. ASTM A 307 bolts shall be Grade A (i.e., with heads). ASTM F 1554 bolts shall be Grade 36 minimum. Instead of bolts with heads, it is permissible to use rods with threads on both ends fabricated from steel complying with ASTM A 36. The threaded end of the rod to be embedded in the concrete shall be provided with a hex or square nut.

R611.5.2.3 Sheet steel angles and tension tie straps. Angles and tension tie straps for use with connection details in accordance with Figures R611.9(1) through R611.9(12) shall be fabricated from sheet steel complying with ASTM A 653 SS, ASTM A 792 SS, or ASTM A 875 SS. The steel shall be minimum Grade 33 unless a higher grade is required by the applicable figure.

R611.5.3 Form materials and form ties. Forms shall be made of wood, steel, aluminum, plastic, a composite of cement and foam insulation, a composite of cement and wood chips, or other *approved* material suitable for supporting and containing concrete. Forms shall provide sufficient strength to contain concrete during the concrete placement operation.

Form ties shall be steel, solid plastic, foam plastic, a composite of cement and wood chips, a composite of cement and foam plastic, or other suitable material capable of resisting the forces created by fluid pressure of fresh concrete.

R611.5.4 Reinforcement installation details.

R611.5.4.1 Support and cover. Reinforcement shall be secured in the proper location in the forms with tie wire or other bar support system such that displacement will not occur during the concrete placement operation. Steel reinforcement in concrete cast against the earth shall have a minimum cover of 3 inches (76 mm). Minimum cover for reinforcement in 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 and smaller, and 2 inches (50 mm) for No. 6 bars and larger. For concrete cast in removable forms that will not be exposed to the earth or weather, and for concrete cast in stay-in-place forms, minimum cover shall be $^3/_4$ inch (19 mm). The minus tolerance for cover shall not exceed the smaller of one-third the required cover and $^3/_8$ inch (10 mm). See Section R611.5.4.4 for cover requirements for hooks of bars developed in tension.

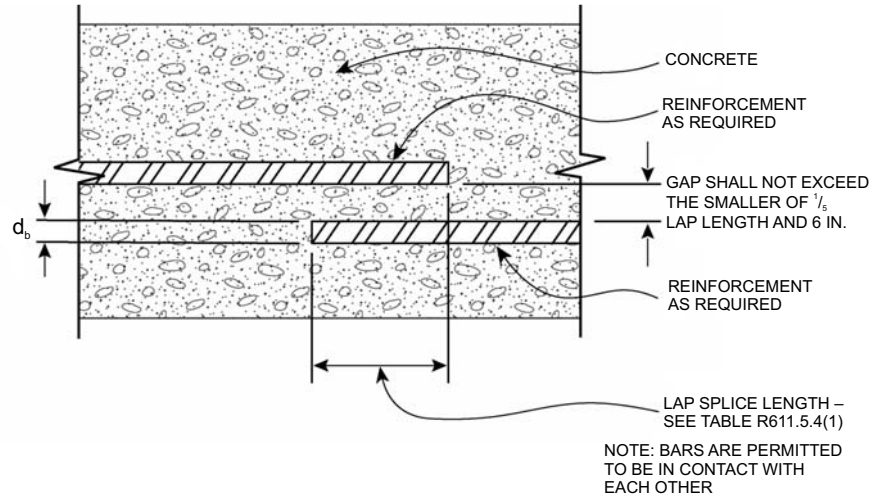
R611.5.4.2 Location of reinforcement in walls. For location of reinforcement in foundation walls and above-grade walls, see Sections R404.1.2.3.7.2 and R611.6.5, respectively.

R611.5.4.3 Lap splices. Vertical and horizontal wall reinforcement required by Sections R611.6 and R611.7 shall be the longest lengths practical. Where splices are necessary in reinforcement, the length of lap splices shall be in accordance with Table R611.5.4(1) and Figure R611.5.4(1). The maximum gap between noncontact parallel bars at a lap splice shall not exceed the smaller of one-fifth the required lap length and 6 inches (152 mm). See Figure R611.5.4(1).

TABLE R611.5.4(1)
LAP SPLICE AND TENSION DEVELOPMENT LENGTHS

		YIELD STRENGTH OF STEEL, f_y - psi (MPa)	
		40,000 (280)	60,000 (420)
	BAR SIZE NO.	Splice length or tension development length (inches)	
Lap splice length–tension	4	20	30
	5	25	38
	6	30	45
Tension development length for straight bar	4	15	23
	5	19	28
	6	23	34
Tension development length for: a. 90-degree and 180-degree standard hooks with not less than $2^1/_2$ inches of side cover perpendicular to plane of hook, and b. 90-degree standard hooks with not less than 2 inches of cover on the bar extension beyond the hook.	4	6	9
	5	7	11
	6	8	13
Tension development length for bar with 90-degree or 180-degree standard hook having less cover than required above.	4	8	12
	5	10	15
	6	12	18

For SI: 1 inch = 25.4 mm, 1 degree = 0.0175 rad.



For SI: 1 inch = 25.4 mm.

FIGURE R611.5.4(1)
LAP SPLICES

R611.5.4.4 Development of bars in tension. Where bars are required to be developed in tension by other provisions of this code, development lengths and cover for hooks and bar extensions shall comply with Table R611.5.4(1) and Figure R611.5.4 (2). The development lengths shown in Table R611.5.4(1) also apply to bundled bars in lintels installed in accordance with Section R611.8.2.2.

R611.5.4.5 Standard hooks. Where reinforcement is required by this code to terminate with a standard hook, the hook shall comply with Figure R611.5.4(3).

R611.5.4.6 Webs of waffle-grid walls. Reinforcement, including stirrups, shall not be placed in webs of waffle-grid walls, including lintels. Webs are permitted to have form ties.

R611.5.4.7 Alternate grade of reinforcement and spacing. Where tables in Sections R404.1.2 and R611.6 specify vertical wall reinforcement based on minimum bar size and maximum spacing, which are based on Grade 60 (420 MPa) steel reinforcement, different size bars and/or bars made from a different grade of steel are permitted provided an equivalent area of steel per linear foot of wall is provided. Use of Table R611.5.4(2) is permitted to determine the maximum bar spacing for different bar sizes than specified in the tables and/or bars made from a different grade of steel. Bars shall not be spaced less than one-half the wall thickness, or more than 48 inches (1219 mm) on center.

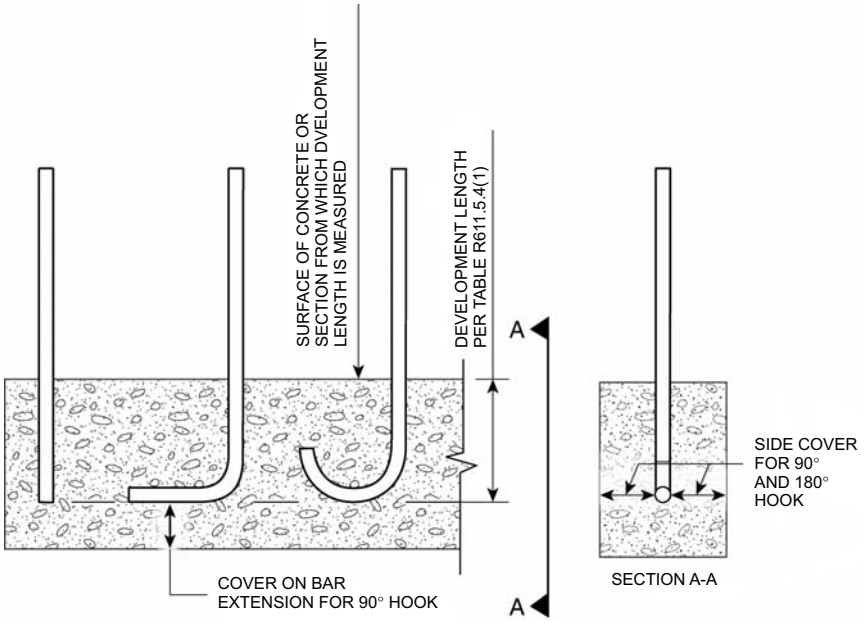
R611.5.5 Construction joints in walls. Construction joints shall be made and located to not impair the strength of the wall. Construction joints in plain concrete walls, including walls required to have not less than No. 4 bars at 48 inches (1219 mm) on center by Section R611.6, shall be located at points of lateral support, and a minimum of one No. 4 bar shall extend across the construction joint at a spacing not to exceed 24 inches (610 mm) on center. Construction joint reinforcement shall have a minimum of 12 inches (305 mm) embedment on both sides of the joint. Construction joints in reinforced concrete walls shall be located in the middle third of the span between lateral supports, or located and constructed as required for joints in plain concrete walls.

Exception: Vertical wall reinforcement required by this code is permitted to be used in lieu of construction joint reinforcement, provided the spacing does not exceed 24 inches (610 mm), or the combination of wall reinforcement and No. 4 bars described above does not exceed 24 inches (610 mm).

R611.6 Above-grade wall requirements.

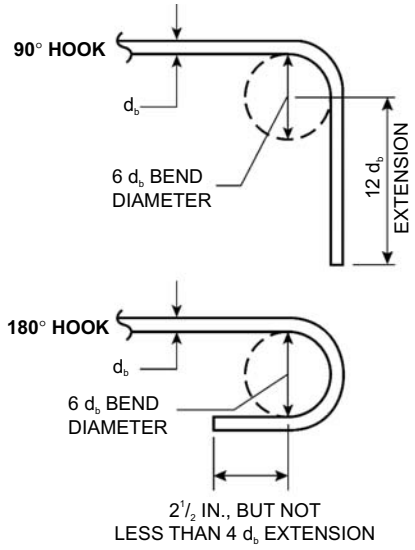
R611.6.1 General. The minimum thickness of load-bearing and nonload-bearing above-grade walls and reinforcement shall be as set forth in the appropriate table in this section based on the type of wall form to be used. Where the wall or building is not within the limitations of Section R611.2, design is required by the tables in this section, or the wall is not within the scope of the tables in this section, the wall shall be designed in accordance with ACI 318.

Above-grade concrete walls shall be constructed in accordance with this section and Figure R611.6(1), R611.6(2), R611.6(3), or R611.6(4). Above-grade concrete walls that are continuous with stem walls and not laterally supported by the slab-on-ground shall be designed and constructed in accordance with this section. Concrete walls shall be supported on continuous foundation walls or slabs-on-ground that are monolithic with the footing in accordance with Section R403. The minimum length of solid wall without openings shall be in accordance with Section R611.7. Reinforcement around openings, including lintels, shall be in accordance with Section R611.8. Lateral support for above-grade walls in the out-of-plane direction shall be provided by connections to the floor framing system, if applicable, and to ceiling and roof framing systems in accordance with Section R611.9. The wall thickness shall be equal to or greater than the thickness of the wall in the *story* above.

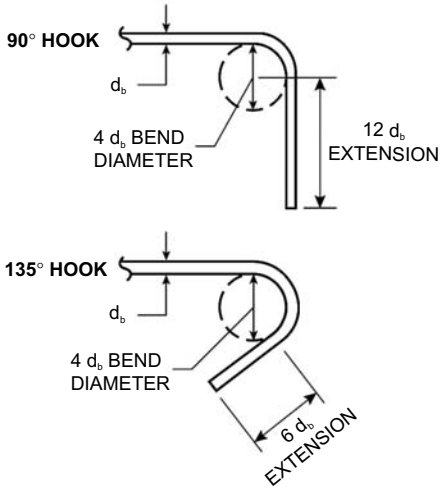


For SI: 1 degree = 0.0175 rad.

FIGURE R611.5.4(2)
DEVELOPMENT LENGTH AND COVER FOR HOOKS AND BAR EXTENSION



HOOKS FOR REINFORCEMENT IN WALLS AND FOUNDATIONS



HOOKS FOR STIRRUPS IN LINTELS

For SI: 1 inch = 25.4 mm, 1 degree = 0.0175 rad.

FIGURE R611.5.4(3)
STANDARD HOOKS

TABLE R611.5.4(2)
MAXIMUM SPACING FOR ALTERNATE BAR SIZE AND/OR ALTERNATE GRADE OF STEEL[a, b, c]

BAR SPACING FROM APPLICABLE TABLE IN SECTION R611.6 (inches)	BAR SIZE FROM APPLICABLE TABLE IN SECTION R611.6														
	#4					#5					#6				
	Alternate bar size and/or alternate grade of steel desired														
	Grade 60		Grade 40			Grade 60		Grade 40			Grade 60		Grade 40		
	#5	#6	#4	#5	#6	#4	#6	#4	#5	#6	#4	#5	#4	#5	#6
	Maximum spacing for alternate bar size and/or alternate grade of steel (inches)														
8	12	18	5	8	12	5	11	3	5	8	4	6	2	4	5
9	14	20	6	9	13	6	13	4	6	9	4	6	3	4	6
10	16	22	7	10	15	6	14	4	7	9	5	7	3	5	7
11	17	24	7	11	16	7	16	5	7	10	5	8	3	5	7
12	19	26	8	12	18	8	17	5	8	11	5	8	4	6	8
13	20	29	9	13	19	8	18	6	9	12	6	9	4	6	9
14	22	31	9	14	21	9	20	6	9	13	6	10	4	7	9
15	23	33	10	16	22	10	21	6	10	14	7	11	5	7	10
16	25	35	11	17	23	10	23	7	11	15	7	11	5	8	11
17	26	37	11	18	25	11	24	7	11	16	8	12	5	8	11
18	28	40	12	19	26	12	26	8	12	17	8	13	5	8	12
19	29	42	13	20	28	12	27	8	13	18	9	13	6	9	13
20	31	44	13	21	29	13	28	9	13	19	9	14	6	9	13
21	33	46	14	22	31	14	30	9	14	20	10	15	6	10	14
22	34	48	15	23	32	14	31	9	15	21	10	16	7	10	15
23	36	48	15	24	34	15	33	10	15	22	10	16	7	11	15
24	37	48	16	25	35	15	34	10	16	23	11	17	7	11	16
25	39	48	17	26	37	16	35	11	17	24	11	18	8	12	17
26	40	48	17	27	38	17	37	11	17	25	12	18	8	12	17
27	42	48	18	28	40	17	38	12	18	26	12	19	8	13	18
28	43	48	19	29	41	18	40	12	19	26	13	20	8	13	19
29	45	48	19	30	43	19	41	12	19	27	13	20	9	14	19
30	47	48	20	31	44	19	43	13	20	28	14	21	9	14	20
31	48	48	21	32	45	20	44	13	21	29	14	22	9	15	21
32	48	48	21	33	47	21	45	14	21	30	15	23	10	15	21
33	48	48	22	34	48	21	47	14	22	31	15	23	10	16	22
34	48	48	23	35	48	22	48	15	23	32	15	24	10	16	23
35	48	48	23	36	48	23	48	15	23	33	16	25	11	16	23
36	48	48	24	37	48	23	48	15	24	34	16	25	11	17	24
37	48	48	25	38	48	24	48	16	25	35	17	26	11	17	25
38	48	48	25	39	48	25	48	16	25	36	17	27	12	18	25
39	48	48	26	40	48	25	48	17	26	37	18	27	12	18	26
40	48	48	27	41	48	26	48	17	27	38	18	28	12	19	27
41	48	48	27	42	48	26	48	18	27	39	19	29	12	19	27
42	48	48	28	43	48	27	48	18	28	40	19	30	13	20	28
43	48	48	29	44	48	28	48	18	29	41	20	30	13	20	29
44	48	48	29	45	48	28	48	19	29	42	20	31	13	21	29
45	48	48	30	47	48	29	48	19	30	43	20	32	14	21	30
46	48	48	31	48	48	30	48	20	31	44	21	32	14	22	31
47	48	48	31	48	48	30	48	20	31	44	21	33	14	22	31
48	48	48	32	48	48	31	48	21	32	45	22	34	15	23	32

For SI: 1 inch = 25.4 mm.

a. This table is for use with tables in Section R611.6 that specify the minimum bar size and maximum spacing of vertical wall reinforcement for foundation walls and above-grade walls. Reinforcement specified in tables in Section R611.6 is based on Grade 60 (420 MPa) steel reinforcement.

b. Bar spacing shall not exceed 48 inches on center and shall not be less than one-half the nominal wall thickness.

c. For Grade 50 (350 MPa) steel bars (ASTM A 996, Type R), use spacing for Grade 40 (280 MPa) bars or interpolate between Grade 40 (280 MPa) and Grade 60 (420 MPa).

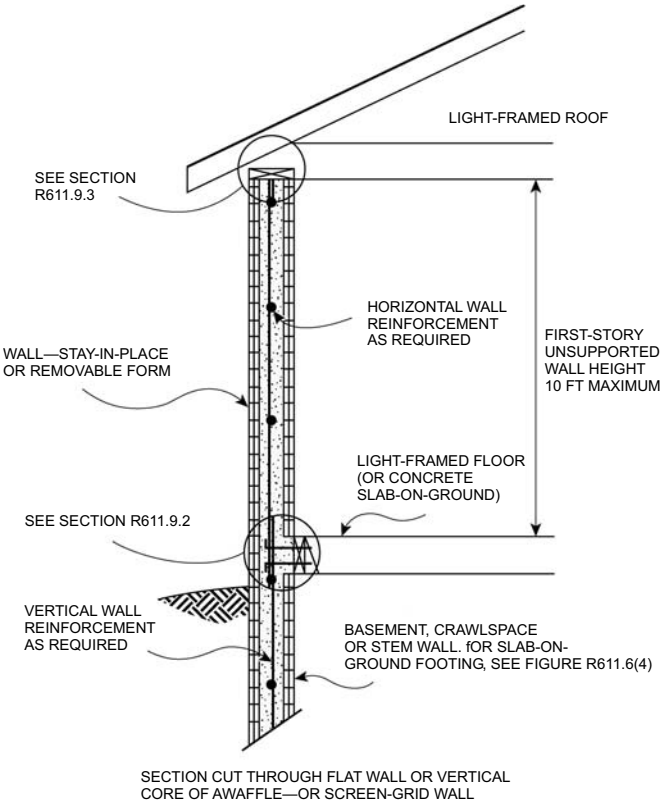
R611.6.2 Wall reinforcement for wind. Vertical wall reinforcement for resistance to out-of-plane wind forces shall be determined from Table R611.6(1), R611.6(2), R611.6(3) or R611.6(4). Also, see Sections R611.7.2.2.2 and R611.7.2.2.3. There shall be a vertical bar at all corners of exterior walls. Unless more horizontal reinforcement is required by Section R611.7.2.2.1, the minimum horizontal reinforcement shall be four No. 4 bars [Grade 40 (280 MPa)] placed as follows: top bar within 12 inches (305 mm) of the top of the wall, bottom bar within 12 inches (305 mm) of the finish floor, and one bar each at approximately one-third and two-thirds of the wall height.

R611.6.3 Continuity of wall reinforcement between stories. Vertical reinforcement required by this section shall be continuous between elements providing lateral support for the wall. Reinforcement in the wall of the *story* above shall be continuous with the reinforcement in the wall of the *story* below, or the foundation wall, if applicable. Lap splices, where required, shall comply with Section R611.5.4.3 and Figure R611.5.4(1). Where the above-grade wall is supported by a monolithic slab-on-ground and footing, dowel bars with a size and spacing to match the vertical above-grade concrete wall reinforcement shall be embedded in the monolithic slab-on-ground and footing the distance required to develop the dowel bar in tension in accordance with Section R611.5.4.4 and Figure R611.5.4(2) and lap-spliced with the above-grade wall reinforcement in accordance with Section R611.5.4.3 and Figure R611.5.4(1).

Exception: Where reinforcement in the wall above cannot be made continuous with the reinforcement in the wall below, the bottom of the reinforcement in the wall above shall be terminated in accordance with one of the following:

1. Extend below the top of the floor the distance required to develop the bar in tension in accordance with Section R611.5.4.4 and Figure R611.5.4(2).
2. Lap-spliced in accordance with Section R611.5.4.3 and Figure R611.5.4(1) with a dowel bar that extends into the wall below the distance required to develop the bar in tension in accordance with Section R611.5.4.4 and Figure R611.5.4(2).

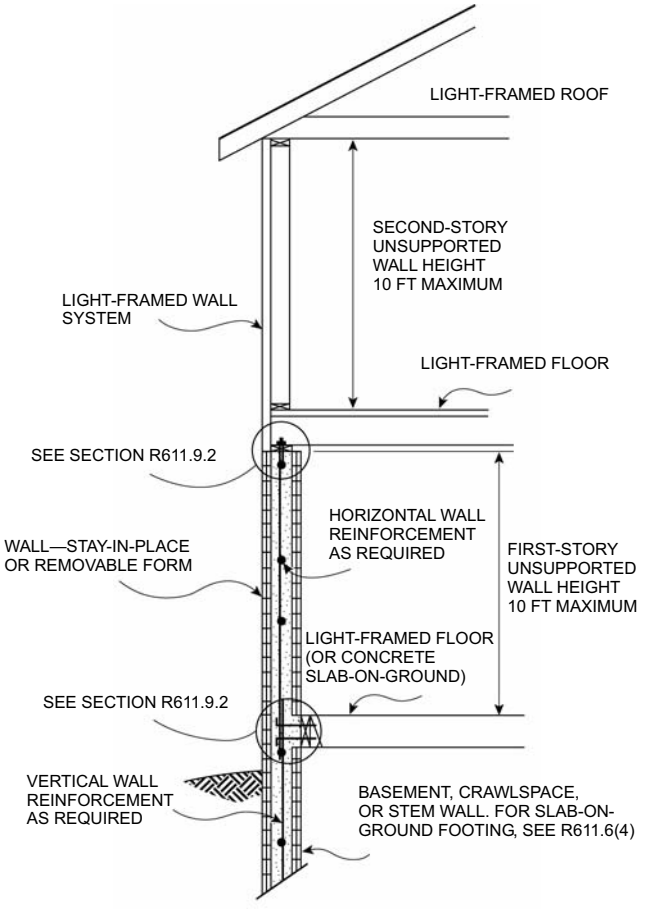
Where a construction joint in the wall is located below the level of the floor and less than the distance required to develop the bar in tension, the distance required to develop the bar in tension shall be measured from the top of the concrete below the joint. See Section R611.5.5.



SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF AWAFFLE—OR SCREEN-GRID WALL

For SI: 1 foot = 304.8 mm.

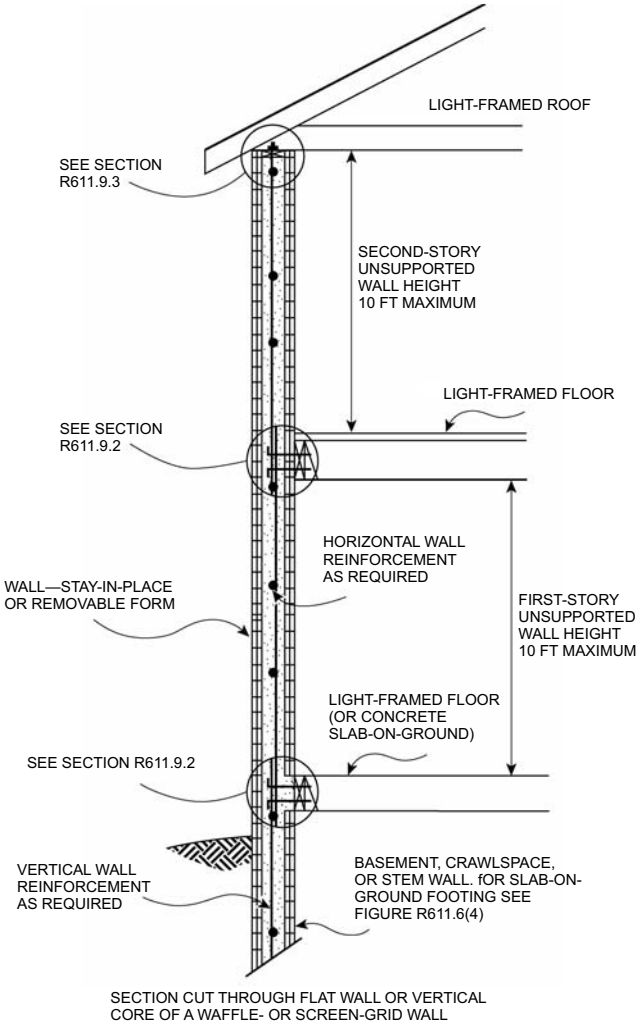
FIGURE R611.6(1)
ABOVE-GRADE CONCRETE WALL CONSTRUCTION ONE



SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF A WAFFLE—OR SCREEN-GRID WALL

For SI: 1 foot = 304.8 mm.

FIGURE R611.6(2)
ABOVE-GRADE CONCRETE WALL CONSTRUCTION CONCRETE FIRST-STORY AND LIGHT-FRAMED SECOND-STORY

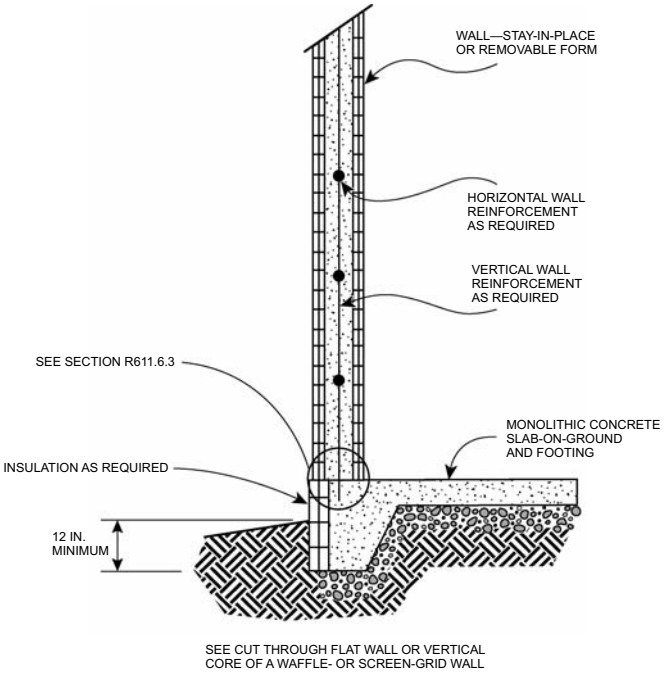


For SI: 1 foot = 304.8 mm.

FIGURE R611.6(3)
ABOVE-GRADE CONCRETE WALL CONSTRUCTION TWO-STORY

R611.6.4 Termination of reinforcement. Where indicated in items 1 through 3 below, vertical wall reinforcement in the top-most *story* with concrete walls shall be terminated with a 90-degree (1.57 rad) standard hook complying with Section R611.5.4.5 and Figure R611.5.4(3).

1. Vertical bars adjacent to door and window openings required by Section R611.8.1.2.
2. Vertical bars at the ends of required solid wall segments. See Section R611.7.2.2.2.
3. Vertical bars (other than end bars – see item 2) used as shear reinforcement in required solid wall segments where the reduction factor for design strength, R_3, used is based on the wall having horizontal and vertical shear reinforcement. See Section R611.7.2.2.3.



For SI: 1 inch = 25.4 mm.

FIGURE R611.6(4)
ABOVE-GRADE CONCRETE WALL SUPPORTED ON MONOLITHIC SLAB-ON GROUND FOOTING

The bar extension of the hook shall be oriented parallel to the horizontal wall reinforcement and be within 4 inches (102 mm) of the top of the wall.

Horizontal reinforcement shall be continuous around the building corners by bending one of the bars and lap-splicing it with the bar in the other wall in accordance with Section R611.5.4.3 and Figure R611.5.4(1).

Exception: In lieu of bending horizontal reinforcement at corners, separate bent reinforcing bars shall be permitted provided that the bent bar is lap-spliced with the horizontal reinforcement in both walls in accordance with Section R611.5.4.3 and Figure R611.5.4(1).

In required solid wall segments where the reduction factor for design strength, R_3, is based on the wall having horizontal and vertical shear reinforcement in accordance with Section R611.7.2.2.1, horizontal wall reinforcement shall be terminated with a standard hook complying with Section R611.5.4.5 and Figure R611.5.4(3) or in a lap-splice, except at corners where the reinforcement shall be continuous as required above.

R611.6.5 Location of reinforcement in wall. Except for vertical reinforcement at the ends of required solid wall segments, which shall be located as required by Section R611.7.2.2.2, the location of the vertical reinforcement shall not vary from the center of the wall by more than the greater of 10 percent of the wall thickness and $^3/_8$-inch (10 mm). Horizontal and vertical reinforcement shall be located to provide not less than the minimum cover required by Section R611.5.4.1.

TABLE R611.6(1)
MINIMUM VERTICAL REINFORCEMENT FOR FLAT ABOVE-GRADE WALLS[a, b, c, d, e]

MAXIMUM WIND SPEED (mph)			MAXIMUM UNSUPPORTED WALL HEIGHT PER STORY (feet)	MINIMUM VERTICAL REINFORCEMENT—BAR SIZE AND SPACING (inches)[f, g]							
				Nominal[h] wall thickness (inches)							
Exposure Category				4		6		8		10	
B	C	D		Top[i]	Side[i]	Top[i]	Side[i]	Top[i]	Side[i]	Top[i]	Side[i]
85	—	—	8	4@48	4@48	4@48	4@48	4@48	4@48	4@48	4@48
			9	4@48	4@43	4@48	4@48	4@48	4@48	4@48	4@48
			10	4@47	4@36	4@48	4@48	4@48	4@48	4@48	4@48
90	—	—	8	4@48	4@47	4@48	4@48	4@48	4@48	4@48	4@48
			9	4@48	4@39	4@48	4@48	4@48	4@48	4@48	4@48
			10	4@42	4@34	4@48	4@48	4@48	4@48	4@48	4@48
100	85	—	8	4@48	4@40	4@48	4@48	4@48	4@48	4@48	4@48
			9	4@42	4@34	4@48	4@48	4@48	4@48	4@48	4@48
			10	4@34	4@34	4@48	4@48	4@48	4@48	4@48	4@48
110	90	85	8	4@44	4@34	4@48	4@48	4@48	4@48	4@48	4@48
			9	4@34	4@34	4@48	4@48	4@48	4@48	4@48	4@48
			10	4@34	4@31	4@48	4@37	4@48	4@48	4@48	4@48
120	100	90	8	4@36	4@34	4@48	4@48	4@48	4@48	4@48	4@48
			9	4@34	4@32	4@48	4@38	4@48	4@48	4@48	4@48
			10	4@30	4@27	4@48	5@48	4@48	4@48	4@48	4@48
130	110	100	8	4@34	4@34	4@48	4@48	4@48	4@48	4@48	4@48
			9	4@32	4@28	4@48	4@33	4@48	4@48	4@48	4@48
			10	4@26	4@23	4@48	5@43	4@48	4@48	4@48	4@48

For SI:1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s, 1 pound per square inch = 1.895kPa.

a. Table is based on ASCE 7 components and cladding wind pressures for an enclosed building using a mean roof height of 35 ft, interior wall area 4, an effective wind area of 10 ft^2, and topographic factor, K_{zt}, and importance factor, I, equal to 1.0.

b. Table is based on concrete with a minimum specified compressive strength of 2,500 psi.

c. See Section R611.6.5 for location of reinforcement in wall.

d. Deflection criterion is $L/240$, where L is the unsupported height of the wall in inches.

e. Interpolation is not permitted.

f. Where No. 4 reinforcing bars at a spacing of 48 inches are specified in the table, use of bars with a minimum yield strength of 40,000 psi or 60,000 psi is permitted.

g. Other than for No. 4 bars spaced at 48 inches on center, table values are based on reinforcing bars with a minimum yield strength of 60,000 psi. Vertical reinforcement with a yield strength of less than 60,000 psi and/or bars of a different size than specified in the table are permitted in accordance with Section R611.5.4.7 and Table R611.5.4(2).

h. See Table R611.3 for tolerances on nominal thicknesses.

i. Top means gravity load from roof and/or floor construction bears on top of wall. Side means gravity load from floor construction is transferred to wall from a wood ledger or cold-formed steel track bolted to side of wall. Where floor framing members span parallel to the wall, use of the top bearing condition is permitted.

TABLE R611.6(2)
MINIMUM VERTICAL REINFORCEMENT FOR WAFFLE-GRID ABOVE-GRADE WALLS[a, b, c, d, e]

MAXIMUM WIND SPEED (mph)			MAXIMUM UNSUPPORTED WALL HEIGHT PER STORY (feet)	MINIMUM VERTICAL REINFORCEMENT—BAR SIZE AND SPACING (inches)[f, g]			
				Nominal[h] wall thickness (inches)			
Exposure Category				6		8	
B	C	D		Top[i]	Side[i]	Top[i]	Side[i]
85	—	—	8	4@48	4@36, 5@48	4@48	4@48
			9	4@48	4@30, 5@47	4@48	4@45
			10	4@48	4@26, 5@40	4@48	4@39
90	—	—	8	4@48	4@33, 5@48	4@48	4@48
			9	4@48	4@28, 5@43	4@48	4@42
			10	4@31, 5@48	4@24, 5@37	4@48	4@36
100	85	—	8	4@48	4@28, 5@44	4@48	4@43
			9	4@31, 5@48	4@24, 5@37	4@48	4@36
			10	4@25, 5@39	4@24, 5@37	4@48	4@31, 5@48
110	90	85	8	4@33, 5@48	4@25, 5@38	4@48	4@38
			9	4@26, 5@40	4@24, 5@37	4@48	4@31, 5@48
			10	4@24, 5@37	4@23, 5@35	4@48	4@27, 5@41
120	100	90	8	4@27, 5@42	4@24, 5@37	4@48	4@33, 5@48
			9	4@24, 5@37	4@23, 5@36	4@48	4@27, 5@43
			10	4@23, 5@35	4@19, 5@30	4@48	4@23, 5@36
130	110	100	8	4@24, 5@37	4@24, 5@37	4@48	4@29, 5@45
			9	4@24, 5@37	4@20, 5@32	4@48	4@24, 5@37
			10	4@19, 5@30	4@17, 5@26	4@23, 5@36	4@20, 5@31

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

a. Table is based on ASCE 7 components and cladding wind pressures for an enclosed building using a mean roof height of 35 ft (10 668 mm), interior wall area 4, an effective wind area of 10 ft^2 (0.9 m^2), and topographic factor, K_{zt}, and importance factor, I, equal to 1.0.

b. Table is based on concrete with a minimum specified compressive strength of 2,500 psi (17.2 MPa).

c. See Section R611.6.5 for location of reinforcement in wall.

d. Deflection criterion is $L/240$, where L is the unsupported height of the wall in inches.

e. Interpolation is not permitted.

f. Where No. 4 reinforcing bars at a spacing of 48 inches are specified in the table, use of bars with a minimum yield strength of 40,000 psi or 60,000 psi is permitted.

g. Other than for No. 4 bars spaced at 48 inches on center, table values are based on reinforcing bars with a minimum yield strength of 60,000 psi. Maximum spacings shown are the values calculated for the specified bar size. Where the bar used is Grade 60 (420 MPa) and the size specified in the table, the actual spacing in the wall shall not exceed a whole-number multiple of 12 inches (i.e., 12, 24, 36 and 48) that is less than or equal to the tabulated spacing. Vertical reinforcement with a yield strength of less than 60,000 psi and/or bars of a different size than specified in the table are permitted in accordance with Section R611.5.4.7 and Table R611.5.4(2).

h. See Table R611.3 for minimum core dimensions and maximum spacing of horizontal and vertical cores.

i. Top means gravity load from roof and/or floor construction bears on top of wall. Side means gravity load from floor construction is transferred to wall from a wood ledger or cold-formed steel track bolted to side of wall. Where floor framing members span parallel to the wall, the top bearing condition is permitted to be used.

TABLE R611.6(3)
MINIMUM VERTICAL REINFORCEMENT FOR 6-INCH SCREEN-GRID ABOVE-GRADE WALLS[a, b, c, d, e]

MAXIMUM WIND SPEED (mph)			MAXIMUM UNSUPPORTED WALL HEIGHT PER STORY (feet)	MINIMUM VERTICAL REINFORCEMENT—BAR SIZE AND SPACING (inches)[f, g]	
				Nominal[h] wall thickness (inches)	
Exposure Category				6	
B	C	D		Top[i]	Side[i]
85	—	—	8	4@48	4@34, 5@48
			9	4@48	4@29, 5@45
			10	4@48	4@25, 5@39
90	—	—	8	4@48	4@31, 5@48
			9	4@48	4@27, 5@41
			10	4@30, 5@47	4@23, 5@35
100	85	—	8	4@48	4@27, 5@42
			9	4@30, 5@47	4@23, 5@35
			10	4@24, 5@38	4@22, 5@34
110	90	85	8	4@48	4@24, 5@37
			9	4@25, 5@38	4@22, 5@34
			10	4@22, 5@34	4@22, 5@34
120	100	90	8	4@26, 5@41	4@22, 5@34
			9	4@22, 5@34	4@22, 5@34
			10	4@22, 6@34	4@19, 5@26
130	110	100	8	4@22, 5@35	4@22, 5@34
			9	4@22, 5@34	4@20, 5@30
			10	4@19, 5@29	4@16, 5@25

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mph = 0.447 m/s, pound per square inch = 6.895kPa.

a. Table is based on ASCE 7 components and cladding wind pressures for an enclosed building using a mean roof height of 35 ft, interior wall area 4, an effective wind area of 10 ft^2, and topographic factor, K_{zt}, and importance factor, I, equal to 1.0.

b. Table is based on concrete with a minimum specified compressive strength of 2,500 psi.

c. See Section R611.6.5 for location of reinforcement in wall.

d. Deflection criterion is $L/240$, where L is the unsupported height of the wall in inches.

e. Interpolation is not permitted.

f. Where No. 4 reinforcing bars at a spacing of 48 inches are specified in the table, use of bars with a minimum yield strength of 40,000 psi or 60,000 psi is permitted.

g. Other than for No. 4 bars spaced at 48 inches on center, table values are based on reinforcing bars with a minimum yield strength of 60,000 psi (420 MPa). Maximum spacings shown are the values calculated for the specified bar size. Where the bar used is Grade 60 and the size specified in the table, the actual spacing in the wall shall not exceed a whole-number multiple of 12 inches (i.e., 12, 24, 36 and 48) that is less than or equal to the tabulated spacing. Vertical reinforcement with a yield strength of less than 60,000 psi and/or bars of a different size than specified in the table are permitted in accordance with Section R611.5.4.7 and Table R611.5.4(2).

h. See Table R611.3 for minimum core dimensions and maximum spacing of horizontal and vertical cores.

i. Top means gravity load from roof and/or floor construction bears on top of wall. Side means gravity load from floor construction is transferred to wall from a wood ledger or cold-formed steel track bolted to side of wall. Where floor framing members span parallel to the wall, use of the top bearing condition is permitted.

TABLE R611.6(4)
MINIMUM VERTICAL REINFORCEMENT FOR FLAT, WAFFLE- AND SCREEN-GRID ABOVE-GRADE WALLS DESIGNED CONTINUOUS WITH FOUNDATION STEM WALLS[a, b, c, d, e, k, l]

MAXIMUM WIND SPEED (mph)			HEIGHT OF STEM WALL[h, i] (feet)	MAXIMUM DESIGN LATERAL SOIL LOAD (psf/ft)	MAXIMUM UNSUPPORTED HEIGHT OF ABOVE-GRADE WALL (feet)	MINIMUM VERTICAL REINFORCEMENT—BAR SIZE AND SPACING (inches)[f, g]						
						Wall type and nominal thickness[j] (inches)						
Exposure Category						Flat				Waffle		Screen
B	C	D				4	6	8	10	6	8	6
85	—	—	3	30	8	4@33	4@39	4@48	4@48	4@24	4@28	4@22
					10	4@26	5@48	4@41	4@48	4@19	4@22	4@18
				60	10	4@21	5@40	5@48	4@44	4@16	4@19	4@15
			6	30	10	DR	5@22	6@35	6@43	DR	4@11	DR
				60	10	DR	DR	6@26	6@28	DR	DR	DR
90	—	—	3	30	8	4@30	4@36	4@48	4@48	4@22	4@26	4@21
					10	4@24	5@44	4@38	4@48	4@17	4@21	4@17
				60	10	4@20	5@37	4@48	4@41	4@15	4@18	4@14
			6	30	10	DR	5@21	6@35	6@41	DR	4@10	DR
				60	10	DR	DR	6@26	6@28	DR	DR	DR
100	85	—	3	30	8	4@26	5@48	4@42	4@48	4@19	4@23	4@18
					10	4@20	5@37	4@33	4@41	4@15	4@18	4@14
			6	60	10	4@17	5@34	5@44	4@36	4@13	4@17	4@12
				30	10	DR	5@20	6@35	6@38	DR	4@9	DR
				60	10	DR	DR	6@24	6@28	DR	DR	DR
110	90	85	3	30	8	4@22	5@42	4@37	4@46	4@16	4@20	4@16
					10	4@17	5@34	5@44	4@35	4@12	4@17	4@12
				60	10	4@15	5@34	5@39	5@48	4@11	4@17	4@11
			6	30	10	DR	5@18	6@35	6@35	DR	4@9	DR
				60	10	DR	DR	6@23	6@28	DR	DR	DR
120	100	90	3	30	8	4@19	5@37	5@48	4@40	4@14	4@17	4@14
					10	4@14	5@34	5@38	5@48	4@11	4@17	4@10
				60	10	4@13	5@33	6@48	5@43	4@10	4@16	4@9
			6	30	10	DR	5@16	6@33	6@32	DR	4@8	DR
				60	10	DR	DR	6@22	6@28	DR	DR	DR
130	110	100	3	30	8	4@17	5@34	5@44	4@36	4@12	4@17	4@10
					10	DR	5@32	6@47	5@42	4@9	4@15	DR
				60	10	DR	5@29	6@43	5@39	DR	4@14	DR
			6	30	10	DR	5@15	6@30	6@29	DR	4@7	DR
				60	10	DR	DR	6@21	6@27	DR	DR	DR

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s; 1 pound per square foot per foot = 0.1571kPa/m.

a. Table is based on ASCE 7 components and cladding wind pressures for an enclosed building using a mean roof height of 35 ft (10 668 mm), interior wall area 4, an effective wind area of 10 ft^2, and topographic factor, K_{zt}, and importance factor, I, equal to 1.0.

b. Table is based on concrete with a minimum specified compressive strength of 2,500 psi.

c. See Section R611.6.5 for location of reinforcement in wall.

d. Deflection criterion is $L/240$, where L is the height of the wall in inches from the exterior finish ground level to the top of the above-grade wall.

e. Interpolation is not permitted. For intermediate values of basic wind speed, heights of stem wall and above-grade wall, and design lateral soil load, use next higher value.

f. Where No. 4 reinforcing bars at a spacing of 48 inches are specified in the table, use of bars with a minimum yield strength of 40,000 psi or 60,000 psi is permitted.

g. Other than for No. 4 bars spaced at 48 inches on center, table values are based on reinforcing bars with a minimum yield strength of 60,000 psi. Maximum spacings shown are the values calculated for the specified bar size. In waffle and screen-grid walls where the bar used is Grade 60 and the size specified in the table, the actual spacing in the wall shall not exceed a whole-number multiple of 12 inches (i.e., 12, 24, 36 and 48) that is less than or equal to the tabulated spacing. Vertical reinforcement with a yield strength of less than 60,000 psi and/or bars of a different size than specified in the table are permitted in accordance with Section R611.5.4.7 and Table R611.5.4(2).

h. Height of stem wall is the distance from the exterior finish ground level to the top of the slab-on-ground.

i. Where the distance from the exterior finish ground level to the top of the slab-on-ground is equal to or greater than 4 feet, the stem wall shall be laterally supported at the top and bottom before backfilling. Where the wall is designed and constructed to be continuous with the above-grade wall, temporary supports bracing the top of the stem wall shall remain in place until the above-grade wall is laterally supported at the top by floor or roof construction.

j. See Table R611.3 for tolerances on nominal thicknesses, and minimum core dimensions and maximum spacing of horizontal and vertical cores for waffle- and screen-grid walls.

k. Tabulated values are applicable to construction where gravity loads bear on top of wall, and conditions where gravity loads from floor construction are transferred to wall from a wood ledger or cold-formed steel track bolted to side of wall. See Tables R611.6(1), R611.6(2) and R611.6(3).

l. DR indicates design required.

R611.7 Solid walls for resistance to lateral forces.

R611.7.1 Length of solid wall. Each exterior wall line in each *story* shall have a total length of solid wall required by Section R611.7.1.1. A solid wall is a section of flat, waffle-grid or screen-grid wall, extending the full *story height* without openings or penetrations, except those permitted by Section R611.7.2. Solid wall segments that contribute to the total length of solid wall shall comply with Section R611.7.2.

R611.7.1.1 Length of solid wall for wind. All buildings shall have solid walls in each exterior endwall line (the side of a building that is parallel to the span of the roof or floor framing) and sidewall line (the side of a building that is perpendicular to the span of the roof or floor framing) to resist lateral in-plane wind forces. The site-appropriate basic wind speed and exposure category shall be used in Tables R611.7(1A) through (1C) to determine the unreduced total length, UR, of solid wall required in each exterior endwall line and sidewall line. For buildings with a mean roof height of less than 35 feet (10 668 mm), the unreduced values determined from Tables R611.7(1A) though (1C) is permitted by multiplying by the applicable factor, R1, from Table R611.7(2); however, reduced values shall not be less than the minimum values in Tables R611.7(1A) through (1C). Where the floor-to-ceiling height of a *story* is less than 10 feet (3048 mm), the unreduced values determined from Tables R611.7(1A) through (C), including minimum values, is permitted to be reduced by multiplying by the applicable factor, R_2, from Table R611.7(3). To account for different design strengths than assumed in determining the values in Tables R611.7(1A) through (1C), the unreduced lengths determined from Tables R611.7(1A) through (1C), including minimum values, are permitted to be reduced by multiplying by the applicable factor, R_3, from Table R611.7(4). The reductions permitted by Tables R611.7(2), R611.7(3) and R611.7(4) are cumulative.

The total length of solid wall segments, *TL*, in a wall line that comply with the minimum length requirements of Section R611.7.2.1 [see Figure R611.7(1)] shall be equal to or greater than the product of the unreduced length of solid wall from Tables R611.7(1A) through (1C), *UR* and the applicable reduction factors, if any, from Tables R611.7(2), R611.7(3) and R611.7(4) as indicated by Equation R611-1.

$$TL \geq R_1 \cdot R_2 \cdot R_3 \cdot UR \qquad \textbf{(Equation R611-1)}$$

Where

TL = total length of solid wall segments in a wall line that comply with Section R611.7.2.1 [see Figure R611.7(1)], and

R_1 = 1.0 or reduction factor for mean roof height from Table R611.7(2),

R_2 = 1.0 or reduction factor for floor-to-ceiling wall height from Table R611.7(3),

R_3 = 1.0 or reduction factor for design strength from Table R611.7(4), and

UR = unreduced length of solid wall from Tables R611.7(1A) through (1C).

The total length of solid wall in a wall line, *TL*, shall not be less than that provided by two solid wall segments complying with the minimum length requirements of Section R611.7.2.1.

To facilitate determining the required wall thickness, wall type, number and *grade* of vertical bars at the each end of each solid wall segment, and whether shear reinforcement is required, use of Equation R611-2 is permitted.

$$R_3 \leq \frac{TL}{R_1 \cdot R_2 \cdot UR} \qquad \textbf{(Equation R611-2)}$$

After determining the maximum permitted value of the reduction factor for design strength, R_3, in accordance with Equation R611-2, select a wall type from Table R611.7(4) with R_3 less than or equal to the value calculated.

R611.7.2 Solid wall segments. Solid wall segments that contribute to the required length of solid wall shall comply with this section. Reinforcement shall be provided in accordance with Section R611.7.2.2 and Table R611.7(4). Solid wall segments shall extend the full story-height without openings, other than openings for the utilities and other building services passing through the wall. In flat walls and waffle-grid walls, such openings shall have an area of less than 30 square inches (19 355 mm^2) with no dimension exceeding $6^1/_4$ inches (159 mm), and shall not be located within 6 inches (152 mm) of the side edges of the solid wall segment. In screen-grid walls, such openings shall be located in the portion of the solid wall segment between horizontal and vertical cores of concrete and opening size and location are not restricted provided no concrete is removed.

R611.7.2.1 Minimum length of solid wall segment and maximum spacing. Only solid wall segments equal to or greater than 24 inches (610 mm) in length shall be included in the total length of solid wall required by Section R611.7.1. In addition, no more than two solid wall segments equal to or greater than 24 inches (610 mm) in length and less than 48 inches (1219 mm) in length shall be included in the required total length of solid wall. The maximum clear opening width shall be 18 feet (5486 mm). See Figure R611.7(1).

R611.7.2.2 Reinforcement in solid wall segments.

R611.7.2.2.1 Horizontal shear reinforcement. Where reduction factors for design strength, R_3, from Table R611.7(4) based on horizontal and vertical shear reinforcement being provided are used, solid wall segments shall have horizontal reinforcement consisting of minimum No. 4 bars. Horizontal shear

reinforcement shall be the same grade of steel required for the vertical reinforcement at the ends of solid wall segments by Section R611.7.2.2.2.

The spacing of horizontal reinforcement shall not exceed the smaller of one-half the length of the solid wall segment, minus 2 inches (51 mm), and 18 inches (457 mm). Horizontal shear reinforcement shall terminate in accordance with Section R611.6.4.

R611.7.2.2.2 Vertical reinforcement. Vertical reinforcement applicable to the reduction factor(s) for design strength, R_3, from Table R611.7(4) that is used, shall be located at each end of each solid wall segment in accordance with the applicable detail in Figure R611.7(2). The No. 4 vertical bar required on each side of an opening by Section R611.8.1.2 is permitted to be used as reinforcement at the ends of solid wall segments where installed in accordance with the applicable detail in Figure R611.7(2). There shall be not less than two No. 4 bars at each end of solid wall segments located as required by the applicable detail in Figure R611.7(2). One of the bars at each end of solid wall segments shall be deemed to meet the requirements for vertical wall reinforcement required by Section R611.6.

The vertical wall reinforcement at each end of each solid wall segment shall be developed below the bottom of the adjacent wall opening [see Figure R611.7(3)] by one of the following methods:

1. Where the wall height below the bottom of the adjacent opening is equal to or greater than 22 inches (559 mm) for No. 4 or 28 inches (711 mm) for No. 5 vertical wall reinforcement, reinforcement around openings in accordance with Section R611.8.1 shall be sufficient, or
2. Where the wall height below the bottom of the adjacent opening is less than required by Item 1 above, the vertical wall reinforcement adjacent to the opening shall extend into the footing far enough to develop the bar in tension in accordance with Section R611.5.4.4 and Figure R611.5.4(2), or shall be lap-spliced with a dowel that is embedded in the footing far enough to develop the dowel-bar in tension.

R611.7.2.2.3 Vertical shear reinforcement. Where reduction factors for design strength, R_3, from Table R611.7(4) based on horizontal and vertical shear reinforcement being provided are used, solid wall segments shall have vertical reinforcement consisting of minimum No. 4 bars. Vertical shear reinforcement shall be the same grade of steel required by Section R611.7.2.2.2 for the vertical reinforcement at the ends of solid wall segments. The spacing of vertical reinforcement throughout the length of the segment shall not exceed the smaller of one third the length of the segment, and 18 inches (457 mm). Vertical shear reinforcement shall be continuous between stories in accordance with Section R611.6.3, and shall terminate in accordance with Section R611.6.4. Vertical shear reinforcement required by this section is permitted to be used for vertical reinforcement required by Table R611.6(1), R611.6(2), R611.6(3) or R611.6(4), whichever is applicable.

R611.7.2.3 Solid wall segments at corners. At all interior and exterior corners of exterior walls, a solid wall segment shall extend the full height of each wall *story*. The segment shall have the length required to develop the horizontal reinforcement above and below the adjacent opening in tension in accordance with Section R611.5.4.4. For an exterior corner, the limiting dimension is measured on the outside of the wall, and for an interior corner the limiting dimension is measured on the inside of the wall. See Section R611.8.1. The length of a segment contributing to the required length of solid wall shall comply with Section R611.7.2.1.

The end of a solid wall segment complying with the minimum length requirements of Section R611.7.2.1 shall be located no more than 6 feet (1829 mm) from each corner.

TABLE R611.7(1A)
UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE ONE STORY OR TOP STORY OF TWO-STORY[a,c,d,e,f,g]

SIDEWALL LENGTH (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE (feet)						
			Basic Wind Speed (mph) Exposure						
			85B	90B	100B	110B	120B	130B	
					85C	90C	100C	110C	
						85D	90D	100D	Minimum[b]
15	15	< 1:12	0.90	1.01	1.25	1.51	1.80	2.11	0.98
		5:12	1.25	1.40	1.73	2.09	2.49	2.92	1.43
		7:12	1.75	1.96	2.43	2.93	3.49	4.10	1.64
		12:12	2.80	3.13	3.87	4.68	5.57	6.54	2.21
	30	< 1:12	0.90	1.01	1.25	1.51	1.80	2.11	1.09
		5:12	1.25	1.40	1.73	2.09	2.49	2.92	2.01
		7:12	2.43	2.73	3.37	4.08	4.85	5.69	2.42
		12:12	4.52	5.07	6.27	7.57	9.01	10.58	3.57
	45	< 1:12	0.90	1.01	1.25	1.51	1.80	2.11	1.21
		5:12	1.25	1.40	1.73	2.09	2.49	2.92	2.59
		7:12	3.12	3.49	4.32	5.22	6.21	7.29	3.21
		12:12	6.25	7.00	8.66	10.47	12.45	14.61	4.93
	60	< 1:12	0.90	1.01	1.25	1.51	1.80	2.11	1.33
		5:12	1.25	1.40	1.73	2.09	2.49	2.92	3.16
		7:12	3.80	4.26	5.26	6.36	7.57	8.89	3.99
		12:12	7.97	8.94	11.05	13.36	15.89	18.65	6.29
30	15	< 1:12	1.61	1.80	2.23	2.70	3.21	3.77	1.93
		5:12	2.24	2.51	3.10	3.74	4.45	5.23	2.75
		7:12	3.15	3.53	4.37	5.28	6.28	7.37	3.12
		12:12	4.90	5.49	6.79	8.21	9.77	11.46	4.14
	30	< 1:12	1.61	1.80	2.23	2.70	3.21	3.77	2.14
		5:12	2.24	2.51	3.10	3.74	4.45	5.23	3.78
		7:12	4.30	4.82	5.96	7.20	8.57	10.05	4.52
		12:12	7.79	8.74	10.80	13.06	15.53	18.23	6.57
	45	< 1:12	1.61	1.80	2.23	2.70	3.21	3.77	2.35
		5:12	2.24	2.51	3.10	3.74	4.45	5.23	4.81
		7:12	5.44	6.10	7.54	9.12	10.85	12.73	5.92
		12:12	10.69	11.98	14.81	17.90	21.30	25.00	9.00
	60	< 1:12	1.61	1.80	2.23	2.70	3.21	3.77	2.56
		5:12	2.24	2.51	3.10	3.74	4.45	5.23	5.84
		7:12	6.59	7.39	9.13	11.04	13.14	15.41	7.32
		12:12	13.58	15.22	18.82	22.75	27.07	31.77	11.43

(continued)

TABLE R611.7(1A)—continued
UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE ONE STORY OR TOP STORY OF TWO-STORY[a,c,d,e,f,g]

SIDEWALL LENGTH (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE (feet)						
			Basic Wind Speed (mph) Exposure						
			85B	90B	100B	110B	120B	130B	
					85C	90C	100C	110C	
						85D	90D	100D	Minimum[b]
60	15	< 1:12	2.99	3.35	4.14	5.00	5.95	6.98	3.83
		5:12	4.15	4.65	5.75	6.95	8.27	9.70	5.37
		7:12	5.91	6.63	8.19	9.90	11.78	13.83	6.07
		12:12	9.05	10.14	12.54	15.16	18.03	21.16	8.00
	30	< 1:12	2.99	3.35	4.14	5.00	5.95	6.98	4.23
		5:12	4.15	4.65	5.75	6.95	8.27	9.70	7.31
		7:12	7.97	8.94	11.05	13.36	15.89	18.65	8.71
		12:12	14.25	15.97	19.74	23.86	28.40	33.32	12.57
	45	< 1:12	3.11	3.48	4.30	5.20	6.19	7.26	4.63
		5:12	4.31	4.84	5.98	7.23	8.60	10.09	9.25
		7:12	10.24	11.47	14.19	17.15	20.40	23.84	11.35
		12:12	19.84	22.24	27.49	33.23	39.54	46.40	17.14
	60	< 1:12	3.22	3.61	4.46	5.39	6.42	7.53	5.03
		5:12	4.47	5.01	6.19	7.49	8.91	10.46	11.19
		7:12	12.57	14.09	17.42	21.05	25.05	29.39	13.99
		12:12	25.61	28.70	35.49	42.90	51.04	59.90	21.71

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s, 1 pound-force per linear foot = 0.146kN/m, 1 pound per square foot = 47.88 Pa.

a. Tabulated lengths were derived by calculating design wind pressures in accordance with Figure 6-10 of ASCE 7 for a building with a mean roof height of 35 feet (10 668 mm). For wind perpendicular to the ridge, the effects of a 2-foot overhang on each endwall are included. The design pressures were used to calculate forces to be resisted by solid wall segments in each endwall [Table R611.7(1A) or R611.7(1B) or sidewall (Table R611.7(1C)], as appropriate. The forces to be resisted by each wall line were then divided by the default design strength of 840 pounds per linear foot (12.26 kN/m) of length to determine the required solid wall length. The actual mean roof height of the building shall not exceed the least horizontal dimension of the building.

b. Tabulated lengths in the "minimum" column are based on the requirement of Section 6.1.4.1 of ASCE 7 that the main wind-force resisting system be designed for a minimum service level force of 10 psf multiplied by the area of the building projected onto a vertical plane normal to the assumed wind direction. Tabulated lengths in shaded cells are less than the "minimum" value. Where the minimum controls, it is permitted to be reduced in accordance with Notes c, d and e. See Section R611.7.1.1.

c. For buildings with a mean roof height of less than 35 feet, tabulated lengths are permitted to be reduced by multiplying by the appropriate factor, R_1, from Table R611.7(2). The reduced length shall not be less than the "minimum" value shown in the table.

d. Tabulated lengths for "one story or top story of two-story" are based on a floor-to-ceiling height of 10 feet. Tabulated lengths for "first story of two-story" are based on floor-to-ceiling heights of 10 feet each for the first and second story. For floor-to-ceiling heights less than assumed, use the lengths in Table R611.7(1A), (1B) or (1C), or multiply the value in the table by the reduction factor, R_2, from Table R611.7(3).

e. Tabulated lengths are based on the default design shear strength of 840 pounds per linear foot of solid wall segment. The tabulated lengths are permitted to be reduced by multiplying by the applicable reduction factor for design strength, R_3, from Table R611.7(4).

f. The reduction factors, R_1, R_2, and R_3, in Tables R611.7(2), R611.7(3), and R611.7(4), respectively, are permitted to be compounded, subject to the limitations of Note b. However, the minimum number and minimum length of solid walls segments in each wall line shall comply with Sections R611.7.1 and R611.7.2.1, respectively.

g. For intermediate values of sidewall length, endwall length, roof slope and basic wind speed, use the next higher value, or determine by interpolation.

TABLE R611.7(1B)
UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE FIRST STORY OF TWO-STORY[a,c,d,e,f,g]

SIDEWALL LENGTH (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE (feet)						
			Basic Wind Speed (mph) Exposure						
			85B	90B	100B 85C	110B 90C 85D	120B 100C 90D	130B 110C 100D	
			Velocity pressure (psf)						
			11.51	12.90	15.95	19.28	22.94	26.92	Minimum[b]
15	15	< 1:12	2.60	2.92	3.61	4.36	5.19	6.09	2.59
		5:12	3.61	4.05	5.00	6.05	7.20	8.45	3.05
		7:12	3.77	4.23	5.23	6.32	7.52	8.82	3.26
		12:12	4.81	5.40	6.67	8.06	9.60	11.26	3.83
	30	< 1:12	2.60	2.92	3.61	4.36	5.19	6.09	2.71
		5:12	3.61	4.05	5.00	6.05	7.20	8.45	3.63
		7:12	4.45	4.99	6.17	7.46	8.88	10.42	4.04
		12:12	6.54	7.33	9.06	10.96	13.04	15.30	5.19
	45	< 1:12	2.60	2.92	3.61	4.36	5.19	6.09	2.83
		5:12	3.61	4.05	5.00	6.05	7.20	8.45	4.20
		7:12	5.14	5.76	7.12	8.60	10.24	12.01	4.83
		12:12	8.27	9.27	11.46	13.85	16.48	19.34	6.55
	60	< 1:12	2.60	2.92	3.61	4.36	5.19	6.09	2.95
		5:12	3.61	4.05	5.00	6.05	7.20	8.45	4.78
		7:12	5.82	6.52	8.06	9.75	11.60	13.61	5.61
		12:12	9.99	11.20	13.85	16.74	19.92	23.37	7.90
30	15	< 1:12	4.65	5.21	6.45	7.79	9.27	10.88	5.16
		5:12	6.46	7.24	8.95	10.82	12.87	15.10	5.98
		7:12	6.94	7.78	9.62	11.62	13.83	16.23	6.35
		12:12	8.69	9.74	12.04	14.55	17.32	20.32	7.38
	30	< 1:12	4.65	5.21	6.45	7.79	9.27	10.88	5.38
		5:12	6.46	7.24	8.95	10.82	12.87	15.10	7.01
		7:12	8.09	9.06	11.21	13.54	16.12	18.91	7.76
		12:12	11.58	12.98	16.05	19.40	23.08	27.09	9.81
	45	< 1:12	4.65	5.21	6.45	7.79	9.27	10.88	5.59
		5:12	6.46	7.24	8.95	10.82	12.87	15.10	8.04
		7:12	9.23	10.35	12.79	15.46	18.40	21.59	9.16
		12:12	14.48	16.22	20.06	24.25	28.85	33.86	12.24
	60	< 1:12	4.65	5.21	6.45	7.79	9.27	10.88	5.80
		5:12	6.46	7.24	8.95	10.82	12.87	15.10	9.08
		7:12	10.38	11.63	14.38	17.38	20.69	24.27	10.56
		12:12	17.37	19.47	24.07	29.10	34.62	40.63	14.67

(continued)

TABLE R611.7(1B)—continued
UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE FIRST STORY OF TWO-STORY[a,c,d,e,f,g]

SIDEWALL LENGTH (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE (feet)						
			Basic Wind Speed (mph) Exposure						
			85B	90B	100B	110B	120B	130B	
					85C	90C	100C	110C	
						85D	90D	100D	
			Velocity Pressure (psf)						
			11.51	12.90	15.95	19.28	22.94	26.92	Minimum[b]
60	15	< 1:12	8.62	9.67	11.95	14.45	17.19	20.17	10.30
		5:12	11.98	13.43	16.61	20.07	23.88	28.03	11.85
		7:12	13.18	14.78	18.27	22.08	26.28	30.83	12.54
		12:12	16.32	18.29	22.62	27.34	32.53	38.17	14.48
	30	< 1:12	8.62	9.67	11.95	14.45	17.19	20.17	10.70
		5:12	11.98	13.43	16.61	20.07	23.88	28.03	13.79
		7:12	15.25	17.09	21.13	25.54	30.38	35.66	15.18
		12:12	21.52	24.12	29.82	36.05	42.89	50.33	19.05
	45	< 1:12	8.97	10.06	12.43	15.03	17.88	20.99	11.10
		5:12	12.46	13.97	17.27	20.88	24.84	29.15	15.73
		7:12	17.67	19.80	24.48	29.59	35.21	41.32	17.82
		12:12	27.27	30.56	37.79	45.68	54.35	63.78	23.62
	60	< 1:12	9.30	10.43	12.89	15.58	18.54	21.76	11.50
		5:12	12.91	14.47	17.90	21.63	25.74	30.20	17.67
		7:12	20.14	22.58	27.91	33.74	40.15	47.11	20.46
		12:12	33.19	37.19	45.99	55.59	66.14	77.62	28.19

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s, 1 pound force per linear foot = 0.146kN/m, 1 pound per square foot = 47.88 Pa.

a. Tabulated lengths were derived by calculating design wind pressures in accordance with Figure 6-10 of ASCE 7 for a building with a mean roof height of 35 feet (10 668 mm). For wind perpendicular to the ridge, the effects of a 2-foot (610 mm) overhang on each endwall are included. The design pressures were used to calculate forces to be resisted by solid wall segments in each endwall [Table R611.7(1A) or R611.7(1B)] or sidewall [Table R611.7(1C)], as appropriate. The forces to be resisted by each wall line were then divided by the default design strength of 840 pounds per linear foot (12.26 kN/m) of length to determine the required solid wall length. The actual mean roof height of the building shall not exceed the least horizontal dimension of the building.

b. Tabulated lengths in the "minimum" column are based on the requirement of Section 6.1.4.1 of ASCE 7 that the main wind-force resisting system be designed for a minimum service level force of 10 psf multiplied by the area of the building projected onto a vertical plane normal to the assumed wind direction. Tabulated lengths in shaded cells are less than the "minimum" value. Where the minimum controls, it is permitted to be reduced in accordance with Notes c, d and e. See Section R611.7.1.1.

c. For buildings with a mean roof height of less than 35 feet tabulated lengths are permitted to be reduced by multiplying by the appropriate factor, R_1, from Table R611.7(2). The reduced length shall not be less than the "minimum" value shown in the table.

d. Tabulated lengths for "one story or top story of two-story" are based on a floor-to-ceiling height of 10 feet. Tabulated lengths for "first story of two-story" are based on floor-to-ceiling heights of 10 feet each for the first and second story. For floor-to-ceiling heights less than assumed, use the lengths in Table R611.7(1A), (1B) or (1C), or multiply the value in the table by the reduction factor, R_2, from Table R611.7(3).

e. Tabulated lengths are based on the default design shear strength of 840 pounds per linear foot of solid wall segment. The tabulated lengths are permitted to be reduced by multiplying by the applicable reduction factor for design strength, R_3, from Table R611.7(4).

f. The reduction factors, R_1, R_2, and R_3, in Tables R611.7(2), R611.7(3), and R611.7(4), respectively, are permitted to be compounded, subject to the limitations of Note b. However, the minimum number and minimum length of solid walls segments in each wall line shall comply with Sections R611.7.1 and R611.7.2.1, respectively.

g. For intermediate values of sidewall length, endwall length, roof slope and basic wind speed, use the next higher value, or determine by interpolation.

TABLE R611.7(1C)
UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN EACH EXTERIOR SIDEWALL FOR WIND PARALLEL TO RIDGE[a,c,d,e,f,g]

SIDEWALL LENGTH (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE (feet)						
			Basic Wind Speed (mph) Exposure						
			85B	90B	100B 85C	110B 90C 85D	120B 100C 90D	130B 110C 100D	
			One story or top story of two-story						Minimum[b]
< 30	15	< 1:12	0.95	1.06	1.31	1.59	1.89	2.22	0.90
		5:12	1.13	1.26	1.56	1.88	2.24	2.63	1.08
		7:12	1.21	1.35	1.67	2.02	2.40	2.82	1.17
		12:12	1.43	1.60	1.98	2.39	2.85	3.34	1.39
	30	< 1:12	1.77	1.98	2.45	2.96	3.53	4.14	1.90
		5:12	2.38	2.67	3.30	3.99	4.75	5.57	2.62
		7:12	2.66	2.98	3.69	4.46	5.31	6.23	2.95
		12:12	3.43	3.85	4.76	5.75	6.84	8.03	3.86
	45	< 1:12	2.65	2.97	3.67	4.43	5.27	6.19	2.99
		5:12	3.98	4.46	5.51	6.66	7.93	9.31	4.62
		7:12	4.58	5.14	6.35	7.68	9.14	10.72	5.36
		12:12	6.25	7.01	8.67	10.48	12.47	14.63	7.39
	60	< 1:12	3.59	4.03	4.98	6.02	7.16	8.40	4.18
		5:12	5.93	6.65	8.22	9.93	11.82	13.87	7.07
		7:12	6.99	7.83	9.69	11.71	13.93	16.35	8.38
		12:12	9.92	11.12	13.75	16.62	19.77	23.21	12.00
60	45	< 1:12	2.77	3.11	3.84	4.65	5.53	6.49	2.99
		5:12	4.15	4.66	5.76	6.96	8.28	9.72	4.62
		7:12	4.78	5.36	6.63	8.01	9.53	11.18	5.36
		12:12	6.51	7.30	9.03	10.91	12.98	15.23	7.39
	60	< 1:12	3.86	4.32	5.35	6.46	7.69	9.02	4.18
		5:12	6.31	7.08	8.75	10.57	12.58	14.76	7.07
		7:12	7.43	8.32	10.29	12.44	14.80	17.37	8.38
		12:12	10.51	11.78	14.56	17.60	20.94	24.57	12.00
First story of two-story									
< 30	15	< 1:12	2.65	2.97	3.67	4.44	5.28	6.20	2.52
		5:12	2.83	3.17	3.92	4.74	5.64	6.62	2.70
		7:12	2.91	3.26	4.03	4.87	5.80	6.80	2.79
		12:12	3.13	3.51	4.34	5.25	6.24	7.32	3.01
	30	< 1:12	4.81	5.39	6.67	8.06	9.59	11.25	5.14
		5:12	5.42	6.08	7.52	9.09	10.81	12.69	5.86
		7:12	5.70	6.39	7.90	9.55	11.37	13.34	6.19
		12:12	6.47	7.25	8.97	10.84	12.90	15.14	7.10
	45	< 1:12	6.99	7.83	9.69	11.71	13.93	16.35	7.85
		5:12	8.32	9.33	11.53	13.94	16.59	19.47	9.48
		7:12	8.93	10.01	12.37	14.95	17.79	20.88	10.21
		12:12	10.60	11.88	14.69	17.75	21.13	24.79	12.25
	60	< 1:12	9.23	10.35	12.79	15.46	18.40	21.59	10.65
		5:12	11.57	12.97	16.03	19.38	23.06	27.06	13.54
		7:12	12.63	14.15	17.50	21.15	25.17	29.54	14.85
		12:12	15.56	17.44	21.56	26.06	31.01	36.39	18.48

(continued)

TABLE R611.7(1C)—continued
UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE FIRST STORY OF TWO-STORY[a,c,d,e,f,g]

SIDEWALL LENGTH (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	UNREDUCED LENGTH, *UR*, OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE (feet)						
			Basic Wind Speed (mph) Exposure						
			85B	90B	100B 85C	110B 90C 85D	120B 100C 90D	130B 110C 100D	Minimum[b]
60	45	< 1:12	7.34	8.22	10.17	12.29	14.62	17.16	7.85
		5:12	8.72	9.77	12.08	14.60	17.37	20.39	9.48
		7:12	9.34	10.47	12.95	15.65	18.62	21.85	10.21
		12:12	11.08	12.41	15.35	18.55	22.07	25.90	12.25
	60	< 1:12	9.94	11.14	13.77	16.65	19.81	23.25	10.65
		5:12	12.40	13.89	17.18	20.76	24.70	28.99	13.54
		7:12	13.51	15.14	18.72	22.63	26.92	31.60	14.85
		12:12	16.59	18.59	22.99	27.79	33.06	38.80	18.48

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound force per linear foot = 0.146kN/m, 1 pound per square foot = 47.88 Pa.

a. Tabulated lengths were derived by calculating design wind pressures in accordance with Figure 6-10 of ASCE 7 for a building with a mean roof height of 35 feet (10 668 mm). For wind perpendicular to the ridge, the effects of a 2-foot (610 mm) overhang on each endwall are included. The design pressures were used to calculate forces to be resisted by solid wall segments in each endwall [Table R611.7(1A) or R611.7(1B)] or sidewall [(Table R611.7(1C)], as appropriate. The forces to be resisted by each wall line were then divided by the default design strength of 840 pounds per linear foot (12.26 kN/m) of length to determine the required solid wall length. The actual mean roof height of the building shall not exceed the least horizontal dimension of the building.

b. Tabulated lengths in the "minimum" column are based on the requirement of Section 6.1.4.1 of ASCE 7 that the main wind-force resisting system be designed for a minimum service level force of 10 psf multiplied by the area of the building projected onto a vertical plane normal to the assumed wind direction. Tabulated lengths in shaded cells are less than the "minimum" value. Where the minimum controls, it is permitted to be reduced in accordance with Notes c, d and e. See Section R611.7.1.1.

c. For buildings with a mean roof height of less than 35 feet, tabulated lengths are permitted to be reduced by multiplying by the appropriate factor, R_1, from Table R611.7(2). The reduced length shall not be less than the "minimum" value shown in the table.

d. Tabulated lengths for "one story or top story of two-story" are based on a floor-to-ceiling height of 10 feet. Tabulated lengths for "first story of two-story" are based on floor-to-ceiling heights of 10 feet each for the first and second story. For floor-to-ceiling heights less than assumed, use the lengths in Table R611.7(1A), (1B) or (1C), or multiply the value in the table by the reduction factor, R_2, from Table R611.7(3).

e. Tabulated lengths are based on the default design shear strength of 840 pounds per linear foot of solid wall segment. The tabulated lengths are permitted to be reduced by multiplying by the applicable reduction factor for design strength, R_3, from Table R611.7(4).

f. The reduction factors, R_1, R_2, and R_3, in Tables R611.7(2), R611.7(3), and R611.7(4), respectively, are permitted to be compounded, subject to the limitations of Note b. However, the minimum number and minimum length of solid walls segments in each wall line shall comply with Sections R611.7.1 and R611.7.2.1, respectively.

g. For intermediate values of sidewall length, endwall length, roof slope and basic wind speed, use the next higher value, or determine by interpolation.

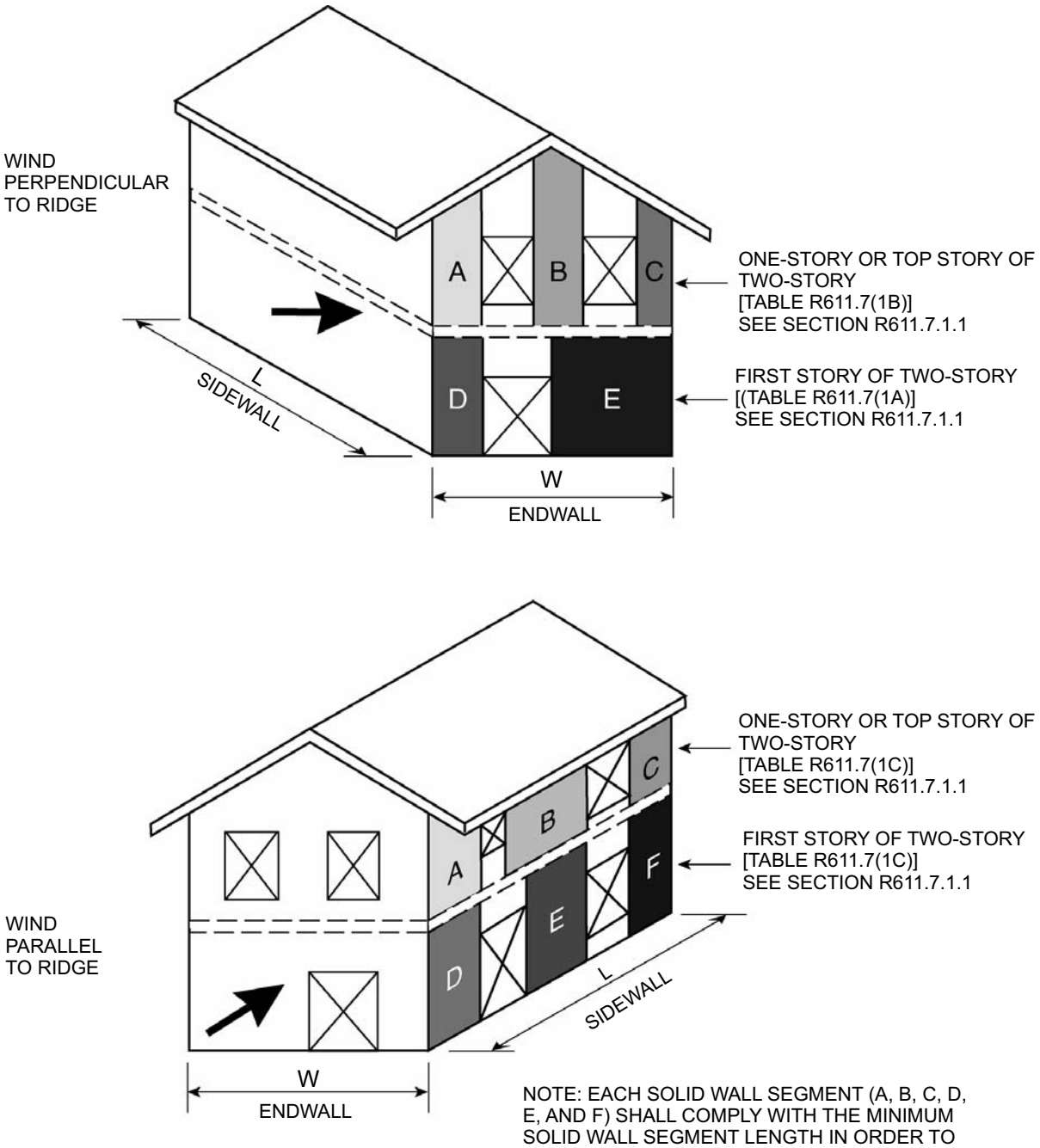


FIGURE R611.7(1)
MINIMUM SOLID WALL LENGTH

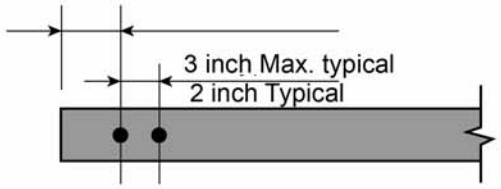
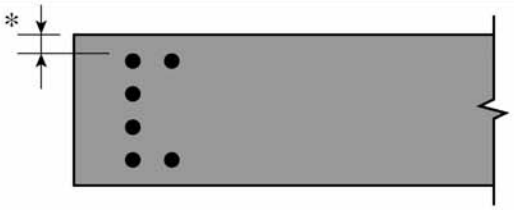
DETAIL NO.	NOM. WALL THICKNESS, IN.	REINFORCEMENT LAYOUT AT ENDS OF SOLID WALL SEGMENTS	NOTES
1	4		For SI: 1 inch = 25.4 mm. 1. See Table R611.7(4) for use of details. 2. Minimum length of solid wall segment and size and grade of reinforcement in each end of each solid wall segment shall be determined from Table R611.7(4). 3. For minimum cover requirements, see Section R611.5.4.1. 4. For details 3 - 8 where two or more bars are in the same row parallel to the end of the segment, place bars so that corner bars are as close to the sides of the wall segments as minimum cover requirements of Section R611.5.4.1 will permit. 5. For waffle- and screen-grid walls, each end of each solid wall segment shall have rectangular flanges. In the through-the-wall dimension, the flange shall not be less than $5^1/_2$ inches for 6-inch nominal waffle- and screen-grid forms, and not less than $7^1/_2$ inches for 8-inch nominal waffle-grid forms. In the in-plane dimension, flanges shall be long enough to accommodate the vertical reinforcement required by the layout detail selected and provide the cover required by Section R611.5.4.1 If necessary to achieve the required dimensions, form material shall be removed or flat wall forms are permitted. See Table R611.7(4), Note e.
2	4		
3	6 8 10		
4	6		
5	8		
6	8		
7	10		
8	10	 * For minimum cover see Section R611.5.4.1	

FIGURE R611.7(2)
VERTICAL REINFORCEMENT LAYOUT DETAIL

TABLE R611.7(2)
REDUCTION FACTOR, R_1, FOR BUILDINGS WITH MEAN ROOF HEIGHT LESS THAN 35 FEET[a]

MEAN ROOF HEIGHT[b,c] (feet)	REDUCTION FACTOR R_1, FOR MEAN ROOF HEIGHT		
	Exposure category		
	B	C	D
< 15	0.96	0.84	0.87
20	0.96	0.89	0.91
25	0.96	0.93	0.94
30	0.96	0.97	0.98
35	1.00	1.00	1.00

For SI: 1 foot = 304.8 mm.

a. See Section R611.7.1.1 and note c to Table R611.7(1A) for application of reduction factors in this table. This reduction is not permitted for "minimum" values.

b. For intermediate values of mean roof height, use the factor for the next greater height, or determine by interpolation.

c. Mean roof height is the average of the roof eave height and height of the highest point on the roof surface, except that for roof slopes of less than or equal to $2^1/_8$:12 (10 degrees), the mean roof height is permitted to be taken as the roof eave height.

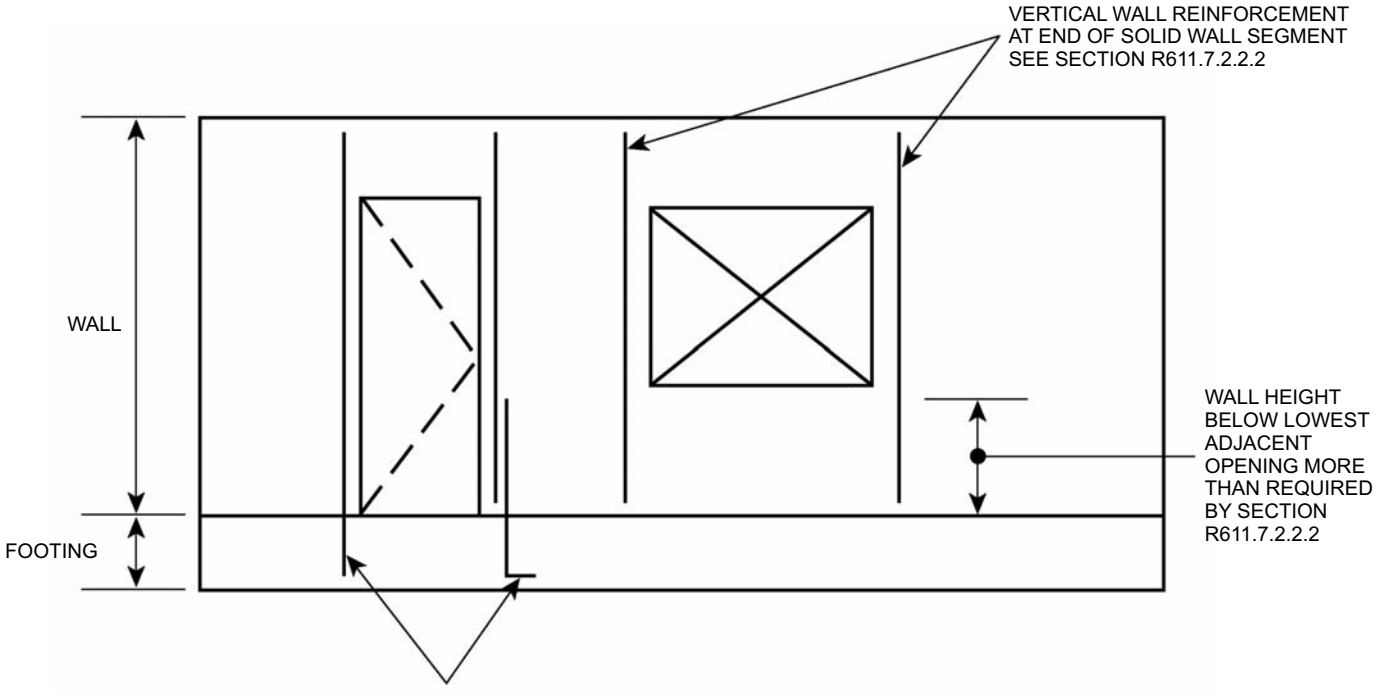


FIGURE R611.7(3)
VERTICAL WALL REINFORCEMENT ADJACENT TO WALL OPENINGS

TABLE R611.7(3)
REDUCTION FACTOR, R_2, FOR FLOOR-TO-CEILING WALL HEIGHTS LESS THAN 10 FEET[a,b]

STORY UNDER CONSIDERATION	FLOOR-TO-CEILING HEIGHT[c] (feet)	ENDWALL LENGTH (feet)	ROOF SLOPE	REDUCTION FACTOR, R_2
Endwalls—for wind perpendicular to ridge				
One story or top story of two-story	8	15	< 5:12	0.83
			7:12	0.90
			12:12	0.94
		60	< 5:12	0.83
			7:12	0.95
			12:12	0.98
First story of two-story	16 combined first and second story	15	< 5:12	0.83
			7:12	0.86
			12:12	0.89
		60	< 5:12	0.83
			7:12	0.91
			12:12	0.95
Sidewalls—for wind parallel to ridge				
One story or top story of two-story	8	15	< 1:12	0.84
			5:12	0.87
			7:12	0.88
			12:12	0.89
		60	< 1:12	0.86
			5:12	0.92
			7:12	0.93
			12:12	0.95
First story of two-story	16 combined first and second story	15	< 1:12	0.83
			5:12	0.84
			7:12	0.85
			12:12	0.86
		60	< 1:12	0.84
			5:12	0.87
			7:12	0.88
			12:12	0.90

For SI: 1 foot = 304.8 mm.

a. See Section R611.7.1.1 and Note d to Table R611.7(1A) for application of reduction factors in this table.

b. For intermediate values of endwall length, and/or roof slope, use the next higher value, or determine by interpolation.

c. Tabulated values in Table R611.7(1A) and (1C) for "one story or top story of two-story" are based on a floor-to-ceiling height of 10 feet (3048 mm). Tabulated values in Table R611.7(1B) and (1C) for "first story of two-story" are based on floor-to-ceiling heights of 10 feet each for the first and second story. For floor to ceiling heights between those shown in this table and those assumed in Table R611.7(1A), (1B) or (1C), use the solid wall lengths in Table R611.7(1A), (1B) or (1C), or determine the reduction factor by interpolating between 1.0 and the factor shown in this table.

TABLE R611.7(4)
REDUCTION FACTOR FOR DESIGN STRENGTH, R_3, FOR FLAT, WAFFLE- AND SCREEN-GRID WALLS[a,c]

NOMINAL THICKNESS OF WALL (inches)	VERTICAL BARS AT EACH END OF SOLID WALL SEGMENT		VERTICAL REINFORCEMENT LAYOUT DETAIL [see Figure R611.7(2)]	REDUCTION FACTOR, R_3, FOR LENGTH OF SOLID WALL			
				Horizontal and vertical shear reinforcement provided			
				No		Yes[d]	
	Number of bars	Bar size		40,000[b]	60,000[b]	40,000[b]	60,000[b]
Flat walls							
4	2	4	1	0.74	0.61	0.74	0.50
	3	4	2	0.61	0.61	0.52	0.27
	2	5	1	0.61	0.61	0.48	0.25
	3	5	2	0.61	0.61	0.26	0.18
6	2	4	3	0.70	0.48	0.70	0.48
	3	4	4	0.49	0.38	0.49	0.33
	2	5	3	0.46	0.38	0.46	0.31
	3	5	4	0.38	0.38	0.32	0.16
8	2	4	3	0.70	0.47	0.70	0.47
	3	4	5	0.47	0.32	0.47	0.32
	2	5	3	0.45	0.31	0.45	0.31
	4	4	6	0.36	0.28	0.36	0.25
	3	5	5	0.31	0.28	0.31	0.16
	4	5	6	0.28	0.28	0.24	0.12
10	2	4	3	0.70	0.47	0.70	0.47
	2	5	3	0.45	0.30	0.45	0.30
	4	4	7	0.36	0.25	0.36	0.25
	6	4	8	0.25	0.22	0.25	0.13
	4	5	7	0.24	0.22	0.24	0.12
	6	5	8	0.22	0.22	0.12	0.08
Waffle-grid walls[e]							
6	2	4	3	0.78	0.78	0.70	0.48
	3	4	4	0.78	0.78	0.49	0.25
	2	5	3	0.78	0.78	0.46	0.23
	3	5	4	0.78	0.78	0.24	0.16
8	2	4	3	0.78	0.78	0.70	0.47
	3	4	5	0.78	0.78	0.47	0.24
	2	5	3	0.78	0.78	0.45	0.23
	4	4	6	0.78	0.78	0.36	0.18
	3	5	5	0.78	0.78	0.23	0.16
	4	5	6	0.78	0.78	0.18	0.13
Screen-grid walls[e]							
6	2	4	3	0.93	0.93	0.70	0.48
	3	4	4	0.93	0.93	0.49	0.25
	2	5	3	0.93	0.93	0.46	0.23
	3	5	4	0.93	0.93	0.24	0.16

For SI: 1 inch = 25.4 mm; 1,000 pounds per square inch = 6.895 MPa.

a. See note e to Table R611.7(1A) for application of adjustment factors in this table.

b. Yield strength in pounds per square inch of vertical wall reinforcement at ends of solid wall segments.

c. Values are based on concrete with a specified compressive strength, f'_c, of 2,500 psi. Where concrete with f'_c of not less than 3,000 psi is used, values in shaded cells are permitted to be decreased by multiplying by 0.91.

d. Horizontal and vertical shear reinforcement shall be provided in accordance with Section R611.7.2.2.

e. Each end of each solid wall segment shall have rectangular flanges. In the through-the-wall dimension, the flange shall not be less than $5^1/_2$ inches for 6-inch nominal waffle- and screen-grid walls, and not less than $7^1/_2$ inches for 8-inch nominal waffle-grid walls. In the in-plane dimension, flanges shall be long enough to accommodate the vertical reinforcement required by the layout detail selected from Figure R611.7(2) and provide the cover required by Section R611.5.4.1. If necessary to achieve the required dimensions, form material shall be removed or use of flat wall forms is permitted.

R611.8 Requirements for lintels and reinforcement around openings.

R611.8.1 Reinforcement around openings. Reinforcement shall be provided around openings in walls equal to or greater than 2 feet (610 mm) in width in accordance with this section and Figure R611.8(1), in addition to the minimum wall reinforcement required by Sections R404.1.2, R611.6 and R611.7. Vertical wall reinforcement required by this section is permitted to be used as reinforcement at the ends of solid wall segments required by Section R611.7.2.2.2 provided it is located in accordance with Section R611.8.1.2. Wall openings shall have a minimum depth of concrete over the width of the opening of 8 inches (203 mm) in flat walls and waffle-grid walls, and 12 inches (305 mm) in screen-grid walls. Wall openings in waffle-grid and screen-grid walls shall be located such that not less than one-half of a vertical core occurs along each side of the opening.

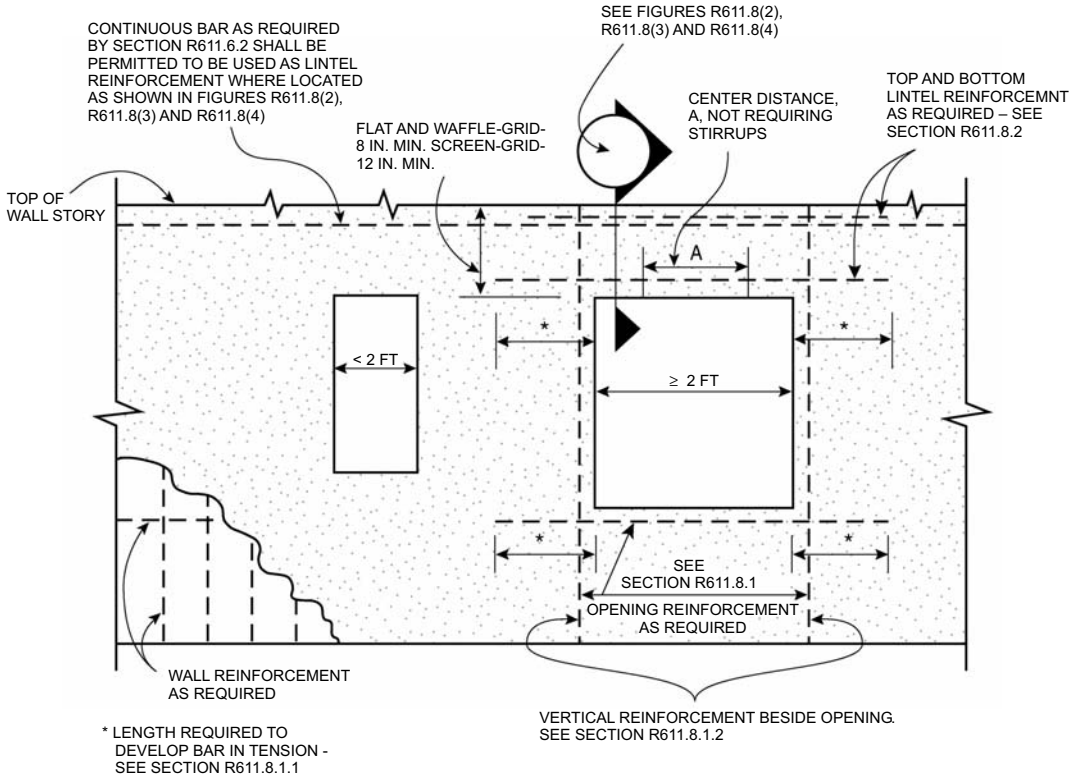
R611.8.1.1 Horizontal reinforcement. Lintels complying with Section R611.8.2 shall be provided above wall openings equal to or greater than 2 feet (610 mm) in width.

Exception: Continuous horizontal wall reinforcement placed within 12 inches (305 mm) of the top of the wall *story* as required in Sections R404.1.2.2 and R611.6.2 is permitted in lieu of top or bottom lintel reinforcement required by Section R611.8.2 provided that the continuous horizontal wall reinforcement meets the location requirements specified in Figures R611.8(2), R611.8(3), and R611.8(4) and the size requirements specified in Tables R611.8(2) through R611.8(10).

Openings equal to or greater than 2 feet (610 mm) in width shall have a minimum of one No. 4 bar placed within 12 inches (305 mm) of the bottom of the opening. See Figure R611.8(1).

Horizontal reinforcement placed above and below an opening shall extend beyond the edges of the opening the dimension required to develop the bar in tension in accordance with Section R611.5.4.4.

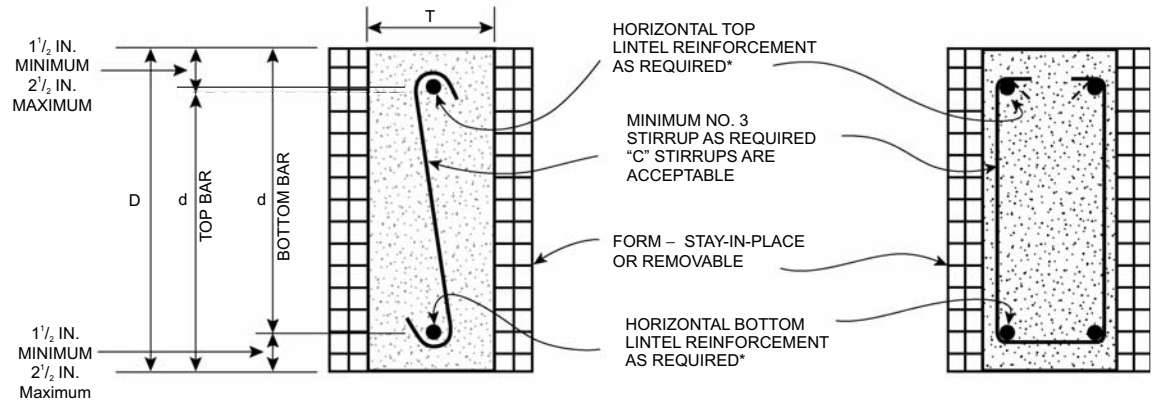
R611.8.1.2 Vertical reinforcement. Not less than one No. 4 bar [Grade 40 (280 MPa)] shall be provided on each side of openings equal to or greater than 2 feet (610 mm) in width. The vertical reinforcement required by this section shall extend the full height of the wall *story* and shall be located within 12 inches (305 mm) of each side of the opening. The vertical reinforcement required on each side of an opening by this section is permitted to serve as reinforcement at the ends of solid wall segments in accordance with Section R611.7.2.2.2, provided it is located as required by the applicable detail in Figure R611.7(2). Where the vertical reinforcement required by this section is used to satisfy the requirements of Section R611.7.2.2.2 in waffle- and screen-grid walls, a concrete flange shall be created at the ends of the solid wall segments in accordance with Table R611.7(4), note e. In the top-most *story*, the reinforcement shall terminate in accordance with Section R611.6.4.



ELEVATION OF WALL

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

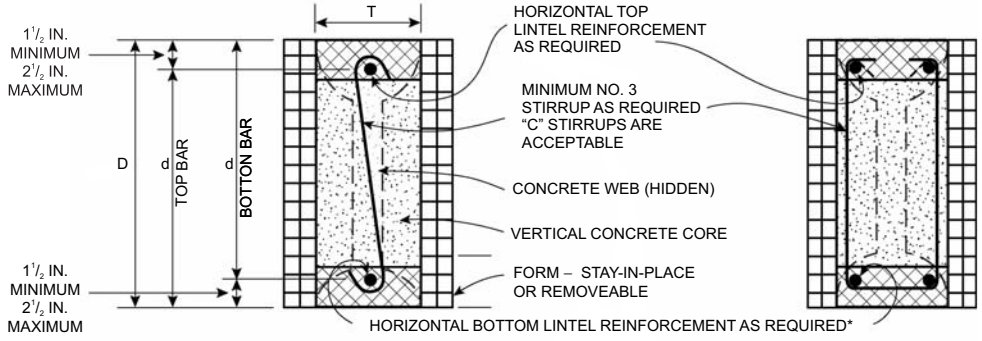
FIGURE R611.8(1)
REINFORCEMENT OF OPENINGS



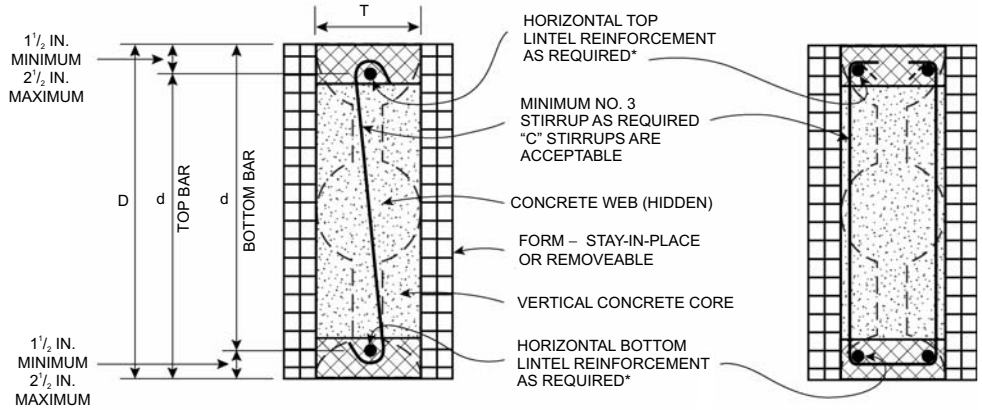
*FOR BUNDLED BARS, SEE SECTION R611.8.2.2.
SECTION CUT THROUGH FLAT WALL LINTEL

For SI: 1 inch = 25.4 mm.

FIGURE R611.8(2)
LINTEL FOR FLAT WALLS



(a) SINGLE FORM HEIGHT SECTION CUT THROUGH VERTICAL CORE OF A WAFFLE-GRID LINTEL



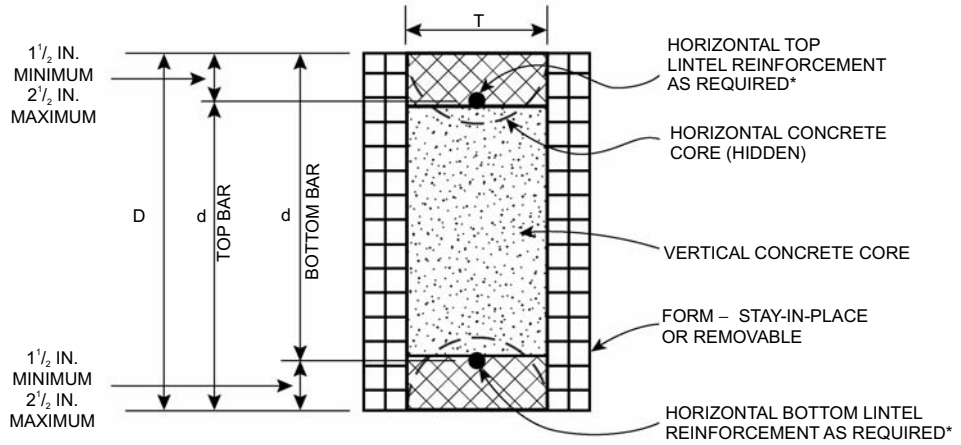
(b) DOUBLE FORM HEIGHT SECTION CUT THROUGH VERTICAL CORE OF A WAFFLE-GRID LINTEL

*FOR BUNDLED BARS, SEE SECTION R611.8.2.2.

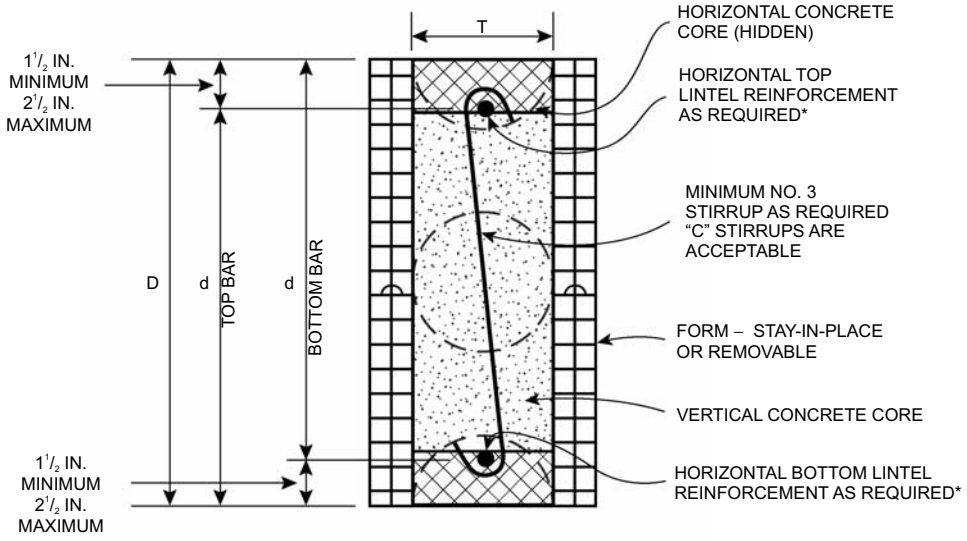
NOTE: CROSS-HATCHING REPRESENTS THE AREA IN WHICH FORM MATERIAL SHALL BE REMOVED, IF NECESSARY, TO CREATE FLANGES CONTINUOUS THE LENGTH OF THE LINTEL. FLANGES SHALL HAVE A MINIMUM THICKNESS OF 3 IN., AND A MINIMUM WIDTH OF 5 IN. AND 7 IN. IN 6 IN. NOMINAL AND 8 IN. NOMINAL WAFFLE-GRID WALLS, RESPECTIVELY. SEE NOTE a TO TABLES R611.8(6) AND R611.8(10).

For SI: 1 inch = 25.4 mm.

FIGURE R611.8(3)
LINTELS FOR WAFFLE-GRID WALLS



(a) SINGLE FORM HEIGHT SECTION CUT THROUGH VERTICAL CORE OF A SCREEN-GRID LINTEL



(b) DOUBLE FORM HEIGHT SECTION CUT THROUGH VERTICAL CORE OF A SCREEN-GRID LINTEL

*FOR BUNDLED BARS, SEE SECTION R611.8.2.2.

NOTE: CROSS-HATCHING REPRESENTS THE AREA IN WHICH FORM MATERIAL SHALL BE REMOVED, IF NECESSARY, TO CREATE FLANGES CONTINUOUS THE LENGTH OF THE LINTEL. FLANGES SHALL HAVE A MINIMUM THICKNESS OF 2.5 IN. AND A MINIMUM WIDTH OF 5 IN. SEE NOTE a TO TABLES R611.8(8) AND R611.8(10).

For SI: 1 inch = 25.4 mm.

FIGURE R611.8(4)
LINTELS FOR SCREEN-GRID WALLS

R611.8.2 Lintels. Lintels shall be provided over all openings equal to or greater than 2 feet (610 mm) in width. Lintels with uniform loading shall conform to Sections R611.8.2.1, and R611.8.2.2, or Section R611.8.2.3. Lintels supporting concentrated loads, such as from roof or floor beams or girders, shall be designed in accordance with ACI 318.

R611.8.2.1 Lintels designed for gravity load-bearing conditions. Where a lintel will be subjected to gravity load condition 1 through 5 of Table R611.8(1), the clear span of the lintel shall not exceed that permitted by Tables R611.8(2) through R611.8(8). The maximum clear span of lintels with and without stirrups in flat walls shall be determined in accordance with Tables R611.8(2) through R611.8(5), and constructed in accordance with Figure R611.8(2). The maximum clear span of lintels with and without stirrups in waffle-grid walls shall be determined in accordance with Tables R611.8(6) and R611.8(7), and constructed in accordance with Figure R611.8(3). The maximum clear span of lintels with and without stirrups in screen-grid walls shall be determined in accordance with Table R611.8(8), and constructed in accordance with Figure R611.8(4).

Where required by the applicable table, No. 3 stirrups shall be installed in lintels at a maximum spacing of *d*/2 where d equals the depth of the lintel, *D*, less the cover of the concrete as shown in Figures R611.8(2) through R611.8(4). The smaller value of *d* computed for the top and bottom bar shall be used to determine the maximum stirrup spacing. Where stirrups are required in a lintel with a single bar or two bundled bars in the top and bottom, they shall be fabricated like the letter "c" or "s" with 135-degree (2.36 rad) standard hooks at each end that comply with Section R611.5.4.5 and Figure R611.5.4(3) and installed as shown in Figures R611.8(2) through R611.8(4). Where two bars are required in the top and bottom of the lintel and the bars are not bundled, the bars shall be separated by a minimum of 1 inch (25 mm). The free end of the stirrups shall be fabricated with 90- or 135-degree (1.57 or 2.36 rad) standard hooks that comply with Section R611.5.4.5 and Figure R611.5.4(3) and installed as shown in Figures R611.8(2) and R611.8(3). For flat, waffle-grid and screen-grid lintels, stirrups are not required in the center distance, A, portion of spans in accordance with Figure R611.8(1) and Tables R611.8(2) through R611.8(8). See Section R611.8.2.2, Item 5, for requirement for stirrups throughout lintels with bundled bars.

R611.8.2.2 Bundled bars in lintels. It is permitted to bundle two bars in contact with each other in lintels if all of the following are observed:

1. Bars no larger than No. 6 are bundled.
2. Where the wall thickness is not sufficient to provide not less than 3 inches (76 mm) of clear space beside bars (total on both sides) oriented horizontally in a bundle, the bundled bars shall be oriented in a vertical plane.
3. Where vertically oriented bundled bars terminate with standard hooks to develop the bars in tension beyond the support (see Section R611.5.4.4), the hook extensions shall be staggered to provide a minimum of one inch (25 mm) clear spacing between the extensions.

4 Bundled bars shall not be lap spliced within the lintel span and the length on each end of the lintel that is required to develop the bars in tension.

5. Bundled bars shall be enclosed within stirrups throughout the length of the lintel. Stirrups and the installation thereof shall comply with Section R611.8.2.1.

R611.8.2.3 Lintels without stirrups designed for nonload-bearing conditions. The maximum clear span of lintels without stirrups designed for nonload-bearing conditions of Table R611.8(1).1 shall be determined in accordance with this section. The maximum clear span of lintels without stirrups in flat walls shall be determined in accordance with Table R611.8(9), and the maximum clear span of lintels without stirrups in walls of waffle-grid or screen-grid construction shall be determined in accordance with Table R611.8(10).

TABLE R611.8(1)
LINTEL DESIGN LOADING CONDITIONS[a, b, d]

DESCRIPTION OF LOADS AND OPENINGS ABOVE INFLUENCING DESIGN OF LINTEL			DESIGN LOAD CONDITION[c]
Opening in wall of top story of two-story building, or first story of one-story building			
Wall supporting loads from roof, including attic floor, if applicable, and	Top of lintel equal to or less than W/2 below top of wall		2
	Top of lintel greater than W/2 below top of wall		NLB
Wall not supporting loads from roof or attic floor			NLB
Opening in wall of first story of two-story building where wall immediately above is of concrete construction, or opening in basement wall of one-story building where wall immediately above is of concrete construction			
LB ledger board mounted to side of wall with bottom of ledger less than or equal to W/2 above top of lintel, and	Top of lintel greater than W/2 below bottom of opening in story above		1
	Top of lintel less than or equal to W/2 below bottom of opening in story above, and	Opening is entirely within the footprint of the opening in the story above	1
		Opening is partially within the footprint of the opening in the story above	4
LB ledger board mounted to side of wall with bottom of ledger more than W/2 above top of lintel			NLB
NLB ledger board mounted to side of wall with bottom of ledger less than or equal to W/2 above top of lintel, or no ledger board, and	Top of lintel greater than W/2 below bottom of opening in story above		NLB
	Top of lintel less than or equal to W/2 below bottom of opening in story above, and	Opening is entirely within the footprint of the opening in the story above	NLB
		Opening is partially within the footprint of the opening in the story above	1
Opening in basement wall of two-story building where walls of two stories above are of concrete construction			
LB ledger board mounted to side of wall with bottom of ledger less than or equal to W/2 above top of lintel, and	Top of lintel greater than W/2 below bottom of opening in story above		1
	Top of lintel less than or equal to W/2 below bottom of opening in story above, and	Opening is entirely within the footprint of the opening in the story above	1
		Opening is partially within the footprint of the opening in the story above	5
LB ledger board mounted to side of wall with bottom of ledger more than W/2 above top of lintel			NLB
NLB ledger board mounted to side of wall with bottom of ledger less than or equal to W/2 above top of lintel, or no ledger board, and	Top of lintel greater than W/2 below bottom of opening in story above		NLB
	Top of lintel less than or equal to W/2 below bottom of opening in story above, and	Opening is entirely within the footprint of the opening in the story above	NLB
		Opening is partially within the footprint of the opening in the story above	1
Opening in wall of first story of two-story building where wall immediately above is of light framed construction, or opening in basement wall of one-story building, where wall immediately above is of light framed construction			
Wall supporting loads from roof, second floor and top-story wall of light-framed construction, and	Top of lintel equal to or less than W/2 below top of wall		3
	Top of lintel greater than W/2 below top of wall		NLB
Wall not supporting loads from roof or second floor			NLB

a. LB means load bearing, NLB means nonload-bearing, and W means width of opening.
b. Footprint is the area of the wall below an opening in the story above, bounded by the bottom of the opening and vertical lines extending downward from the edges of the opening.
c. For design loading condition "NLB" see Tables R611.8(9) and R611.8(10). For all other design loading conditions see Tables R611.8(2) through R611.8(8).
d. A NLB ledger board is a ledger attached to a wall that is parallel to the span of the floor, roof or ceiling framing that supports the edge of the floor, ceiling or roof.

TABLE R611.8(2)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 4-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D^g (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		40		5	
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
8	Span without stirrups[i, j]		3-2	3-4	2-4	2-6	2-2	2-1	2-0	2-0	2-0
	1-#4	40,000	5-2	5-5	4-1	4-3	3-10	3-7	3-4	2-9	2-9
		60,000	6-2	6-5	4-11	5-1	4-6	4-2	3-8	2-11	2-10
	1-#5	40,000	6-3	6-7	5-0	5-2	4-6	4-2	3-8	2-11	2-10
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		1-1	1-2	0-8	0-9	0-7	0-6	0-5	0-4	0-4
12	Span without stirrups[i, j]		3-4	3-7	2-9	2-11	2-8	2-6	2-5	2-2	2-2
	1-#4	40,000	6-7	7-0	5-4	5-7	5-0	4-9	4-4	3-8	3-7
		60,000	7-11	8-6	6-6	6-9	6-0	5-9	5-3	4-5	4-4
	1-#5	40,000	8-1	8-8	6-7	6-10	6-2	5-10	5-4	4-6	4-5
		60,000	9-8	10-4	7-11	8-2	7-4	6-11	6-2	4-10	4-8
	2-#4 1-#6	40,000	9-1	9-8	7-4	7-8	6-10	6-6	6-0	4-10	4-8
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		1-8	1-11	1-1	1-3	1-0	0-11	0-9	0-6	0-6
16	Span without stirrups[i, j]		4-7	5-0	3-11	4-0	3-8	3-7	3-4	3-1	3-0
	1-#4	40,000	6-8	7-3	5-6	5-9	5-2	4-11	4-6	3-10	3-8
		60,000	9-3	10-1	7-9	8-0	7-2	6-10	6-3	5-4	5-2
	1-#4	40,000	9-6	10-4	7-10	8-2	7-4	6-11	6-5	5-5	5-3
		60,000	11-5	12-5	9-6	9-10	8-10	8-4	7-9	6-6	6-4
	2-#4 1-#6	40,000	10-7	11-7	8-10	9-2	8-3	7-9	7-2	6-1	5-11
		60,000	12-9	13-10	10-7	11-0	9-10	9-4	8-7	6-9	6-6
	2-#5	40,000	13-0	14-1	10-9	11-2	9-11	9-2	8-2	6-6	6-3
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance[k, l]		2-3	2-8	1-7	1-8	1-4	1-3	1-0	0-9	0-8
20	Span without stirrups[i, j]		5-9	6-5	5-0	5-2	4-9	4-7	4-4	3-11	3-11
	1-#4	40,000	7-5	8-2	6-3	6-6	5-10	5-7	5-1	4-4	4-2
		60,000	9-0	10-0	7-8	7-11	7-1	6-9	6-3	5-3	5-1
	1-#5	40,000	9-2	10-2	7-9	8-1	7-3	6-11	6-4	5-4	5-2
		60,000	12-9	14-2	10-10	11-3	10-1	9-7	8-10	7-5	7-3
	2-#4 1-#6	40,000	11-10	13-2	10-1	10-5	9-4	8-11	8-2	6-11	6-9
		60,000	14-4	15-10	12-1	12-7	11-3	10-9	9-11	8-4	8-1
	2-#5	40,000	14-7	16-2	12-4	12-9	11-4	10-6	9-5	7-7	7-3
		60,000	17-5	19-2	14-9	15-3	13-5	12-4	11-0	8-8	8-4
	2-#6	40,000	16-4	18-11	12-7	13-3	11-4	10-6	9-5	7-7	7-3
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-9	3-5	2-0	2-2	1-9	1-7	1-4	0-11	0-11

(continued)

TABLE R611.8(2)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR 4-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, *D*[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL		DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
24	Span without stirrups[i, j]		6-11	7-9	6-1	6-3	5-9	5-7	5-3	4-9	4-8
	1-#4	40,000	8-0	9-0	6-11	7-2	6-5	6-2	5-8	4-9	4-8
		60,000	9-9	11-0	8-5	8-9	7-10	7-6	6-11	5-10	5-8
	1-#5	40,000	10-0	11-3	8-7	8-11	8-0	7-7	7-0	5-11	5-9
		60,000	13-11	15-8	12-0	12-5	11-2	10-7	9-10	8-3	8-0
	2-#4 1-#6	40,000	12-11	14-6	11-2	11-6	10-5	9-10	9-1	7-8	7-5
		60,000	15-7	17-7	13-6	13-11	12-7	11-11	11-0	9-3	9-0
	2-#5	40,000	15-11	17-11	13-7	14-3	12-8	11-9	10-8	8-7	8-4
		60,000	19-1	21-6	16-5	17-1	15-1	14-0	12-6	9-11	9-7
	2-#6	40,000	17-7	21-1	14-1	14-10	12-8	11-9	10-8	8-7	8-4
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		3-3	4-1	2-5	2-7	2-1	1-11	1-7	1-2	1-1

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 pound per square foot = 0.0479 kPa; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

a. See Table R611.3 for tolerances permitted from nominal thickness.

b. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See note j.

c. Table values are based on uniform loading. See Section R611.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is *L*/240, where *L* is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads and between lintel depths.

f. DR indicates design required.

g. Lintel depth, *D*, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Allowable clear span without stirrups applicable to all lintels of the same depth, *D*. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than d/2.

j. Where concrete with a minimum specified compressive strength of 3,000 psi (20.7 MPa) is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

k. Center distance, *A*, is the center portion of the clear span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, *A*, shall be permitted to be multiplied by 1.10.

m. The maximum clear opening width between two solid wall segments shall be 18 feet (5486 mm). See Section R611.7.2.1. Lintel clear spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(3)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
8	Span without stirrups[i, j]		4-2	4-8	3-1	3-3	2-10	2-6	2-3	2-0	2-0
	1-#4	40,000	5-1	5-5	4-2	4-3	3-10	3-6	3-3	2-8	2-7
		60,000	6-2	6-7	5-0	5-2	4-8	4-2	3-11	3-3	3-2
	1-#5	40,000	6-3	6-8	5-1	5-3	4-9	4-3	4-0	3-3	3-2
		60,000	7-6	8-0	6-1	6-4	5-8	5-1	4-9	3-8	3-6
	2-#4 1-#6	40,000	7-0	7-6	5-8	5-11	5-3	4-9	4-5	3-8	3-6
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		1-7	1-10	1-1	1-2	0-11	0-9	0-8	0-5	0-5
12	Span without stirrups[i, j]		4-2	4-8	3-5	3-6	3-2	2-11	2-9	2-5	2-4
	1-#4	40,000	5-7	6-1	4-8	4-10	4-4	3-11	3-8	3-0	2-11
		60,000	7-9	8-6	6-6	6-9	6-1	5-6	5-1	4-3	4-1
	1-#5	40,000	7-11	8-8	6-8	6-11	6-2	5-7	5-2	4-4	4-2
		60,000	9-7	10-6	8-0	8-4	7-6	6-9	6-3	5-2	5-1
	2-#4 1-#6	40,000	8-11	9-9	7-6	7-9	6-11	6-3	5-10	4-10	4-8
		60,000	10-8	11-9	8-12	9-4	8-4	7-6	7-0	5-10	5-8
	2-#5	40,000	10-11	12-0	9-2	9-6	8-6	7-8	7-2	5-6	5-3
		60,000	12-11	14-3	10-10	11-3	10-1	9-0	8-1	6-1	5-10
	2-#6	40,000	12-9	14-0	10-8	11-1	9-7	8-1	7-3	5-6	5-3
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-6	3-0	1-9	1-10	1-6	1-3	1-1	0-9	0-8
16	Span without stirrups[i, j]		5-7	6-5	4-9	4-11	4-5	4-0	3-10	3-4	3-4
	1-#4	40,000	6-5	7-2	5-6	5-9	5-2	4-8	4-4	3-7	3-6
		60,000	7-10	8-9	6-9	7-0	6-3	5-8	5-3	4-4	4-3
	1-#5	40,000	7-11	8-11	6-10	7-1	6-5	5-9	5-4	4-5	4-4
		60,000	11-1	12-6	9-7	9-11	8-11	8-0	7-6	6-2	6-0
	2-#4 1-#6	40,000	10-3	11-7	8-10	9-2	8-3	7-6	6-11	5-9	5-7
		60,000	12-5	14-0	10-9	11-1	10-0	9-0	8-5	7-0	6-9
	2-#5	40,000	12-8	14-3	10-11	11-4	10-2	9-2	8-7	6-9	6-6
		60,000	15-2	17-1	13-1	13-7	12-3	11-0	10-3	7-11	7-7
	2-#6	40,000	14-11	16-9	12-8	13-4	11-4	9-8	8-8	6-9	6-6
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		3-3	4-1	2-5	2-7	2-1	1-9	1-6	1-0	1-0

(continued)

TABLE R611.8(3)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
20	Span without stirrups[i, j]		6-11	8-2	6-1	6-3	5-8	5-2	4-11	4-4	4-3
	1-#5	40,000	8-9	10-1	7-9	8-0	7-3	6-6	6-1	5-1	4-11
		60,000	10-8	12-3	9-5	9-9	8-10	8-0	7-5	6-2	6-0
	2-#4 1-#6	40,000	9-11	11-4	8-9	9-1	8-2	7-4	6-10	5-8	5-7
		60,000	13-9	15-10	12-2	12-8	11-5	10-3	9-7	7-11	7-9
	2-#5	40,000	14-0	16-2	12-5	12-11	11-7	10-6	9-9	7-11	7-8
		60,000	16-11	19-6	15-0	15-6	14-0	12-7	11-9	9-1	8-9
	2-#6	40,000	16-7	19-1	14-7	15-3	13-1	11-3	10-2	7-11	7-8
		60,000	19-11	22-10	17-4	18-3	15-6	13-2	11-10	9-1	8-9
	Center distance A[k, l]		3-11	5-2	3-1	3-3	2-8	2-2	1-11	1-4	1-3
24	Span without stirrups[i, j]		8-2	9-10	7-4	7-8	6-11	6-4	5-11	5-3	5-2
	1-#5	40,000	9-5	11-1	8-7	8-10	8-0	7-3	6-9	5-7	5-5
		60,000	11-6	13-6	10-5	10-9	9-9	8-9	8-2	6-10	6-8
	2-#4 1-#6	40,000	10-8	12-6	9-8	10-0	9-0	8-2	7-7	6-4	6-2
		60,000	12-11	15-2	11-9	12-2	11-0	9-11	9-3	7-8	7-6
	2-#5	40,000	15-2	17-9	13-9	14-3	12-10	11-7	10-10	9-0	8-9
		60,000	18-4	21-6	16-7	17-3	15-6	14-0	13-1	10-4	10-0
	2-#6	40,000	18-0	21-1	16-4	16-11	14-10	12-9	11-8	9-2	8-11
		60,000	21-7	25-4	19-2	20-4	17-2	14-9	13-4	10-4	10-0
	Center distance A[k, l]		4-6	6-2	3-8	4-0	3-3	2-8	2-3	1-7	1-6

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 psf = 0.0479 kPa; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

a. See Table R611.3 for tolerances permitted from nominal thickness.

b. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Note j.

c. Table values are based on uniform loading. See Section R611.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads and between lintel depths.

f. DR indicates design required.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than d/2.

j. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

k. Center distance, A, is the center portion of the clear span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

m. The maximum clear opening width between two solid wall segments shall be 18 feet (5486 mm). See Section R611.7.2.1. Lintel clear spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(4)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 8-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
8	Span without stirrups[i, j]		4-4	4-9	3-7	3-9	3-4	2-10	2-7	2-1	2-0
	1-#4	40,000	4-4	4-9	3-7	3-9	3-4	2-11	2-9	2-3	2-2
		60,000	6-1	6-7	5-0	5-3	4-8	4-0	3-9	3-1	3-0
	1-#5	40,000	6-2	6-9	5-2	5-4	4-9	4-1	3-10	3-2	3-1
		60,000	7-5	8-1	6-2	6-5	5-9	4-11	4-7	3-9	3-8
	2-#4 1-#6	40,000	6-11	7-6	5-9	6-0	5-4	4-7	4-4	3-6	3-5
		60,000	8-3	9-0	6-11	7-2	6-5	5-6	5-2	4-2	4-1
	2-#5	40,000	8-5	9-2	7-0	7-3	6-6	5-7	5-3	4-2	4-0
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-1	2-6	1-5	1-6	1-3	0-11	0-10	0-6	0-6
12	Span without stirrups[i, j]		4-10	5-8	4-0	4-2	3-9	3-2	3-0	2-7	2-6
	1-#4	40,000	5-5	6-1	4-8	4-10	4-4	3-9	3-6	2-10	2-10
		60,000	6-7	7-5	5-8	5-11	5-4	4-7	4-3	3-6	3-5
	1-#5	40,000	6-9	7-7	5-9	6-0	5-5	4-8	4-4	3-7	3-6
		60,000	9-4	10-6	8-1	8-4	7-6	6-6	6-1	5-0	4-10
	2-#4 1-#6	40,000	8-8	9-9	7-6	7-9	7-0	6-0	5-8	4-7	4-6
		60,000	10-6	11-9	9-1	9-5	8-5	7-3	6-10	5-7	5-5
	2-#5	40,000	10-8	12-0	9-3	9-7	8-7	7-5	6-11	5-6	5-4
		60,000	12-10	14-5	11-1	11-6	10-4	8-11	8-4	6-7	6-4
	2-#6	40,000	12-7	14-2	10-10	11-3	10-2	8-3	7-6	5-6	5-4
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		3-2	4-0	2-4	2-6	2-0	1-6	1-4	0-11	0-10
16	Span without stirrups[i, j]		6-5	7-9	5-7	5-10	5-2	4-5	4-2	3-7	3-6
	1-#4	40,000	6-2	7-1	5-6	5-8	5-1	4-5	4-2	3-5	3-4
		60,000	7-6	8-8	6-8	6-11	6-3	5-5	5-1	4-2	4-0
	1-#5	40,000	7-8	8-10	6-10	7-1	6-4	5-6	5-2	4-3	4-1
		60,000	9-4	10-9	8-4	8-7	7-9	6-8	6-3	5-2	5-0
	2-#4 1-#6	40,000	8-8	10-0	7-8	8-0	7-2	6-2	5-10	4-9	4-8
		60,000	12-0	13-11	10-9	11-2	10-0	8-8	8-1	6-8	6-6
	2-#5	40,000	12-3	14-2	11-0	11-4	10-3	8-10	8-3	6-9	6-7
		60,000	14-10	17-2	13-3	13-8	12-4	10-8	10-0	7-11	7-8
	2-#6	40,000	14-6	16-10	13-0	13-5	12-1	10-1	9-2	6-11	6-8
		60,000	17-5	20-2	15-7	16-1	14-6	11-10	10-8	7-11	7-8
	Center distance[k, l]		4-1	5-5	3-3	3-6	2-10	2-1	1-10	1-3	1-2

(continued)

TABLE R611.8(4)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR 8-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
20	Span without stirrups[i, j]		7-10	9-10	7-1	7-5	6-7	5-8	5-4	4-7	4-6
	1-#5	40,000	8-4	9-11	7-8	8-0	7-2	6-3	5-10	4-9	4-8
		60,000	10-2	12-1	9-5	9-9	8-9	7-7	7-1	5-10	5-8
	2-#4 1-#6	40,000	9-5	11-3	8-8	9-0	8-1	7-0	6-7	5-5	5-3
		60,000	11-6	13-8	10-7	11-0	9-11	8-7	8-0	6-7	6-5
	2-#5	40,000	11-9	13-11	10-10	11-2	10-1	8-9	8-2	6-8	6-7
		60,000	16-4	19-5	15-0	15-7	14-0	12-2	11-4	9-3	9-0
	2-#6	40,000	16-0	19-0	14-9	15-3	13-9	11-10	10-10	8-3	8-0
		60,000	19-3	22-11	17-9	18-5	16-7	13-7	12-4	9-3	9-0
	Center distance A[k, l]		4-10	6-10	4-1	4-5	3-7	2-8	2-4	1-7	1-6
24	Span without stirrups[i, j]		9-2	11-9	8-7	8-11	8-0	6-11	6-6	5-7	5-6
	1-#5	40,000	8-11	10-10	8-6	8-9	7-11	6-10	6-5	5-3	5-2
		60,000	10-11	13-3	10-4	10-8	9-8	8-4	7-10	6-5	6-3
	2-#4 1-#6	40,000	10-1	12-3	9-7	9-11	8-11	7-9	7-3	6-0	5-10
		60,000	12-3	15-0	11-8	12-1	10-11	9-5	8-10	7-3	7-1
	2-#5	40,000	12-6	15-3	11-11	12-4	11-1	9-7	9-0	7-5	7-3
		60,000	17-6	21-3	16-7	17-2	15-6	13-5	12-7	10-4	10-1
	2-#6	40,000	17-2	20-11	16-3	16-10	15-3	13-2	12-4	9-7	9-4
		60,000	20-9	25-3	19-8	20-4	18-5	15-4	14-0	10-7	10-3
	Center distance A[k, l]		5-6	8-1	4-11	5-3	4-4	3-3	2-10	1-11	1-10

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 psf = 0.0479 kPa; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

Note: Top and bottom reinforcement for lintels without stirrups shown in shaded cells shall be equal to or greater than that required for lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups.

a. See Table R611.3 for tolerances permitted from nominal thickness.

b. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Note j.

c. Table values are based on uniform loading. See Section R611.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads and between lintel depths.

f. DR indicates design required.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than d/2.

j. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

k. Center distance, A, is the center portion of the clear span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

m. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R611.7.2.1. Lintel clear spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(5)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 10-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
8	Span without stirrups[i, j]		6-0	7-2	4-7	4-10	4-1	3-1	2-11	2-3	2-2
	1-#4	40,000	4-3	4-9	3-7	3-9	3-4	2-9	2-7	2-1	2-1
		60,000	5-11	6-7	5-0	5-3	4-8	3-10	3-8	2-11	2-11
	1-#5	40,000	6-1	6-9	5-2	5-4	4-9	3-11	3-9	3-0	2-11
		60,000	7-4	8-1	6-3	6-5	5-9	4-9	4-6	3-7	3-7
	2-#4 1-#6	40,000	6-10	7-6	5-9	6-0	5-5	4-5	4-2	3-4	3-4
		60,000	8-2	9-1	6-11	7-2	6-6	5-4	5-0	4-1	4-0
	2-#5	40,000	8-4	9-3	7-1	7-4	6-7	5-5	5-1	4-1	4-0
		60,000	9-11	11-0	8-5	8-9	7-10	6-6	6-1	4-8	4-6
	2-#6	40,000	9-9	10-10	8-3	8-7	7-9	6-4	5-10	4-1	4-0
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[k, l]		2-6	3-1	1-10	1-11	1-7	1-1	0-11	0-7	0-7
12	Span without stirrups[i, j]		5-5	6-7	4-7	4-10	4-3	3-5	3-3	2-8	2-8
	1-#4	40,000	5-3	6-0	4-8	4-10	4-4	3-7	3-4	2-9	2-8
		60,000	6-5	7-4	5-8	5-10	5-3	4-4	4-1	3-4	3-3
	1-#5	40,000	6-6	7-6	5-9	6-0	5-5	4-5	4-2	3-5	3-4
		60,000	7-11	9-1	7-0	7-3	6-7	5-5	5-1	4-2	4-0
	2-#4 1-#6	40,000	7-4	8-5	6-6	6-9	6-1	5-0	4-9	3-10	3-9
		60,000	10-3	11-9	9-1	9-5	8-6	7-0	6-7	5-4	5-3
	2-#5	40,000	10-5	12-0	9-3	9-7	8-8	7-2	6-9	5-5	5-4
		60,000	12-7	14-5	11-2	11-6	10-5	8-7	8-1	6-6	6-4
	2-#6	40,000	12-4	14-2	10-11	11-4	10-2	8-5	7-8	5-7	5-5
		60,000	14-9	17-0	13-1	13-6	12-2	10-0	9-1	6-6	6-4
	Center distance A[k, l]		3-9	4-11	2-11	3-2	2-7	1-9	1-7	1-0	1-0
16	Span without stirrups[i, j]		7-1	9-0	6-4	6-8	5-10	4-9	4-6	3-9	3-8
	1-#4	40,000	5-11	7-0	5-5	5-8	5-1	4-3	4-0	3-3	3-2
		60,000	7-3	8-7	6-8	6-11	6-3	5-2	4-10	3-11	3-10
	1-#5	40,000	7-4	8-9	6-9	7-0	6-4	5-3	4-11	4-0	3-11
		60,000	9-0	10-8	8-3	8-7	7-9	6-5	6-0	4-11	4-9
	2-#4 1-#6	40,000	8-4	9-11	7-8	7-11	7-2	5-11	5-7	4-6	4-5
		60,000	10-2	12-0	9-4	9-8	8-9	7-3	6-10	5-6	5-5
	2-#5	40,000	10-4	12-3	9-6	9-10	8-11	7-4	6-11	5-8	5-6
		60,000	14-4	17-1	13-3	13-8	12-4	10-3	9-8	7-10	7-8
	2-#6	40,000	14-1	16-9	13-0	13-5	12-2	10-1	9-6	7-0	6-10
		60,000	17-0	20-2	15-8	16-2	14-7	12-0	10-11	8-0	7-9
	Center distance[k, l]		4-9	6-8	4-0	4-4	3-6	2-5	2-2	1-5	1-4

(continued)

TABLE R611.8(5)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR 10-INCH NOMINAL THICK FLAT LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, m]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
20	Span without stirrups[i, j]		8-7	11-4	8-1	8-5	7-5	6-1	5-9	4-10	4-9
	1-#4	40,000	6-5	7-10	6-2	6-4	5-9	4-9	4-6	3-8	3-7
		60,000	7-10	9-7	7-6	7-9	7-0	5-10	5-6	4-5	4-4
	1-#5	40,000	8-0	9-9	7-8	7-11	7-2	5-11	5-7	4-6	4-5
		60,000	9-9	11-11	9-4	9-8	8-9	7-3	6-10	5-6	5-5
	2-#4 1-#6	40,000	9-0	11-1	8-8	8-11	8-1	6-9	6-4	5-2	5-0
		60,000	11-0	13-6	10-6	10-11	9-10	8-2	7-9	6-3	6-2
	2-#5	40,000	11-3	13-9	10-9	11-1	10-0	8-4	7-10	6-5	6-3
		60,000	15-8	19-2	15-0	15-6	14-0	11-8	11-0	8-11	8-9
	2-#6	40,000	15-5	18-10	14-8	15-2	13-9	11-5	10-9	8-6	8-3
		60,000	18-7	22-9	17-9	18-5	16-7	13-10	12-9	9-5	9-2
	Center distance A[k, l]		5-7	8-4	5-1	5-5	4-5	3-1	2-9	1-10	1-9
24	Span without stirrups[i, j]		9-11	13-7	9-9	10-2	9-0	7-5	7-0	5-10	5-9
	1-#5	40,000	8-6	10-8	8-5	8-8	7-10	6-6	6-2	5-0	4-11
		60,000	10-5	13-0	10-3	10-7	9-7	8-0	7-6	6-1	6-0
	2-#4 1-#6	40,000	9-7	12-1	9-6	9-9	8-10	7-5	7-0	5-8	5-6
		60,000	11-9	14-9	11-7	11-11	10-10	9-0	8-6	6-11	6-9
	2-#5	40,000	12-0	15-0	11-9	12-2	11-0	9-2	8-8	7-1	6-11
		60,000	14-7	18-3	14-4	14-10	13-5	11-2	10-7	8-7	8-5
	2-#6	40,000	14-3	17-11	14-1	14-7	13-2	11-0	10-4	8-5	8-3
		60,000	19-11	25-0	19-7	20-3	18-4	15-3	14-5	10-10	10-7
	Center distance A[k, l]		6-3	9-11	6-1	6-6	5-4	3-9	3-4	2-2	2-1

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 pound per square foot = 0.0479 kPa; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

Note: Top and bottom reinforcement for lintels without stirrups shown in shaded cells shall be equal to or greater than that required for lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups.

a. See Table R611.3 for tolerances permitted from nominal thickness.

b. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Note j.

c. Table values are based on uniform loading. See Section R611.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads and between lintel depths.

f. DR indicates design required.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than d/2.

j. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

k. Center distance, A, is the center portion of the clear span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

m. The maximum clear opening width between two solid wall segments shall be 18 feet (5486 mm). See Section R611.7.2.1. Lintel clear spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(6)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH THICK WAFFLE-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, o]
MAXIMUM ROOF CLEAR SPAN 40 FEET AND MAXIMUM FLOOR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
8[i]	Span without stirrups[k, l]		2-7	2-9	2-0	2-1	2-0	2-0	2-0	2-0	2-0
	1-#4	40,000	5-2	5-5	4-0	4-3	3-7	3-3	2-11	2-4	2-3
		60,000	5-9	6-3	4-0	4-3	3-7	3-3	2-11	2-4	2-3
	1-#5	40,000	5-9	6-3	4-0	4-3	3-7	3-3	2-11	2-4	2-3
		60,000	5-9	6-3	4-0	4-3	3-7	3-3	2-11	2-4	2-3
	2-#4 1-#6	40,000	5-9	6-3	4-0	4-3	3-7	3-3	2-11	2-4	2-3
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[m, n]		0-9	0-10	0-6	0-6	0-5	0-5	0-4	STL	STL
12[i]	Span without stirrups[k, l]		2-11	3-1	2-6	2-7	2-5	2-4	2-3	2-1	2-0
	1-#4	40,000	5-9	6-2	4-8	4-10	4-4	4-1	3-9	3-2	3-1
		60,000	8-0	8-7	6-6	6-9	6-0	5-5	4-11	3-11	3-10
	1-#5	40,000	8-1	8-9	6-8	6-11	6-0	5-5	4-11	3-11	3-10
		60,000	9-1	10-3	6-8	7-0	6-0	5-5	4-11	3-11	3-10
	2-#4 1-#6	40,000	9-1	9-9	6-8	7-0	6-0	5-5	4-11	3-11	3-10
	Center distance A[m, n]		1-3	1-5	0-10	0-11	0-9	0-8	0-6	STL	STL
16[i]	Span without stirrups[k, l]		4-0	4-4	3-6	3-7	3-4	3-3	3-1	2-10	2-10
	1-#4	40,000	6-7	7-3	5-6	5-9	5-2	4-10	4-6	3-9	3-8
		60,000	8-0	8-10	6-9	7-0	6-3	5-11	5-5	4-7	4-5
	1-#5	40,000	8-2	9-0	6-11	7-2	6-5	6-0	5-7	4-8	4-6
		60,000	11-5	12-6	9-3	9-9	8-4	7-7	6-10	5-6	5-4
	2-#4 1-#6	40,000	10-7	11-7	8-11	9-3	8-3	7-7	6-10	5-6	5-4
		60,000	12-2	14-0	9-3	9-9	8-4	7-7	6-10	5-6	5-4
	2-#5	40,000	12-2	14-2	9-3	9-9	8-4	7-7	6-10	5-6	5-4
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[m, n]		1-8	2-0	1-2	1-3	1-0	0-11	0-9	STL	STL
20[i]	Span without stirrups[k, l]		5-0	5-6	4-6	4-7	4-3	4-1	4-0	3-8	3-8
	1-#4	40,000	7-2	8-2	6-3	6-6	5-10	5-6	5-1	4-3	4-2
		60,000	8-11	9-11	7-8	7-11	7-1	6-8	6-2	5-2	5-0
	1-#5	40,000	9-1	10-2	7-9	8-1	7-3	6-10	6-4	5-4	5-2
		60,000	12-8	14-2	10-11	11-3	10-2	9-6	8-9	7-1	6-10
	2-#4 1-#6	40,000	10-3	11-5	8-9	9-1	8-2	7-8	7-1	6-0	5-10
		60,000	14-3	15-11	11-9	12-5	10-8	9-9	8-9	7-1	6-10
	2-#5	40,000	14-6	16-3	11-6	12-1	10-4	9-6	8-6	6-11	6-8
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[m, n]		2-0	2-6	1-6	1-7	1-3	1-1	1-0	STL	STL

(continued)

TABLE R611.8(6)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH THICK WAFFLE-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, o]
MAXIMUM ROOF CLEAR SPAN 40 FEET AND MAXIMUM FLOOR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
			Maximum ground snow load (psf)								
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
24w[j]	Span without stirrups[k, l]		6-0	6-8	5-5	5-7	5-3	5-0	4-10	4-6	4-5
	1-#4	40,000	7-11	9-0	6-11	7-2	6-5	6-0	5-7	4-8	4-7
		60,000	9-8	10-11	8-5	8-9	7-10	7-4	6-10	5-9	5-7
	1-#5	40,000	9-10	11-2	8-7	8-11	8-0	7-6	7-0	5-10	5-8
		60,000	12-0	13-7	10-6	10-10	9-9	9-2	8-6	7-2	6-11
	2-#4 1-#6	40,000	11-1	12-7	9-8	10-1	9-1	8-6	7-10	6-7	6-5
		60,000	15-6	17-7	13-6	14-0	12-8	11-10	10-8	8-7	8-4
	2-#5	40,000	15-6	17-11	12-8	13-4	11-6	10-7	9-7	7-10	7-7
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[m, n]		2-4	3-0	1-9	1-11	1-6	1-4	1-2	STL	STL

For SI: 1 inch = 25.4 mm; 1 pound per square foot = 0.0479 kPa; 1 foot = 304.8 mm; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

a. Where lintels are formed with waffle-grid forms, form material shall be removed, if necessary, to create top and bottom flanges of the lintel that are not less than 3 inches in depth (in the vertical direction), are not less than 5 inches (127 mm) in width for 6-inch nominal waffle-grid forms and not less than 7 inches in width for 8-inch nominal waffle-grid forms. See Figure R611.8(3). Flat form lintels shall be permitted in place of waffle-grid lintels. See Tables R611.8(2) through R611.8(5).

b. See Table R611.3 for tolerances permitted from nominal thicknesses and minimum dimensions and spacing of cores.

c. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi (17.2 MPa). See Notes l and n. Table values are based on uniform loading. See Section R611.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads.

f. DR indicates design required. STL – stirrups required throughout lintel.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Lintels less than 24 inches in depth with stirrups shall be formed from flat-walls forms [see Tables R611.8(2) through R611.8(5)], or, if necessary, form material shall be removed from waffle-grid forms so as to provide the required cover for stirrups. Allowable spans for lintels formed with flat-wall forms shall be determined from Tables R611.8(2) through R611.8(5).

j. Where stirrups are required for 24-inch (610 mm) deep lintels, the spacing shall not exceed 12 inches (305 mm) on center.

k. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than $d/2$.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

m. Center distance, A, is the center portion of the span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

n. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

o. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R611.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(7)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 8-INCH THICK WAFFLE-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, o]
MAXIMUM ROOF CLEAR SPAN 40 FEET AND MAXIMUM FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)							
			1	2		3		4		5
				Maximum ground snow load (psf)						
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
8[i]	Span with stirrups[k, l]		2-6	2-9	2-0	2-1	2-0	2-0	2-0	2-0	2-0
	1-#4	40,000	4-5	4-9	3-7	3-9	3-4	3-0	2-10	2-3	2-2
		60,000	5-6	6-2	4-0	4-3	3-7	3-1	2-10	2-3	2-2
	1-#5	40,000	5-6	6-2	4-0	4-3	3-7	3-1	2-10	2-3	2-2
	Center distance A[m, n]		0-9	0-10	0-6	0-6	0-5	0-4	0-4	STL	STL
12[i]	Span without stirrups[k, l]		2-10	3-1	2-6	2-7	2-5	2-3	2-2	2-0	2-0
	1-#4	40,000	5-7	6-1	4-8	4-10	4-4	3-11	3-8	3-0	2-11
		60,000	6-9	7-5	5-8	5-11	5-4	4-9	4-5	3-8	3-7
	1-#5	40,000	6-11	7-7	5-10	6-0	5-5	4-10	4-6	3-9	3-7
		60,000	8-8	10-1	6-7	7-0	5-11	5-2	4-8	3-9	3-7
	2-#4 1-#6	40,000	8-8	9-10	6-7	7-0	5-11	5-2	4-8	3-9	3-7
		60,000	8-8	10-1	6-7	7-0	5-11	5-2	4-8	3-9	3-7
	Center distance A[m, n]		1-2	1-5	0-10	0-11	0-9	0-7	0-6	STL	STL
16[i]	Span without stirrups[k, l]		3-10	4-3	3-6	3-7	3-4	3-2	3-0	2-10	2-9
	1-#4	40,000	6-5	7-2	5-6	5-9	5-2	4-8	4-4	3-7	3-6
		60,000	7-9	8-9	6-9	7-0	6-3	5-8	5-3	4-4	4-3
	1-#5	40,000	7-11	8-11	6-10	7-1	6-5	5-9	5-4	4-5	4-4
		60,000	9-8	10-11	8-4	8-8	7-10	7-0	6-6	5-2	5-1
	2-#4 1-#6	40,000	9-0	10-1	7-9	8-0	7-3	6-6	6-1	5-0	4-11
		60,000	11-5	13-10	9-2	9-8	8-3	7-2	6-6	5-2	5-1
	Center distance A[m, n]		1-6	1-11	1-2	1-3	1-0	0-10	0-8	STL	STL
20[i]	Span without stirrups[k, l]		4-10	5-5	4-5	4-7	4-3	4-0	3-11	3-7	3-7
	1-#4	40,000	7-0	8-1	6-3	6-5	5-10	5-3	4-11	4-1	3-11
		60,000	8-7	9-10	7-7	7-10	7-1	6-5	6-0	4-11	4-10
	1-#5	40,000	8-9	10-1	7-9	8-0	7-3	6-6	6-1	5-1	4-11
		60,000	10-8	12-3	9-6	9-10	8-10	8-0	7-5	6-2	6-0
	2-#4 1-#6	40,000	9-10	11-4	8-9	9-1	8-2	7-4	6-10	5-8	5-7
		60,000	12-0	13-10	10-8	11-0	9-11	9-0	8-4	6-8	6-6
	2-#5	40,000	12-3	14-1	10-10	11-3	10-2	8-11	8-1	6-6	6-4
		60,000	14-0	17-6	11-8	12-3	10-6	9-1	8-4	6-8	6-6
	Center distance A[m, n]		1-10	2-5	1-5	1-7	1-3	1-0	0-11	STL	STL
24[j]	Span without stirrups[k, l]		5-9	6-7	5-5	5-6	5-2	4-11	4-9	4-5	4-4
	1-#4	40,000	7-6	8-10	6-10	7-1	6-5	5-9	5-5	4-6	4-4
		60,000	9-2	10-9	8-4	8-8	7-10	7-1	6-7	5-6	5-4
	1-#5	40,000	9-5	11-0	8-6	8-10	8-0	7-2	6-8	5-7	5-5
		60,000	11-5	13-5	10-5	10-9	9-9	8-9	8-2	6-10	6-8
	2-#4 1-#6	40,000	10-7	12-5	9-8	10-0	9-0	8-1	7-7	6-3	6-2
		60,000	12-11	15-2	11-9	12-2	11-0	9-11	9-3	7-8	7-6
	2-#5	40,000	13-2	15-6	12-0	12-5	11-2	9-11	9-2	7-5	7-3
		60,000	16-3	21-0	14-1	14-10	12-9	11-1	10-1	8-1	7-11
	2-#6	40,000	14-4	18-5	12-6	13-2	11-5	9-11	9-2	7-5	7-3
	Center distance A[m, n]		2-1	2-11	1-9	1-10	1-6	1-3	1-1	STL	STL

(continued)

TABLE R611.8(7)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR 8-INCH THICK WAFFLE-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, o]
MAXIMUM ROOF CLEAR SPAN 40 FEET AND MAXIMUM FLOOR CLEAR SPAN 32 FEET

For SI: 1 inch = 25.4 mm; 1 pound per square foot = 0.0479 kPa; 1 foot = 304.8 mm; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

a. Where lintels are formed with waffle-grid forms, form material shall be removed, if necessary, to create top and bottom flanges of the lintel that are not less than 3 inches in depth (in the vertical direction), are not less than 5 inches in width for 6-inch nominal waffle-grid forms and not less than 7 inches in width for 8-inch nominal waffle-grid forms. See Figure R611.8(3). Flat form lintels shall be permitted in lieu of waffle-grid lintels. See Tables R611.8(2) through R611.8(5).

b. See Table R611.3 for tolerances permitted from nominal thicknesses and minimum dimensions and spacing of cores.

c. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi (17.2 MPa). See Notes l and n. Table values are based on uniform loading. See Section R611.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads.

f. DR indicates design required. STL – stirrups required throughout lintel.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Lintels less than 24 inches in depth with stirrups shall be formed from flat-walls forms [see Tables R611.8(2) through R611.8(5)], or, if necessary, form material shall be removed from waffle-grid forms so as to provide the required cover for stirrups. Allowable spans for lintels formed with flat-wall forms shall be determined from Tables R611.8(2) through R611.8(5).

j. Where stirrups are required for 24-inch (610 mm) deep lintels, the spacing shall not exceed 12 inches on center.

k. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than $d/2$.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

m. Center distance, A, is the center portion of the span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

n. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

o. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R611.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(8)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH THICK SCREEN-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, p]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R611.8(1)								
			1	2		3		4		5	
				Maximum ground snow load (psf)							
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
12[i,j]	Span without stirrups		2-9	2-11	2-4	2-5	2-3	2-3	2-2	2-0	2-0
16[i,j]	Span without stirrups		3-9	4-0	3-4	3-5	3-2	3-1	3-0	2-9	2-9
20[i,j]	Span without stirrups		4-9	5-1	4-3	4-4	4-1	4-0	3-10	3-7	3-7
24[k]	Span without stirrups[l, m]		5-8	6-3	5-2	5-3	5-0	4-10	4-8	4-4	4-4
	1-#4	40,000	7-11	9-0	6-11	7-2	6-5	6-1	5-8	4-9	4-7
		60,000	9-9	11-0	8-5	8-9	7-10	7-5	6-10	5-9	5-7
	1-#5	40,000	9-11	11-2	8-7	8-11	8-0	7-7	7-0	5-11	5-9
		60,000	12-1	13-8	10-6	10-10	9-9	9-3	8-6	7-2	7-0
	2-#4 1-#6	40,000	11-2	12-8	9-9	10-1	9-1	8-7	7-11	6-8	6-6
		60,000	15-7	17-7	12-8	13-4	11-6	10-8	9-8	7-11	7-8
	2-#5	40,000	14-11	18-0	12-2	12-10	11-1	10-3	9-4	7-8	7-5
		60,000	DR	DR	DR	DR	DR	DR	DR	DR	DR
	Center distance A[n, o]		2-0	2-6	1-6	1-7	1-4	1-2	1-0	STL	STL

For SI: 1 inch = 25.4 mm; 1 pound per square foot = 0.0479 kPa; 1 foot = 304.8 mm; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

a. Where lintels are formed with screen-grid forms, form material shall be removed if necessary to create top and bottom flanges of the lintel that are not less than 5 inches in width and not less than 2.5 inches in depth (in the vertical direction). See Figure R611.8(4). Flat form lintels shall be permitted in lieu of screen-grid lintels. See Tables R611.8(2) through R611.8(5).

b. See Table R611.3 for tolerances permitted from nominal thickness and minimum dimensions and spacings of cores.

c. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Notes m and o. Table values are based on uniform loading. See Section R611.7.2.1 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads.

f. DR indicates design required. STL indicates stirrups required throughout lintel.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Stirrups are not required for lintels less than 24 inches in depth fabricated from screen-grid forms. Top and bottom reinforcement shall consist of a No. 4 bar having a yield strength of 40,000 psi or 60,000 psi.

j. Lintels between 12 and 24 inches in depth with stirrups shall be formed from flat-wall forms [see Tables R611.8(2) through R611.8(5)], or form material shall be removed from screen-grid forms to provide a concrete section comparable to that required for a flat wall. Allowable spans for flat lintels with stirrups shall be determined from Tables R611.8(2) through R6111.8(5).

k. Where stirrups are required for 24-inch deep lintels, the spacing shall not exceed 12 inches on center.

l. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall not be less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than 12 inches.

m. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

n. Center distance, A, is the center portion of the span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

o. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

p. The maximum clear opening width between two solid wall segments shall be 18 feet (5486 mm). See Section R611.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R611.8(9)
MAXIMUM ALLOWABLE CLEAR SPANS FOR FLAT LINTELS WITHOUT STIRRUPS IN NONLOAD-BEARING WALLS[a, b, c, d, e, g, h]

LINTEL DEPTH, D^i (inches)	NUMBER OF BARS AND BAR SIZE	STEEL YIELD STRENGTH, f_y (psi)	NOMINAL WALL THICKNESS (inches)							
			4		6		8		10	
			Lintel Supporting							
			Concrete Wall	Light-framed Gable	Concrete Wall	Light-framed Gable	Concrete Wall	Light-framed Gable	Concrete Wall	Light-framed Gable
			Maximum Clear Span of Lintel (feet - inches)							
8	1-#4	40,000	10-11	11-5	9-7	11-2	7-10	9-5	7-3	9-2
		60,000	12-5	11-7	10-11	13-5	9-11	13-2	9-3	12-10
	1-#5	40,000	12-7	11-7	11-1	13-8	10-1	13-5	9-4	13-1
		60,000	DR	DR	12-7	16-4	11-6	14-7	10-9	14-6
	2-#4 1-#6	40,000	DR	DR	12-0	15-3	10-11	15-0	10-2	14-8
		60,000	DR	DR	DR	DR	12-2	15-3	11-7	15-3
	2-#5	40,000	DR	DR	DR	DR	12-7	16-7	11-9	16-7
		60,000	DR	DR	DR	DR	DR	DR	13-3	16-7
	2-#6	40,000	DR	DR	DR	DR	DR	DR	13-2	17-8
		60,000	DR	DR	DR	DR	DR	DR	DR	DR
12	1-#4	40,000	11-5	9-10	10-6	12-0	9-6	11-6	8-9	11-1
		60,000	11-5	9-10	11-8	13-3	10-11	14-0	10-1	13-6
	1-#5	40,000	11-5	9-10	11-8	13-3	11-1	14-4	10-3	13-9
		60,000	11-5	9-10	11-8	13-3	11-10	16-0	11-9	16-9
	2-#4 1-#6	40,000	DR	DR	11-8	13-3	11-10	16-0	11-2	15-6
		60,000	DR	DR	11-8	13-3	11-10	16-0	11-11	18-4
	2-#5	40,000	DR	DR	11-8	13-3	11-10	16-0	11-11	18-4
		60,000	DR	DR	11-8	13-3	11-10	16-0	11-11	18-4
16	1-#4	40,000	13-6	13-0	11-10	13-8	10-7	12-11	9-11	12-4
		60,000	13-6	13-0	13-8	16-7	12-4	15-9	11-5	15-0
	1-#5	40,000	13-6	13-0	13-10	17-0	12-6	16-1	11-7	15-4
		60,000	13-6	13-0	13-10	17-1	14-0	19-7	13-4	18-8
	2-#4 1-#6	40,000	13-6	13-0	13-10	17-1	13-8	18-2	12-8	17-4
		60,000	13-6	13-0	13-10	17-1	14-0	20-3	14-1	—
	2-#5	40,000	13-6	13-0	13-10	17-1	14-0	20-3	14-1	—
		60,000	DR	DR	13-10	17-1	14-0	20-3	14-1	—
20	1-#4	40,000	14-11	15-10	13-0	14-10	11-9	13-11	10-10	13-2
		60,000	15-3	15-10	14-11	18-1	13-6	17-0	12-6	16-2
	1-#5	40,000	15-3	15-10	15-2	18-6	13-9	17-5	12-8	16-6
		60,000	15-3	15-10	15-8	20-5	15-9	—	14-7	20-1
	2-#4 1-#6	40,000	15-3	15-10	15-8	20-5	14-11	—	13-10	—
		60,000	15-3	15-10	15-8	20-5	15-10	—	15-11	—
	2-#5	40,000	15-3	15-10	15-8	20-5	15-10	—	15-11	—
		60,000	15-3	15-10	15-8	20-5	15-10	—	15-11	—
24	1-#4	40,000	16-1	17-1	13-11	15-10	12-7	14-9	11-8	13-10
		60,000	16-11	18-5	16-1	19-3	14-6	18-0	13-5	17-0
	1-#5	40,000	16-11	18-5	16-3	19-8	14-9	18-5	13-8	17-4
		60,000	16-11	18-5	17-4	—	17-0	—	15-8	—
	2-#4 1-#6	40,000	16-11	18-5	17-4	—	16-1	—	14-10	—
		60,000	16-11	18-5	17-4	—	17-6	—	17-1	—
	2-#5	40,000	16-11	18-5	17-4	—	17-6	—	17-4	—
		60,000	16-11	18-5	17-4	—	17-6	—	17-8	—

(continued)

TABLE R611.8(9)—continued
MAXIMUM ALLOWABLE CLEAR SPANS FOR FLAT LINTELS WITHOUT STIRRUPS IN NONLOAD-BEARING WALLS[a, b, c, d, e, g, h]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; Grade 40 = 280 MPa; Grade 60 = 420 MPa.

a. See Table R611.3 for tolerances permitted from nominal thickness.
b. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Note e.
c. Deflection criterion is *L*/240, where *L* is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.
d. Linear interpolation between lintels depths, *D*, is permitted provided the two cells being used to interpolate are shaded.
e. Where concrete with a minimum specified compressive strength of 3,000 psi is used, spans in cells that are shaded shall be permitted to be multiplied by 1.05.
f. Lintel depth, *D*, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.
g. DR indicates design required.
h. The maximum clear opening width between two solid wall segments shall be 18 feet (5486 mm). See Section R611.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information purposes only.

TABLE R611.8(10)
MAXIMUM ALLOWABLE CLEAR SPANS FOR WAFFLE-GRID AND SCREEN GRID LINTELS WITHOUT STIRRUPS IN NONLOAD-BEARING WALLS[c, d, e, f, g]

LINTEL DEPTH[h], *D* (inches)	FORM TYPE AND NOMINAL WALL THICKNESS (inches)					
	6-inch Waffle-grid[a]		8-inch Waffle-grid[a]		6-inch Screen-grid[b]	
	Lintel supporting					
	Concrete Wall	Light-framed Gable	Concrete Wall	Light-framed Gable	Concrete Wall	Light-framed Gable
	Maximum Clear Span of Lintel (feet - inches)					
8	10-3	8-8	8-8	8-3	—	—
12	9-2	7-6	7-10	7-1	8-8	6-9
16	10-11	10-0	9-4	9-3	—	—
20	12-5	12-2	10-7	11-2	—	—
24	13-9	14-2	11-10	12-11	13-0	12-9

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; Grade 40 = 280 MPa; Grade 60 = 420 MPa

a. Where lintels are formed with waffle-grid forms, form material shall be removed, if necessary, to create top and bottom flanges of the lintel that are not less than 3 inches in depth (in the vertical direction), are not less than 5 inches in width for 6-inch waffle-grid forms and not less than 7 inches in width for 8-inch waffle-grid forms. See Figure R611.8(3). Flat form lintels shall be permitted in lieu of waffle-grid lintels. See Tables R611.8(2) through R611.8(5).
b. Where lintels are formed with screen-grid forms, form material shall be removed if necessary to create top and bottom flanges of the lintel that are not less than 5 inches in width and not less than 2.5 inches in depth (in the vertical direction). See Figure R611.8(4). Flat form lintels shall be permitted in lieu of screen-grid lintels. See Tables R611.8(2) through R611.8(5).
c. See Table R611.3 for tolerances permitted from nominal thickness and minimum dimensions and spacing of cores.
d. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Note g.
e. Deflection criterion is *L/240*, where *L* is the clear span of the lintel in inches, or $^1/_2$-inch, whichever is less.
f. Top and bottom reinforcement shall consist of a No. 4 bar having a minimum yield strength of 40,000 psi.
g. Where concrete with a minimum specified compressive strength of 3,000 psi is used, spans in shaded cells shall be permitted to be multiplied by 1.05.
h. Lintel depth, *D*, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

R611.9 Requirements for connections–general. Concrete walls shall be connected to footings, floors, ceilings and roofs in accordance with this section.

R611.9.1 Connections between concrete walls and light-framed floor, ceiling and roof systems. Connections between concrete walls and light-framed floor, ceiling and roof systems using the prescriptive details of Figures R611.9(1) through R611.9(12) shall comply with this section and Sections R611.9.2 and R611.9.3.

R611.9.1.1 Anchor bolts. Anchor bolts used to connect light-framed floor, ceiling and roof systems to concrete walls in accordance with Figures R611.9(1) through R611.9(12) shall have heads, or shall be rods with threads on both ends with a hex or square nut on the end embedded in the concrete. Bolts and threaded rods shall comply with Section R611.5.2.2. Anchor bolts with J- or L-hooks shall not be used where the connection details in these figures are used.

R611.9.1.2 Removal of stay-in-place form material at bolts. Holes in stay-in-place forms for installing bolts for attaching face-mounted wood ledger boards to the wall shall be a minimum of 4 inches (102 mm) in diameter for forms not greater than $1^1/_2$ inches (38 mm) in thickness, and increased 1 inch (25 mm) in diameter for each $^1/_2$-inch (13 mm) increase in form thickness. Holes in stay-in-place forms for installing bolts for attaching face-mounted cold-formed steel tracks to the wall shall be a minimum of 4 inches (102 mm) square. The wood ledger board or steel track shall be in direct contact with the concrete at each bolt location.

Exception: A vapor retarder or other material less than or equal to $^1/_{16}$-inch (1.6 mm) in thickness is permitted to be installed between the wood ledger or cold-formed track and the concrete.

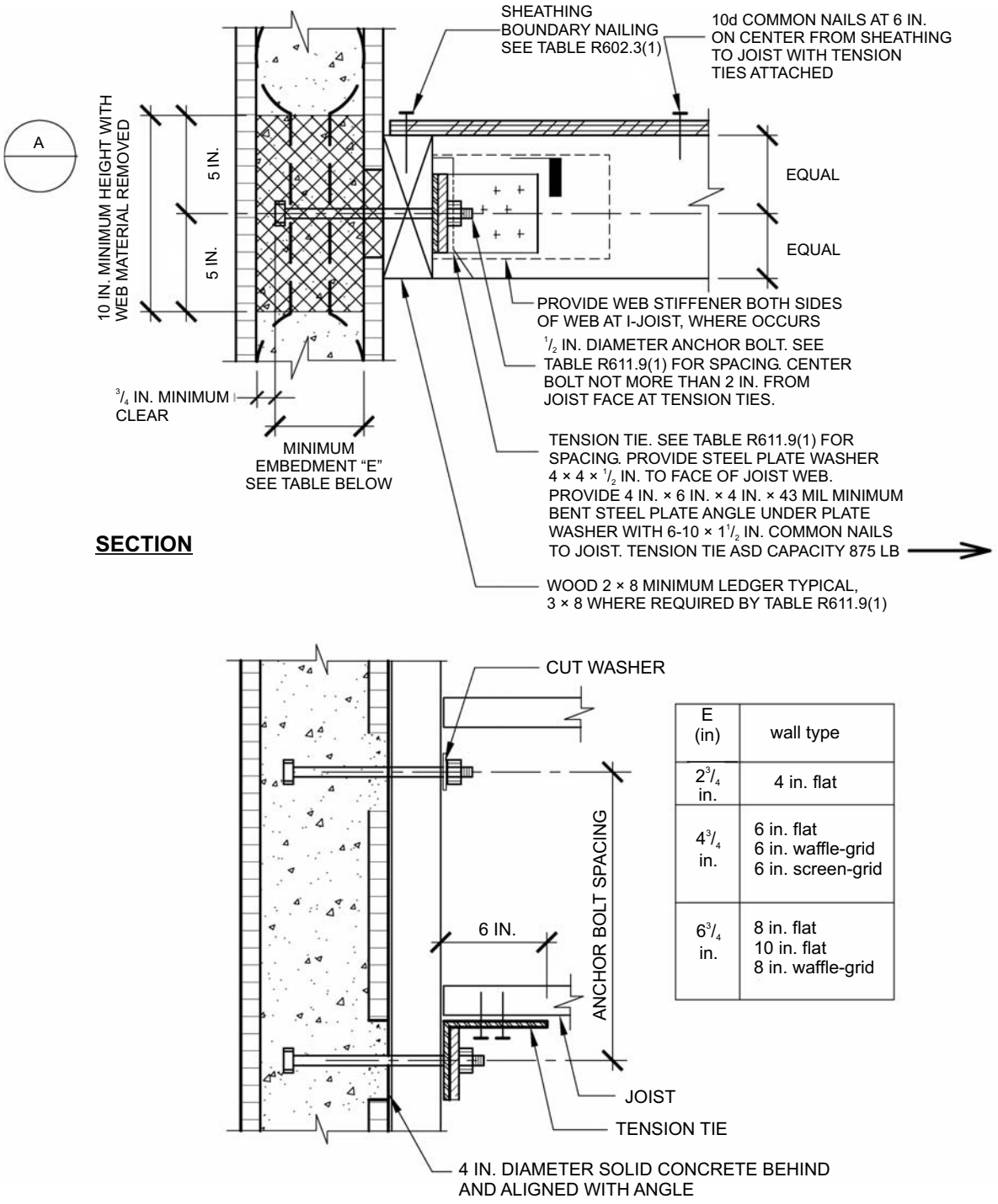
R611.9.2 Connections between concrete walls and light-framed floor systems. Connections between concrete walls and light-framed floor systems shall be in accordance with one of the following:

1. For floor systems of wood frame construction, the provisions of Section R611.9.1 and the prescriptive details of Figures R611.9(1) through R611.9(4), where permitted by the tables accompanying those figures. Portions of connections of wood-framed floor systems not noted in the figures shall be in accordance with Section R502, or AF&PA/WFCM, if applicable.
2. For floor systems of cold-formed steel construction, the provisions of Section R611.9.1 and the prescriptive details of Figures R611.9(5) through R611.9(8), where permitted by the tables accompanying those figures. Portions of connections of cold-formed-steel framed floor systems not noted in the figures shall be in accordance with Section R505, or AISI S230, if applicable.
3. Proprietary connectors selected to resist loads and load combinations in accordance with Appendix A (ASD) or Appendix B (LRFD) of PCA 100.
4. An engineered design using loads and load combinations in accordance with Appendix A (ASD) or Appendix B (LRFD) of PCA 100.
5. An engineered design using loads and material design provisions in accordance with this code, or in accordance with ASCE 7, ACI 318, and AF&PA/NDS for wood frame construction or AISI S100 for cold-formed steel frame construction.

R611.9.3 Connections between concrete walls and light-framed ceiling and roof systems. Connections between concrete walls and light-framed ceiling and roof systems shall be in accordance with one of the following:

1. For ceiling and roof systems of wood frame construction, the provisions of Section R611.9.1 and the prescriptive details of Figures R611.9(9) and R611.9(10), where permitted by the tables accompanying those figures. Portions of connections of wood-framed ceiling and roof systems not noted in the figures shall be in accordance with Section R802, or AF&PA/WFCM, if applicable.
2. For ceiling and roof systems of cold-formed-steel construction, the provisions of Section R611.9.1 and the prescriptive details of Figures R611.9(11) and R611.9(12), where permitted by the tables accompanying those figures. Portions of connections of cold-formed-steel framed ceiling and roof systems not noted in the figures shall be in accordance with Section R804, or AISI S230, if applicable.
3. Proprietary connectors selected to resist loads and load combinations in accordance with Appendix A (ASD) or Appendix B (LRFD) of PCA 100.
4. An engineered design using loads and load combinations in accordance with Appendix A (ASD) or Appendix B (LRFD) of PCA 100.
5. An engineered design using loads and material design provisions in accordance with this code, or in accordance with ASCE 7, ACI 318, and AF&PA/NDS for wood-frame construction or AISI S100 for cold-formed-steel frame construction.

R611.10 Floor, roof and ceiling diaphragms. Floors and roofs in all buildings with exterior walls of concrete shall be designed and constructed as *diaphragms*. Where gable-end walls occur, ceilings shall also be designed and constructed as *diaphragms*. The design and construction of floors, roofs and ceilings of wood framing or cold-formed-steel framing serving as *diaphragms* shall comply with the applicable requirements of this code, or AF&PA/WFCM or AISI S230, if applicable.



E (in)	wall type
2 3/4 in.	4 in. flat
4 3/4 in.	6 in. flat 6 in. waffle-grid 6 in. screen-grid
6 3/4 in.	8 in. flat 10 in. flat 8 in. waffle-grid

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(1)
WOOD FRAMED FLOOR TO SIDE OF CONCRETE WALL, FRAMING PERPENDICULAR

TABLE R611.9(1)
WOOD FRAMED FLOOR TO SIDE OF CONCRETE WALL, FRAMING PERPENDICULAR[a, b, c]

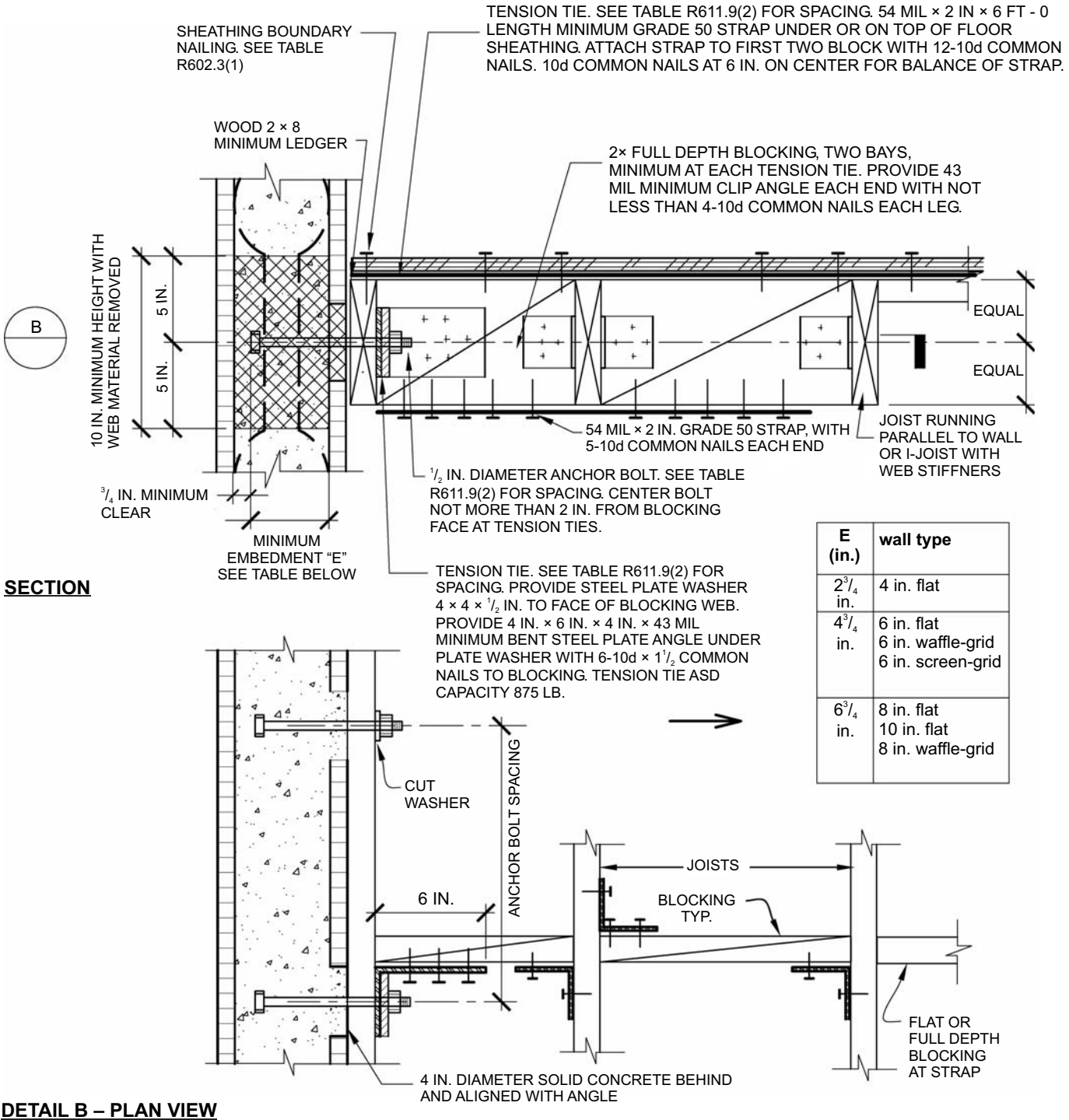
ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph)					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						
12	48						
16	16					A	A
16	32						
16	48						
19.2	19.2	A	A	A	A	A	
19.2	38.4	A	A	A			

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

a. This table is for use with the detail in Figure R611.9(1). Use of this detail is permitted where a cell is not shaded and prohibited where shaded.

b. Wall design per other provisions of Section R611 is required.

c. Letter "A" indicates that a minimum nominal 3×8 ledger is required.



E (in.)	wall type
2 3/4 in.	4 in. flat
4 3/4 in.	6 in. flat 6 in. waffle-grid 6 in. screen-grid
6 3/4 in.	8 in. flat 10 in. flat 8 in. waffle-grid

SECTION

DETAIL B – PLAN VIEW

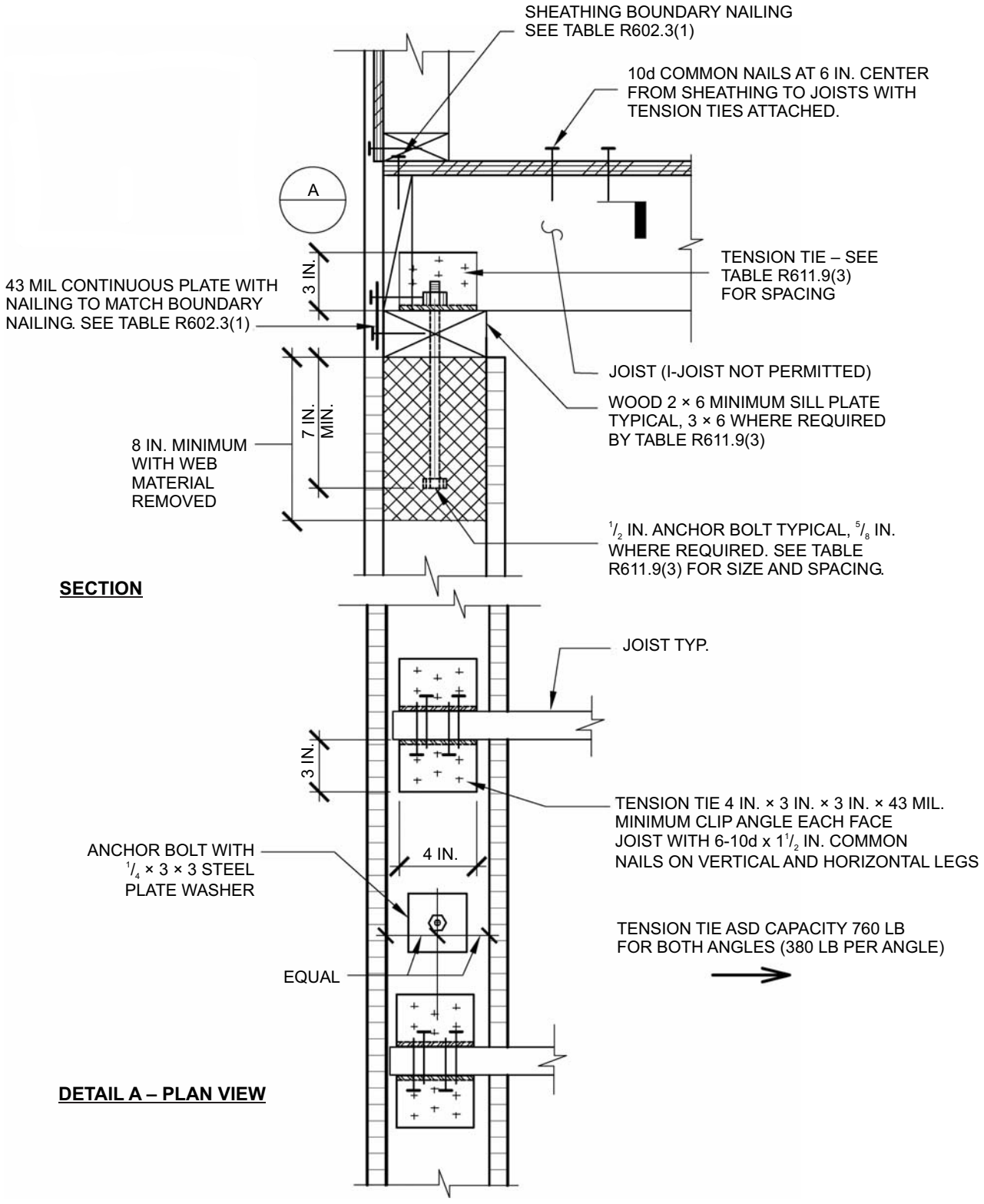
For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(2)
WOOD FRAMED FLOOR TO SIDE OF CONCRETE WALL FRAMING PARALLEL

TABLE R611.9(2)
WOOD FRAMED FLOOR TO SIDE OF CONCRETE WALL, FRAMING PARALLEL[a, b]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85b	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						
12	48						
16	16						
16	32						
16	48						
19.2	19.2						
19.2	38.4						
24	24						
24	48						

For SI: 1 inch = 25.4 mm; 1 mph = 0.447 m/s.
a. This table is for use with the detail in Figure R611.9(2). Use of this detail is permitted where a cell is not shaded and prohibited where shaded.
b. Wall design per other provisions of Section R611 is required.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(3)
WOOD FRAMED FLOOR TO TOP OF CONCRETE WALL FRAMING PERPENDICULAR

TABLE R611.9(3)
WOOD FRAMED FLOOR TO TOP OF CONCRETE WALL, FRAMING PERPENDICULAR[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						
12	48						
16	16					6 A	6 B
16	32					6 A	6 B
16	48						
19.2	19.2				6 A	6 A	6 B
19.2	38.4				6 A	6 A	
24	24			6 A	6 B	6 A	
24	48			6 A			

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

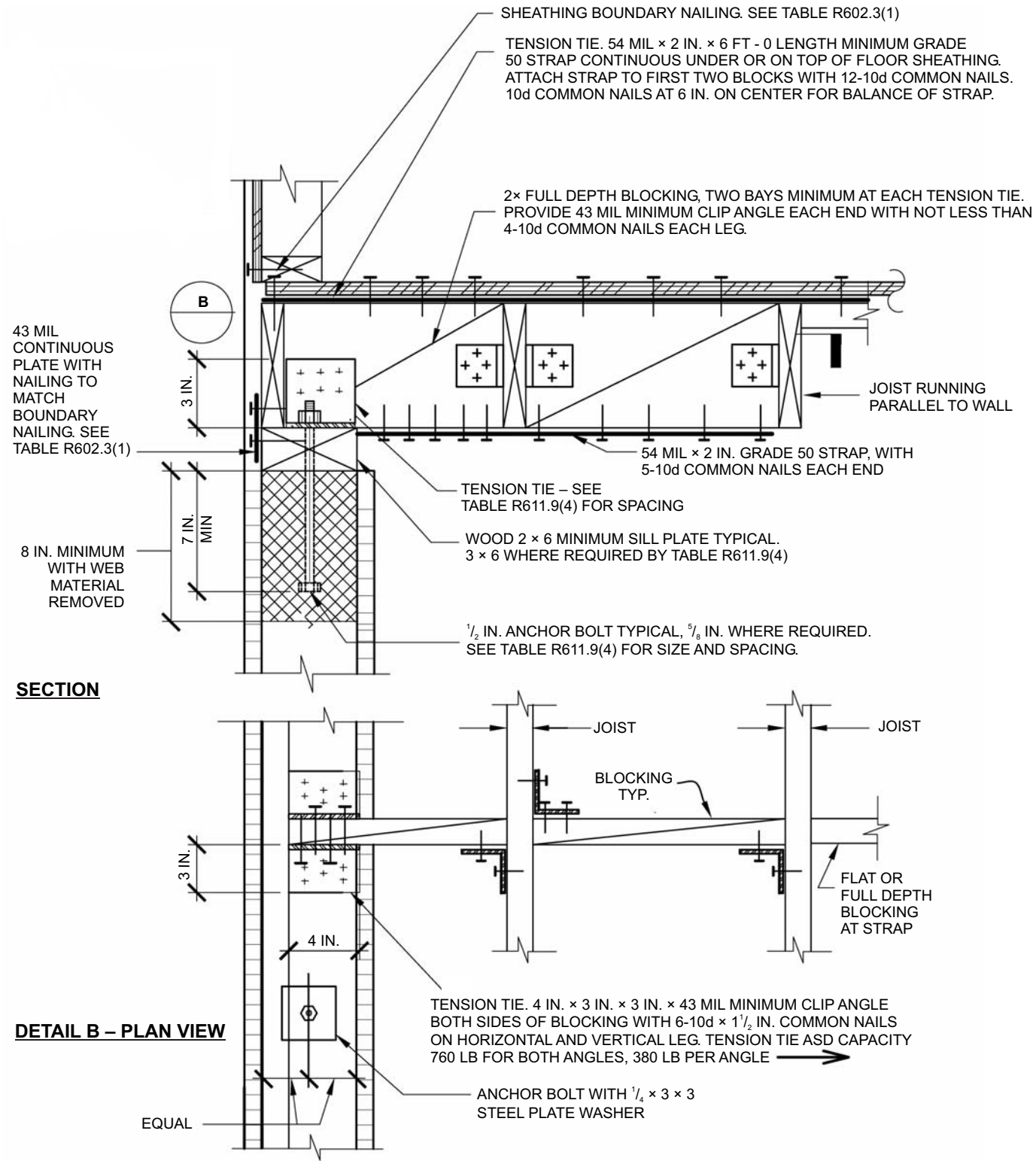
a. This table is for use with the detail in Figure R611.9(3). Use of this detail is permitted where cell is not shaded, prohibited where shaded.

b. Wall design per other provisions in Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Number 6 indicates minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(3). For the remainder of the wall, see Note b.

e. Letter "A" indicates that a minimum nominal 3×6 sill plate is required. Letter "B" indicates that a $^5/_8$ inch (16 mm) diameter anchor bolt and a minimal nominal 3×6 sill plate are required.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(4)
WOOD FRAMED FLOOR TO TOP OF CONCRETE WALL FRAMING PARALLEL

TABLE R611.9(4)
WOOD FRAMED FLOOR TO TOP OF CONCRETE WALL, FRAMING PARALLEL[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
	12						
12	24						
12	36						
12	48						
16	16					6 A	6 B
16	32					6 A	6 B
16	48						
19.2	19.2				6 A	6 A	6 B
19.2	38.4				6 A	6 A	
24	24			6 A	6 B	6 B	
24	48			6 A			

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

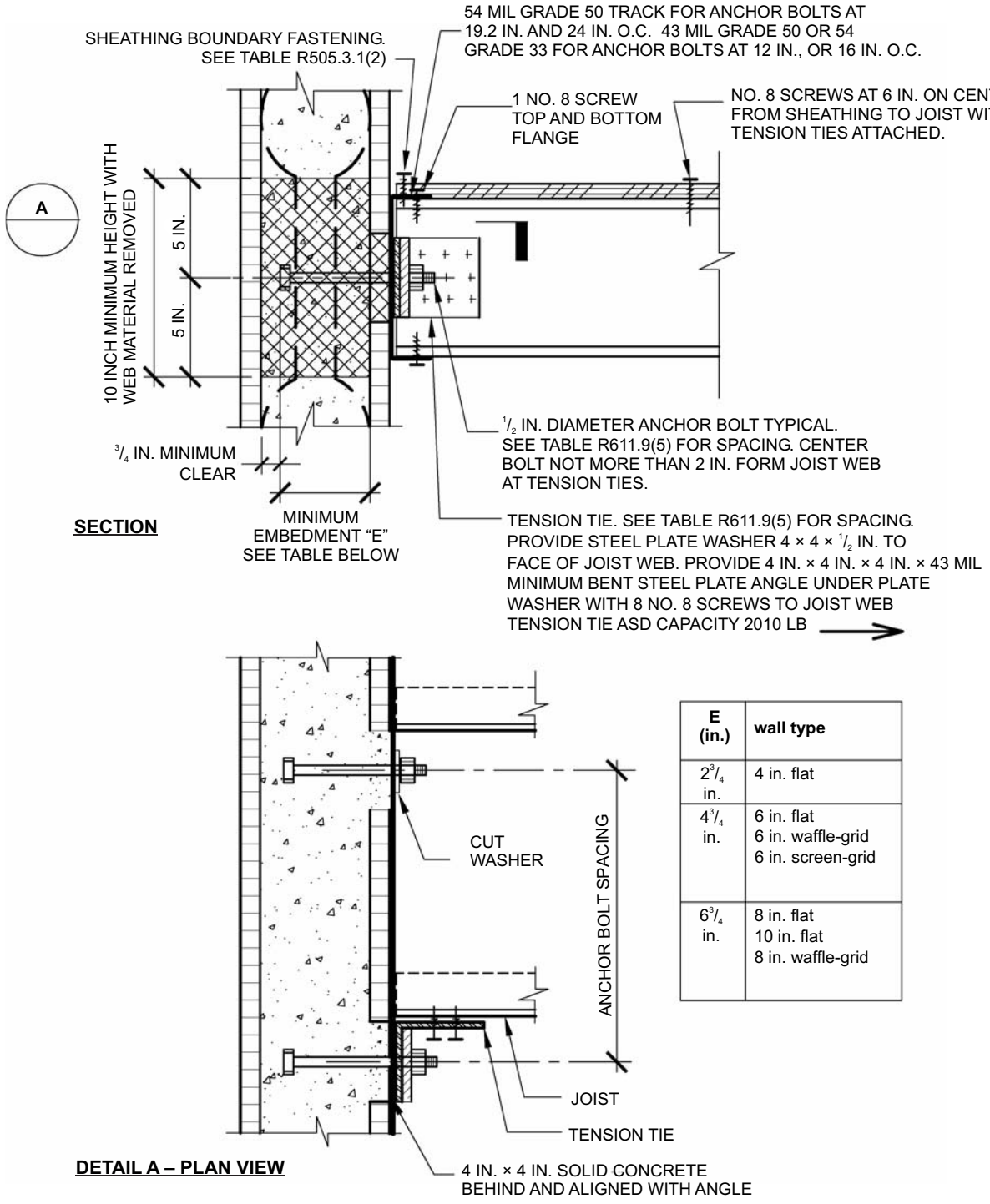
a. This table is for use with the detail in Figure R611.9(4). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Number 6 indicates minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(4). For the remainder of the wall, see Note b.

e. Letter "A" indicates that a minimum nominal 3×6 sill plate is required. Letter "B" indicates that a $^5/_8$ inch diameter anchor bolt and a minimal nominal 3×6 sill plate are required.



E (in.)	wall type
2 3/4 in.	4 in. flat
4 3/4 in.	6 in. flat 6 in. waffle-grid 6 in. screen-grid
6 3/4 in.	8 in. flat 10 in. flat 8 in. waffle-grid

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(5)
COLD-FORMED STEEL FLOOR TO SIDE OF CONCRETE WALL, FRAMING PERPENDICULAR

TABLE R611.9(5)
COLD-FORMED STEEL FRAMED FLOOR TO SIDE OF CONCRETE WALL, FRAMING PERPENDICULAR[a, b, c, d]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						6
12	48					6	6
16	16						
16	32						
16	48					6	6
19.2	19.2						
19.2	38.4						6
24	24						
24	48					6	6

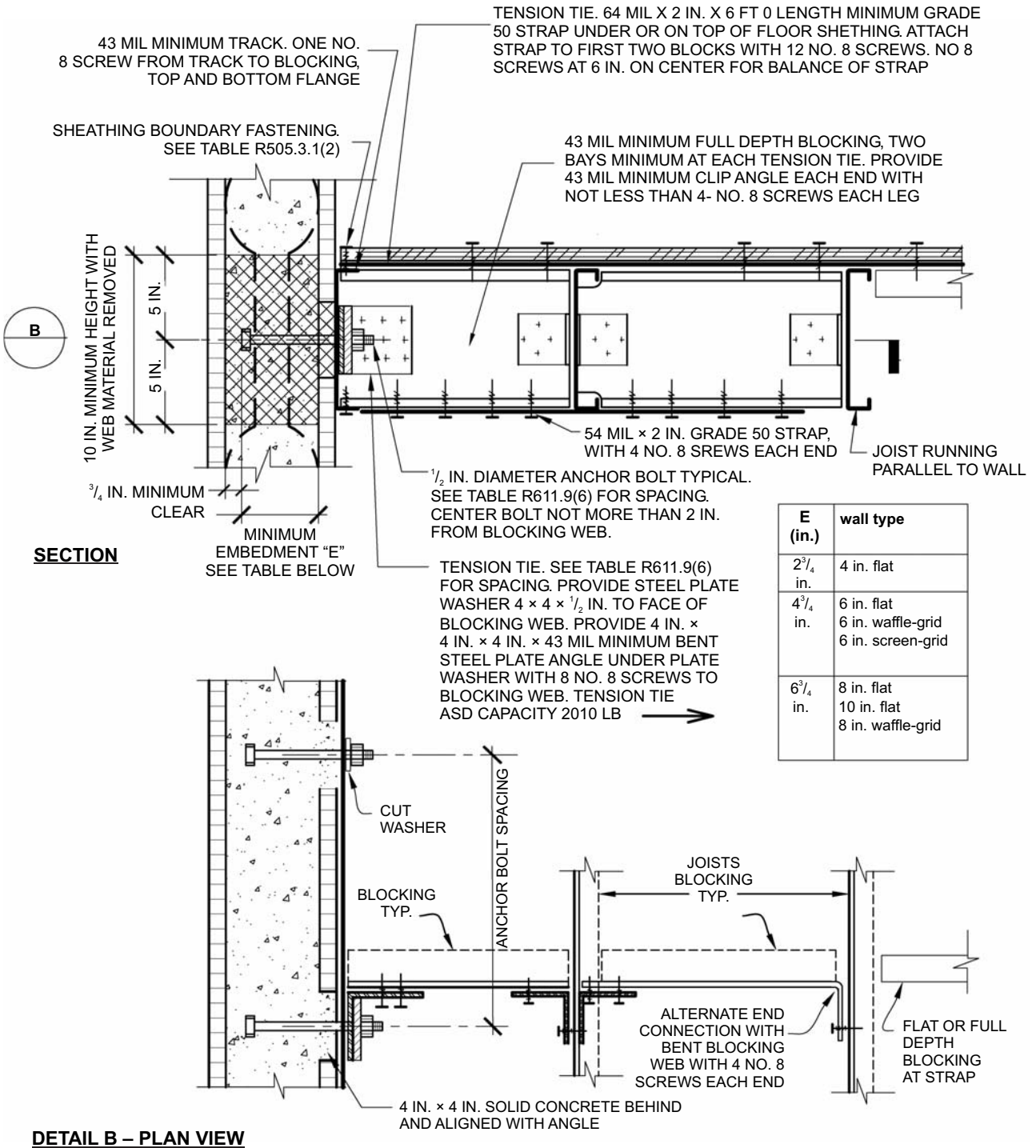
For SI: 1 inch = 25.4 mm; 1 mile per hour = 0.4470 m/s.

a. This table is for use with the detail in Figure R611.9(5). Use of this detail is permitted where a cell is not shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Number 6 indicates minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(5). For the remainder of the wall, see Note b.



E (in.)	wall type
2 3/4 in.	4 in. flat
4 3/4 in.	6 in. flat 6 in. waffle-grid 6 in. screen-grid
6 3/4 in.	8 in. flat 10 in. flat 8 in. waffle-grid

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(6)
COLD-FORMED STEEL FLOOR TO SIDE OF CONCRETE WALL, FRAMING PARALLEL

TABLE R611.9(6)
COLD-FORMED STEEL FRAMED FLOOR TO SIDE OF CONCRETE WALL, FRAMING PARALLEL[a, b, c, d]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						6
12	48					6	6
16	16						
16	32						
16	48					6	6
19.2	19.2						
19.2	38.4						6
24	24						
24	48					6	6

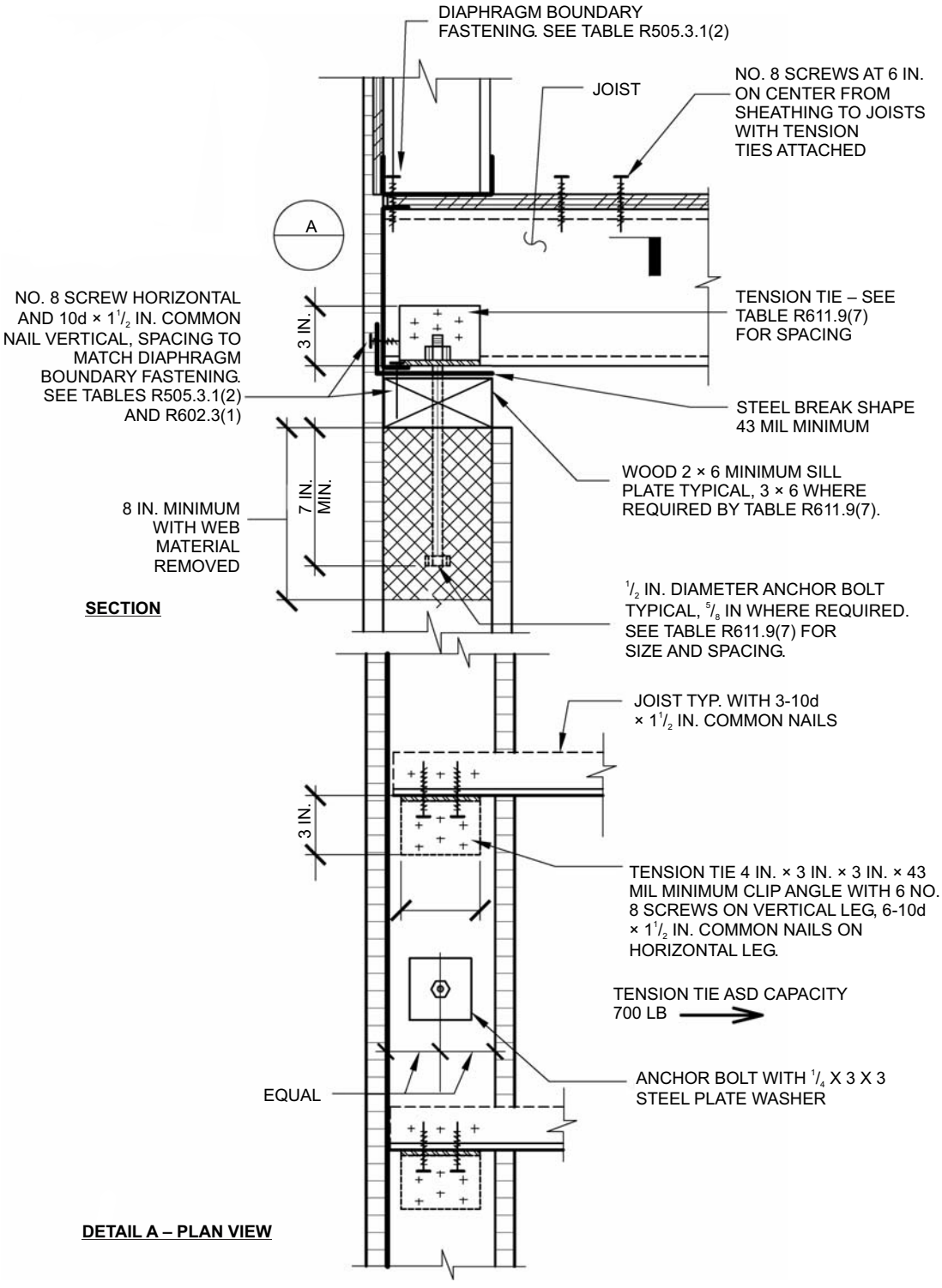
For SI: 1 inch = 25.4 mm; 1 mile per hour = 0.447 m/s.

a. This table is for use with the detail in Figure R611.9(6). Use of this detail is permitted where a cell is not shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Number 6 indicates minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(6). For the remainder of the wall, see Note b.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(7)
COLD-FORMED STEEL FLOOR TO TOP OF CONCRETE WALL FRAMING PERPENDICULAR

TABLE R611.9(7)
COLD-FORMED STEEL FRAMED FLOOR TO TOP OF CONCRETE WALL, FRAMING PERPENDICULAR[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				858C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
16	16					6 A	6 B
16	32					6 A	6 B
19.2	19.2				6 A	8 B	8 B
19.2	38.4				6 A	8 B	8 B
24	24			6 A	8 B	8 B	

For SI: 1 inch = 25.4 mm; 1 mph = 0.447 m/s.

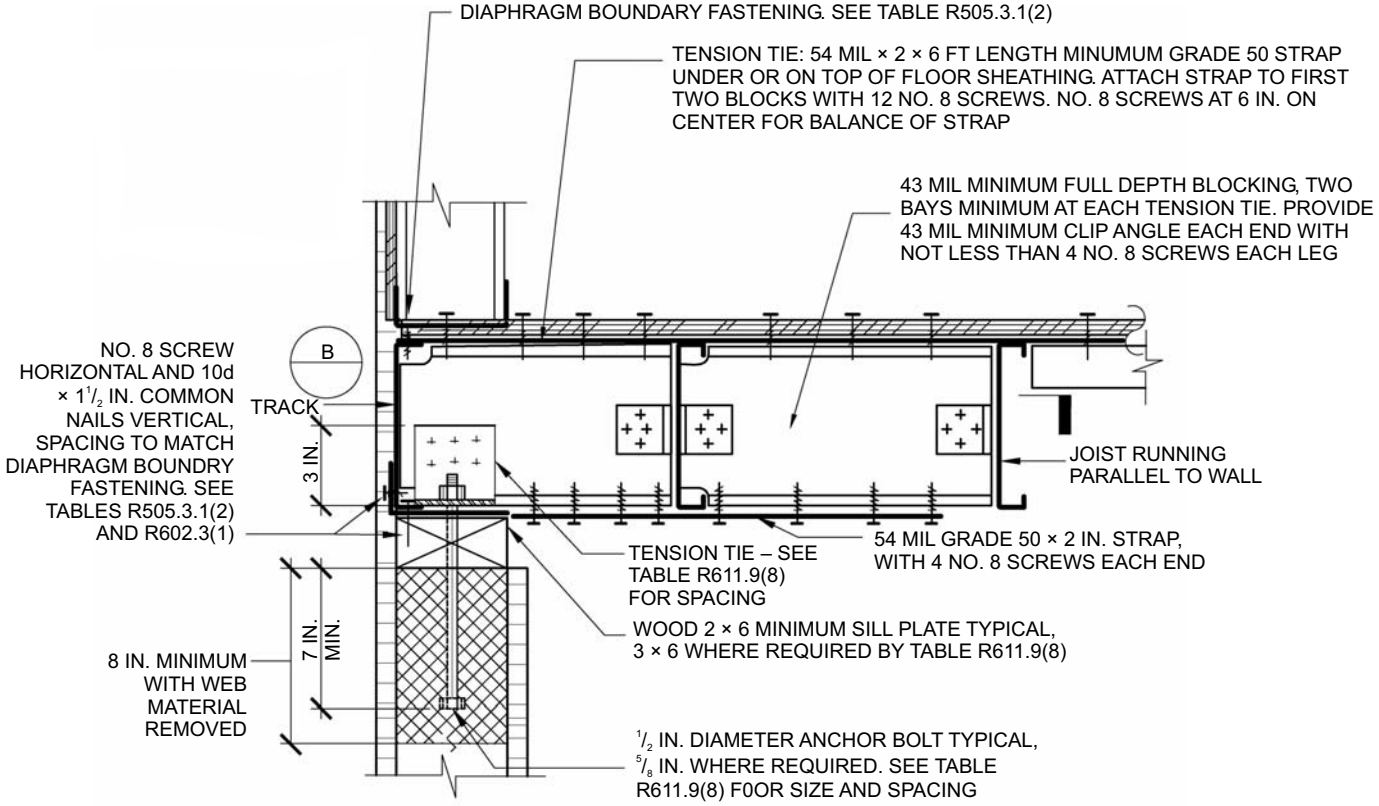
a. This table is for use with the detail in Figure R611.9(7). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

b. Wall design per other provisions of Section R611 is required.

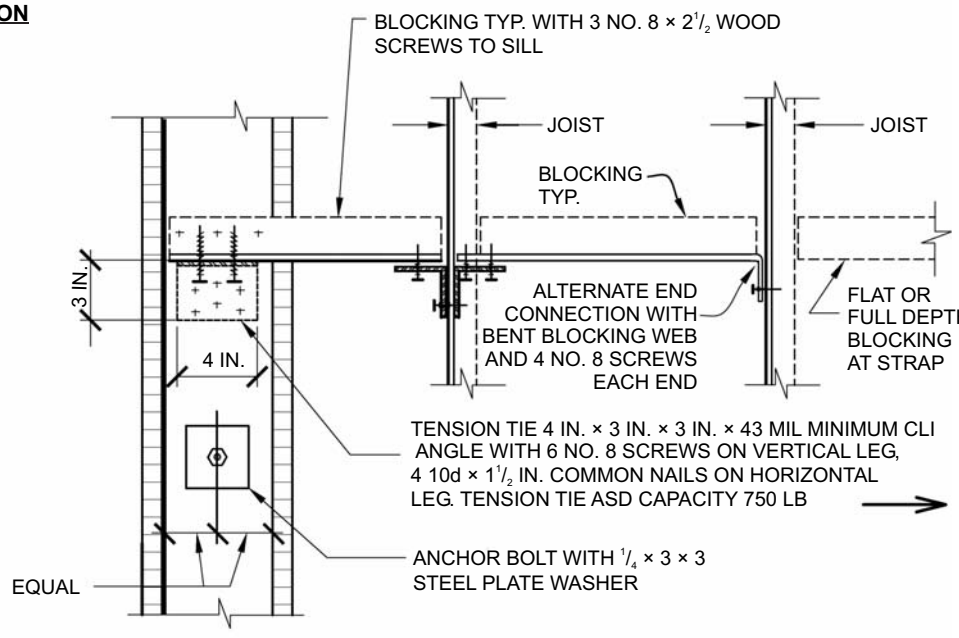
c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Numbers 6 and 8 indicate minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(7). For the remainder of the wall, see Note b.

e. Letter "A" indicates that a minimum nominal 3×6 sill plate is required. Letter "B" indicates that a $^5/_8$ inch diameter anchor bolt and a minimum nominal 3×6 sill plate are required.



SECTION



DETAIL B – PLAN VIEW

For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(8)
COLD-FORMED STEEL FLOOR TO TOP OF CONCRETE WALL, FRAMING PARALLEL

TABLE R611.9(8)
COLD-FORMED STEEL FRAMED FLOOR TO TOP OF CONCRETE WALL, FRAMING PARALLEL[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
16	16					6 A	6 B
16	32					6 A	6 B
19.2	19.2				6 A	8 B	8 B
19.2	38.4				6 A	8 B	8 B
24	24			6 A	8 B	8 B	

For SI: 1 inch = 25.4 mm; 1 mph = 0.447 m/s.

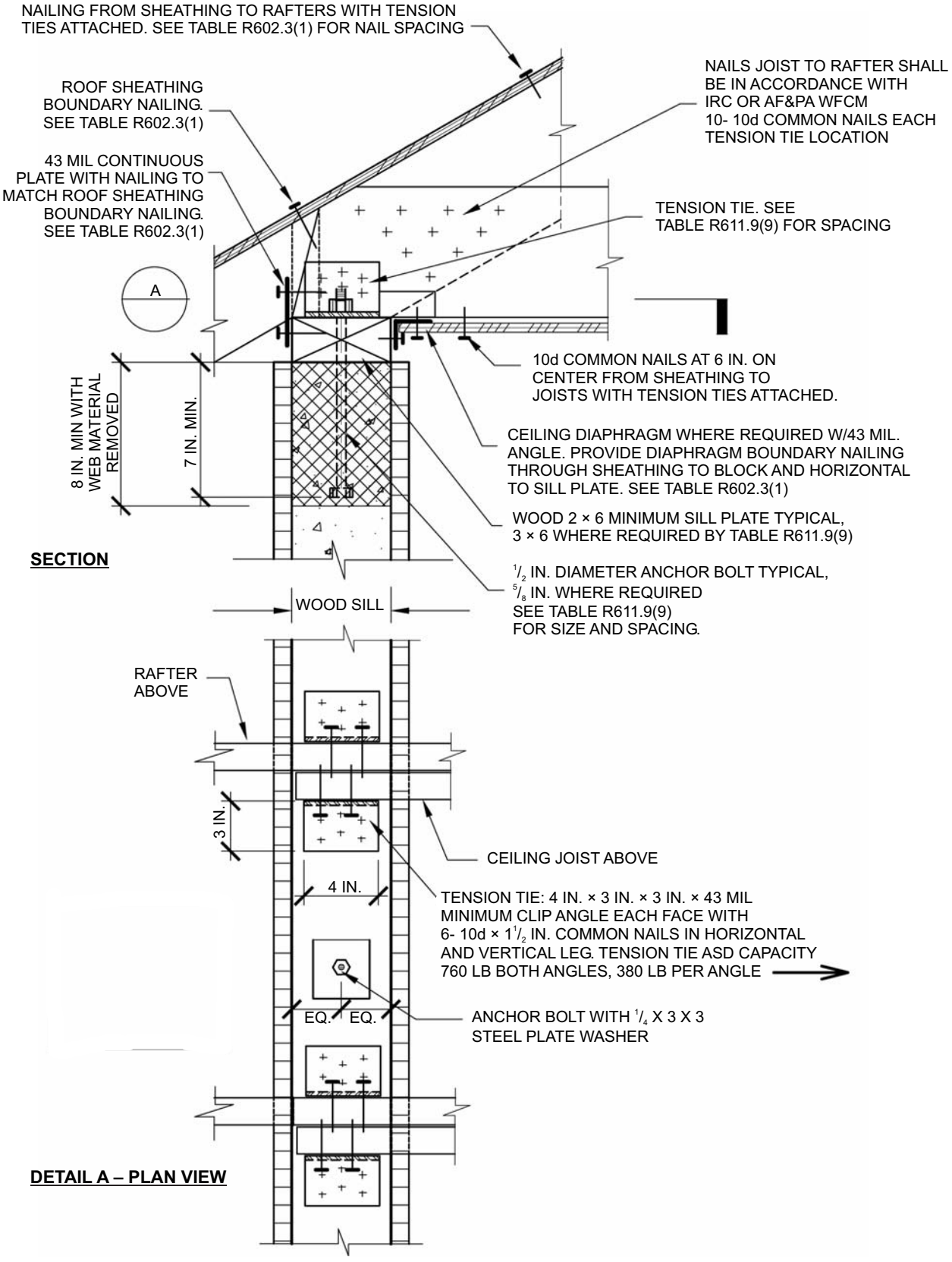
a. This table is for use with the detail in Figure R611.9(8). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Numbers 6 and 8 indicate minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(8). For the remainder of the wall, see Note b.

e. Letter "A" indicates that a minimum nominal 3×6 sill plate is required. Letter "B" indicates that a $^5/_8$ inch diameter anchor bolt and a minimum nominal 3×6 sill plate are required.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(9)
WOOD FRAMED ROOF TO TOP OF CONCRETE WALL, FRAMING PERPENDICULAR

TABLE R611.9(9)
WOOD FRAMED ROOF TO TOP OF CONCRETE WALL, FRAMING PERPENDICULAR[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						
12	48						
16	16						6
16	32						6
16	48						
19.2	19.2					6	6 A
19.2	38.4					6	
24	24				6 A	6 A	6 B
24	48						

For SI: 1 inch = 25.4 mm; 1 mph = 0.447 m/s.

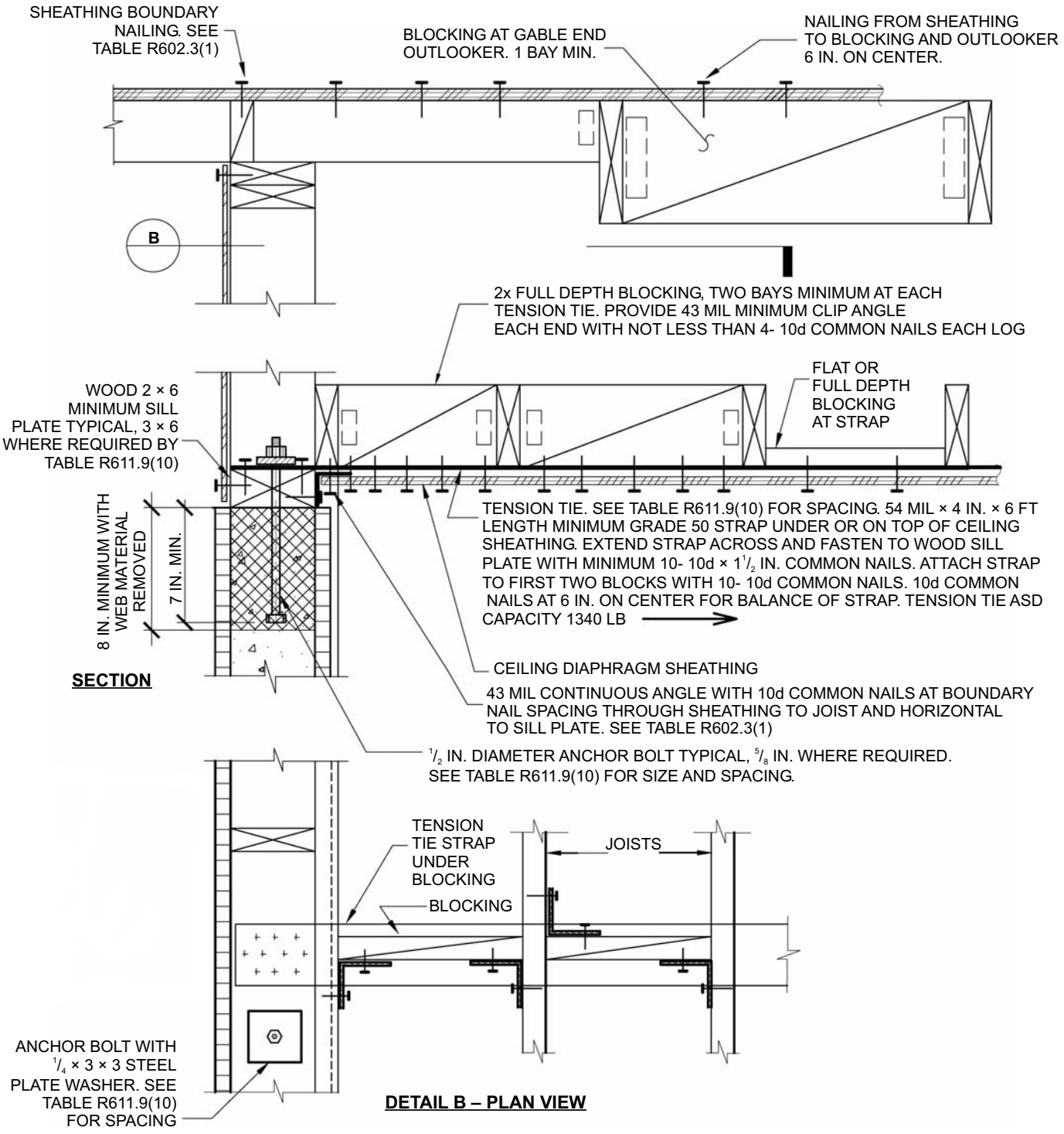
a. This table is for use with the detail in Figure R611.9(9). Use of this detail is permitted where cell a is not shaded, prohibited where shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Number 6 indicates minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(9). For the remainder of the wall, see Note b.

e. Letter "A" indicates that a minimum nominal 3×6 sill plate is required. Letter "B" indicates that a $^5/_8$ inch diameter anchor bolt and a minimum nominal 3×6 sill plate are required.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(10)
WOOD FRAMED ROOF TO TOP OF CONCRETE WALL FRAMING PARALLEL

TABLE R611.9(10)
WOOD FRAMED ROOF TO TOP OF CONCRETE WALL, FRAMING PARALLEL[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
12	36						
12	48						
16	16					6	6
16	32					6	6
16	48					6	6
19.2	19.2				6	6	6 A
19.2	38.4				6	6	6 A
24	24			6	6 A	6 A	6 B
24	48			6	6 A	6 B	6 B

For SI: 1 inch = 25.4 mm; I mph = 0.447 m/s.

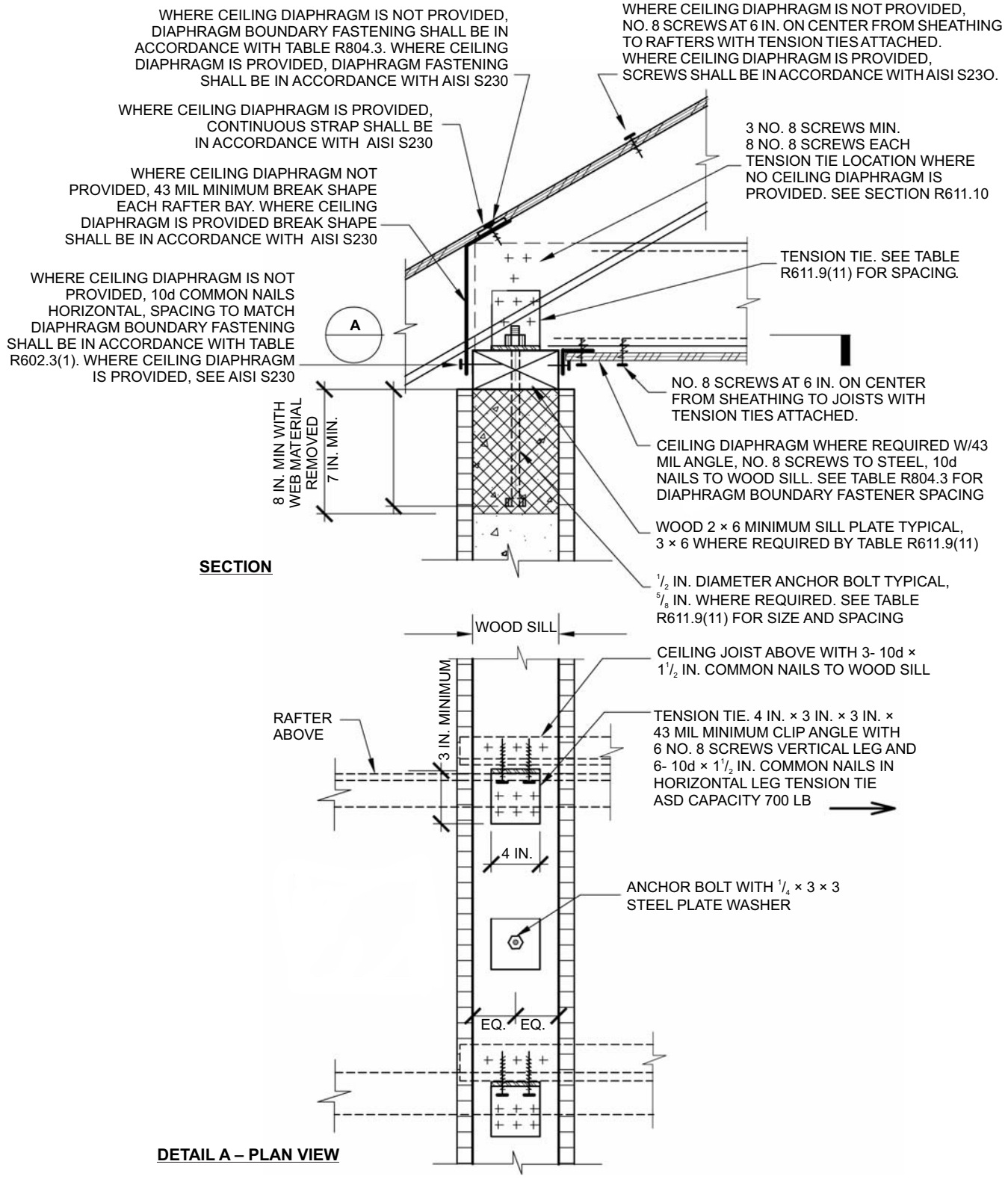
a. This table is for use with the detail in Figure R611.9(10). Use of this detail is permitted where a cell is not shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in cells with no number.

d. Number 6 indicates minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(10). For the remainder of the wall, see Note b.

e. Letter "A" indicates that a minimum nominal 3 × 6 sill plate is required. Letter "B" indicates that a $5/_8$ inch diameter anchor bolt and a minimum nominal 3 × 6 sill plate are required.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(11)
COLD-FORMED STEEL ROOF TO TOP OF CONCRETE WALL, FRAMING PERPENDICULAR

TABLE R611.9(11)
COLD-FORMED STEEL ROOF TO TOP OF CONCRETE WALL, FRAMING PERPENDICULAR[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
16	16					6	6
16	32					6	6
19.2	19.2				6	6	8 B
19.2	38.4				6	6	8 B
24	24			6	6	8 B	

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

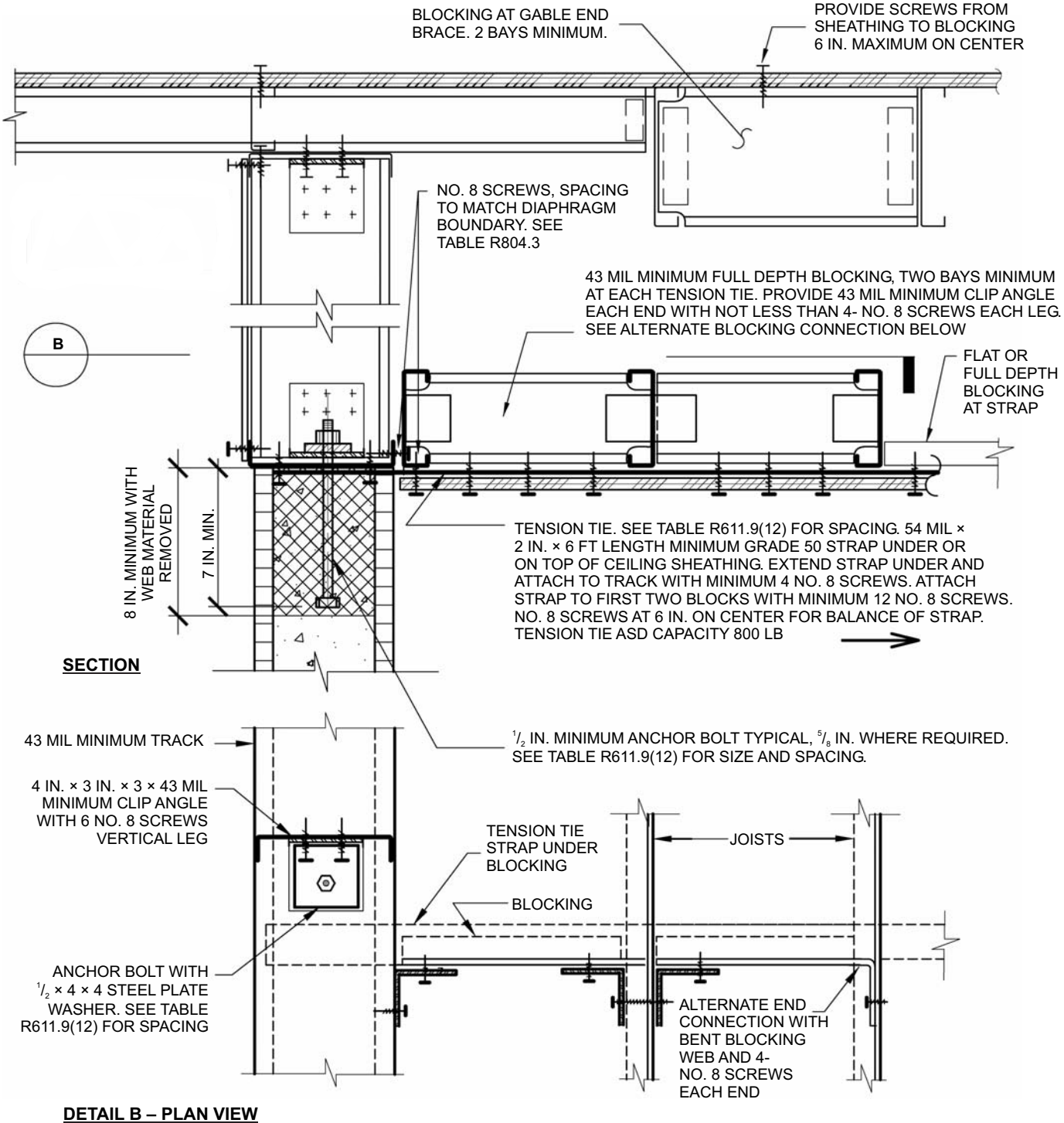
a. This table is for use with the detail in Figure R611.9(11). Use of this detail is permitted where a cell is not shaded, prohibited where shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in unshaded cells with no number.

d. Numbers 6 and 8 indicate minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(11). For the remainder of the wall, see Note b.

e. Letter "B" indicates that a $^5/_8$ inch diameter anchor bolt and a minimum nominal 3×6 sill plate are required.



For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound-force = 4.448 N.

FIGURE R611.9(12)
COLD-FORMED STEEL ROOF TO TOP OF CONCRETE WALL, FRAMING PARALLEL

TABLE R611.9(12)
COLD-FORMED STEEL ROOF TO TOP OF CONCRETE WALL, FRAMING PARALLEL[a, b, c, d, e]

ANCHOR BOLT SPACING (inches)	TENSION TIE SPACING (inches)	BASIC WIND SPEED (mph) AND WIND EXPOSURE CATEGORY					
		85B	90B	100B	110B	120B	130B
				85C	90C	100C	110C
					85D	90D	100D
12	12						
12	24						
16	16						
16	32						
19.2	19.2					6	6
19.2	38.4					6	6
24	24			6	6	8 B	8 B

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

a. This table is for use with the detail in Figure R611.9(12). Use of this detail is permitted where a cell is not shaded.

b. Wall design per other provisions of Section R611 is required.

c. For wind design, minimum 4-inch nominal wall is permitted in cells with no number.

d. Numbers 6 and 8 indicate minimum permitted nominal wall thickness in inches necessary to develop required strength (capacity) of connection. As a minimum, this nominal thickness shall occur in the portion of the wall indicated by the cross-hatching in Figure R611.9(12). For the remainder of the wall, see Note b.

e. Letter"B" indicates that a $^5/_8$ inch diameter anchor bolt is required.

SECTION R612
EXTERIOR WINDOWS AND DOORS

R612.1 General. This section prescribes performance and construction requirements for exterior windows and sliding doors installed in walls. Windows and sliding doors shall be installed in accordance with the fenestration manufacturer's written installation instructions. Window and door openings shall be flashed in accordance with Section R703.8.

R612.2 Window sills. In *dwelling* units, where the opening of an operable window is located more than 72 inches (1829 mm) above the finished *grade* or surface below, the lowest part of the clear opening of the window shall be a minimum of 24 inches (610 mm) above the finished floor of the room in which the window is located. Operable sections of windows shall not permit openings that allow passage of a 4 inch (102 mm) diameter sphere where such openings are located within 24 inches (610 mm) of the finished floor.

Exceptions:

1. Windows whose openings will not allow a 4-inch-diameter (102 mm) sphere to pass through the opening when the opening is in its largest opened position.
2. Openings that are provided with window fall prevention devices that comply with Section R612.3.
3. Openings that are provided with fall prevention devices that comply with ASTM F 2090.
4. Windows that are provided with opening limiting devices that comply with Section R612.4.

R612.3 Window fall prevention devices. Window fall prevention devices and window guards, where provided, shall comply with the requirements of ASTM F 2090.

R612.4 Window opening limiting devices. When required elsewhere in this code, window opening limiting devices shall comply with the provisions of this section.

R612.4.1 General requirements. Window opening limiting devices shall be self acting and shall be positioned to prohibit the free passage of a 4-in. (102-mm) diameter rigid sphere through the window opening when the window opening limiting device is installed in accordance with the manufacturer's instructions.

R612.4.2 Operation for emergency escape. Window opening limiting devices shall be designed with release mechanisms to allow for emergency escape through the window opening without the need for keys, tools or special knowledge. Window opening limiting devices shall comply with all of the following:

1. Release of the window opening-limiting device shall require no more than 15 pounds (66 N) of force.
2. The window opening limiting device release mechanism shall operate properly in all types of weather.
3. Window opening limiting devices shall have their release mechanisms clearly identified for proper use in an emergency.
4. The window opening limiting device shall not reduce the minimum net clear opening area of the window unit below what is required by Section R310.1.1 of the code.

R612.5 Performance. Not adopted by the State of Oregon.

R612.6 Testing and labeling. Exterior windows and sliding doors shall be tested by an *approved* independent laboratory, and bear a *label* identifying manufacturer, performance characteristics and *approved* inspection agency to indicate compliance with AAMA/WDMA/CSA 101/I.S.2/A440. Exterior side-hinged doors shall comply with Section R612.8.

Exception: Decorative glazed openings.

R612.6.1 Comparative analysis. Structural wind load design pressures for window and door units smaller than the size tested in accordance with Section R612.6 shall be permitted to be higher than the design value of the tested unit provided such higher pressures are determined by accepted engineering analysis. All components of the small unit shall be the same as those of the tested unit. Where such calculated design pressures are used, they shall be validated by an additional test of the window or door unit having the highest allowable design pressure.

R612.7 Vehicular access doors. Not adopted by the State of Oregon.

R612.8 Other exterior window and door assemblies. Exterior windows and door assemblies not included within the scope of Section R612.6 shall be tested in accordance with ASTM E 330. Glass in assemblies covered by this exception shall comply with Section R308.5.

R612.9 Wind-borne debris protection. Not adopted by the State of Oregon.

R612.9.1 Fenestration testing and labeling. Fenestration shall be tested by an *approved* independent laboratory, listed by an *approved* entity, and bear a *label* identifying manufacturer, performance characteristics, and *approved* inspection agency to indicate compliance with the requirements of the following specification:

1. ASTM E 1886 and ASTM E 1996; or
2. AAMA 506.

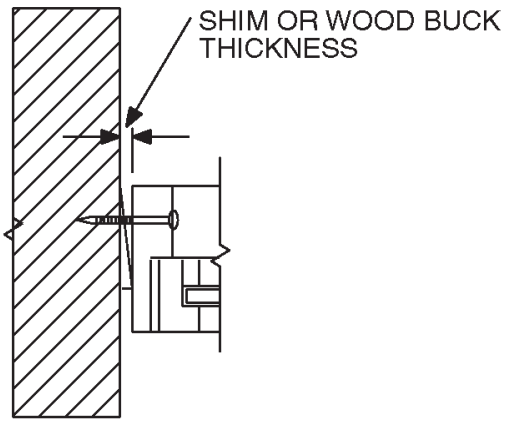
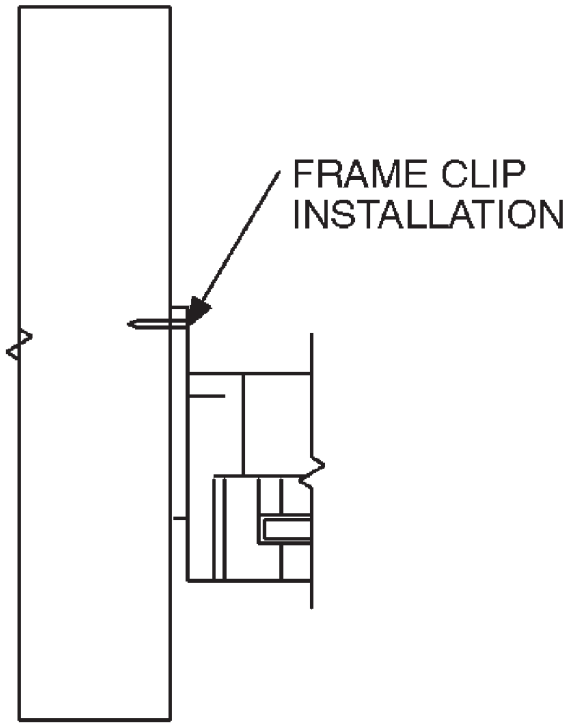
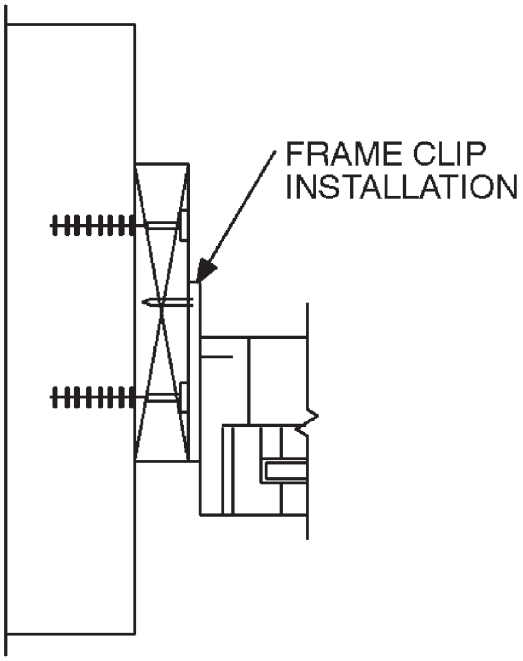


FIGURE R612.8(1)
THROUGH THE FRAME



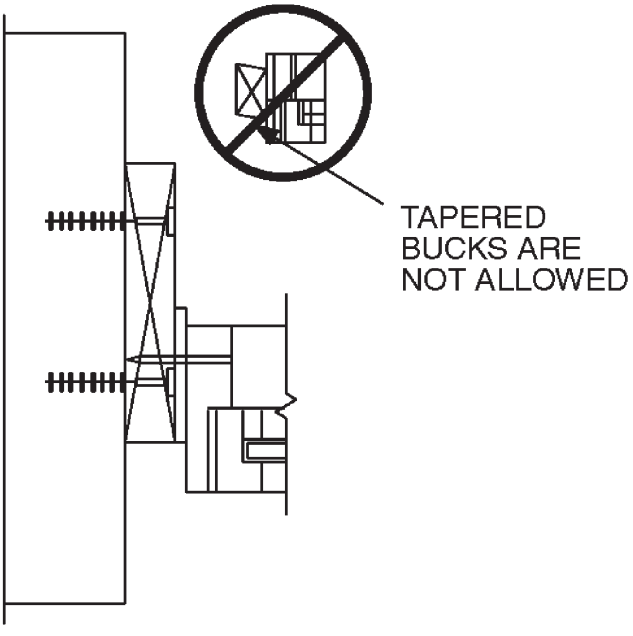
APPLY FRAME CLIP TO WINDOW OR DOOR IN ACCORDANCE WITH PUBLISHED MANUFACTURER'S RECOMMENDATIONS.

FIGURE R612.8(2)
FRAME CLIP



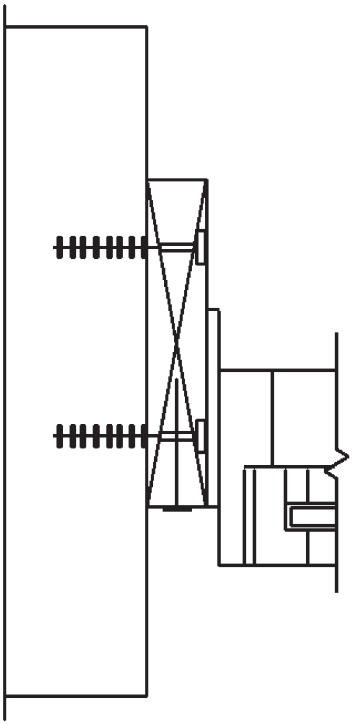
APPLY FRAME CLIP TO WINDOW OR DOOR FRAME IN ACCORDANCE WITH PUBLISHED MANUFACTURER'S RECOMMENDATIONS. ANCHORS SHALL BE PROVIDED TO TRANSFER LOAD FROM THE FRAME CLIP INTO THE ROUGH OPENING SUBSTRATE.

FIGURE R612.8(4)
FRAME CLIP



THROUGH THE FRAME ANCHORING METHOD. ANCHORS SHALL BE PROVIDED TO TRANSFER LOAD FROM THE WINDOW OR DOOR FRAME INTO THE ROUGH OPENING SUBSTRATE.

FIGURE R612.8(3)
THROUGH THE FRAME



APPLY ANCHORS THROUGH FLANGE IN ACCORDANCE WITH PUBLISHED MANUFACTURER'S RECOMMENDATIONS.

FIGURE R612.8(5)
THROUGH THE FLANGE

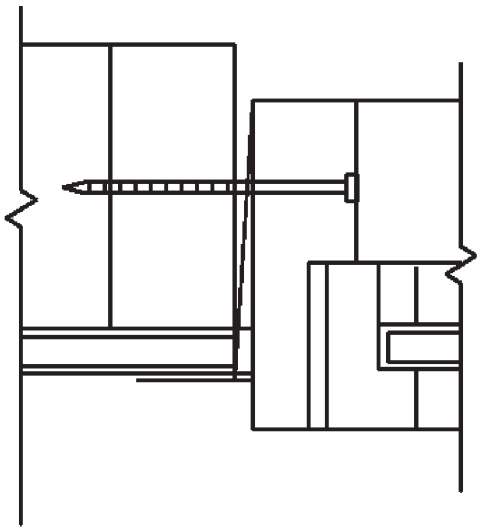


FIGURE R612.8(6)
THROUGH THE FLANGE

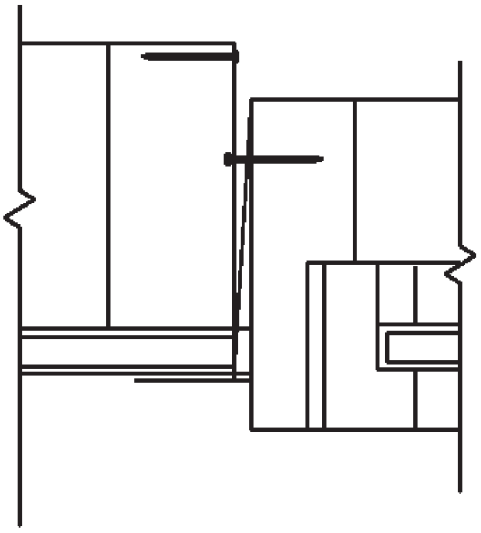


FIGURE R612.8(7)
FRAME CLIP

R612.10 Anchorage methods. The methods cited in this section apply only to anchorage of window and glass door assemblies to the main force-resisting system.

R612.10.1 Anchoring requirements. Window and glass door assemblies shall be anchored in accordance with the published manufacturer's recommendations to achieve the design pressure specified. Substitute anchoring systems used for substrates not specified by the fenestration manufacturer shall provide equal or greater anchoring performance as demonstrated by accepted engineering practice.

R612.10.2 Anchorage details. Products shall be anchored in accordance with the minimum requirements illustrated in Figures R612.8(1), R612.8(2), R612.8(3), R612.8(4), R612.8(5), R612.8(6), R612.8(7) and R612.8(8).

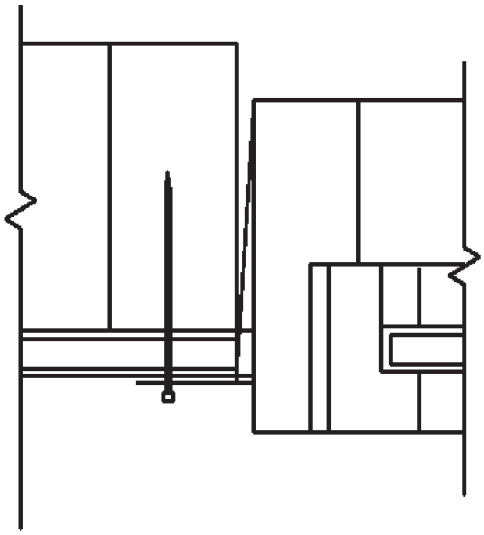


FIGURE R612.8(8)
THROUGH THE FLANGE

R612.10.2.1 Masonry, concrete or other structural substrate. Where the wood shim or buck thickness is less than $1^1/_2$ inches (38 mm), window and glass door assemblies shall be anchored through the jamb, or by jamb clip and anchors shall be embedded directly into the masonry, concrete or other substantial substrate material. Anchors shall adequately transfer load from the window or door frame into the rough opening substrate [see Figures R612.8(1) and R612.8(2).]

Where the wood shim or buck thickness is $1^1/_2$ inches (38 mm) or more, the buck is securely fastened to the masonry, concrete or other substantial substrate, and the buck extends beyond the interior face of the window or door frame, window and glass door assemblies shall be anchored through the jamb, or by jamb clip, or through the flange to the secured wood buck. Anchors shall be embedded into the secured wood buck to adequately transfer load from the window or door frame assembly [Figures R612.8(3), R612.8(4) and R612.8(5)].

R612.10.2.2 Wood or other approved framing material. Where the framing material is wood or other *approved* framing material, window and glass door assemblies shall be anchored through the frame, or by frame clip, or through the flange. Anchors shall be embedded into the frame construction to adequately transfer load [Figures R612.8(6), R612.8(7) and R612.8(8)].

R612.11 Mullions. Mullions shall be tested by an *approved* testing laboratory in accordance with AAMA 450, or be engineered in accordance with accepted engineering practice. Mullions tested as stand-alone units or qualified by engineering shall use performance criteria cited in Sections R612.11.1, R612.11.2 and R612.11.3. Mullions qualified by an actual test of an entire assembly shall comply with Sections R612.11.1 and R612.11.3.

R612.11.1 Load transfer. Mullions shall be designed to transfer the design pressure loads applied by the window and door assemblies to the rough opening substrate.

R612.11.2 Deflection. Mullions shall be capable of resisting the design pressure loads applied by the window and door assemblies to be supported without deflecting more than *L*/175, where *L* is the span of the mullion in inches.

R612.11.3 Structural safety factor. Mullions shall be capable of resisting a load of 1.5 times the design pressure loads applied by the window and door assemblies to be supported without exceeding the appropriate material stress levels. If tested by an *approved* laboratory, the 1.5 times the design pressure load shall be sustained for 10 seconds, and the permanent deformation shall not exceed 0.4 percent of the mullion span after the 1.5 times design pressure load is removed.

SECTION R613
STRUCTURAL INSULATED PANEL WALL CONSTRUCTION

R613.1 General. Structural insulated panel (SIP) walls shall be designed in accordance with the provisions of this section. When the provisions of this section are used to design structural insulated panel walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction* having authority.

R613.2 Applicability limits. The provisions of this section shall control the construction of exterior structural insulated panel walls and interior load-bearing structural insulated panel walls for buildings not greater than 60 feet (18 288 mm) in length perpendicular to the joist or truss span, not greater than 40 feet (12 192 mm) in width parallel to the joist or truss span and not greater than two stories in height with each wall not greater than 10 feet (3048 mm) high. All exterior walls installed in accordance with the provisions of this section shall be considered as load-bearing walls. Structural insulated panel walls constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 130 miles per hour (58 m/s), Exposure A, B or C, and a maximum ground snow load of 70 pounds per foot (3.35 kPa), and Seismic Design Categories A, B, and C.

R613.3 Materials. SIPs shall comply with the following criteria:

R613.3.1 Core. The core material shall be composed of foam plastic insulation meeting one of the following requirements:

1. ASTM C 578 and have a minimum density of 0.90 pounds per cubic feet (14.4 kg/m^3); or
2. Polyurethane meeting the physical properties shown in Table R613.3.1, or;
3. An *approved* alternative.

All cores shall meet the requirements of Section R316.

R613.3.2 Facing. Facing materials for SIPs shall be wood structural panels conforming to DOC PS 1 or DOC PS 2, each having a minimum nominal thickness of $^7/_{16}$ inch (11 mm) and shall meet the additional minimum properties specified in Table R613.3.2. Facing shall be identified by a grade mark or certificate of inspection issued by an *approved* agency.

R613.3.3 Adhesive. Adhesives used to structurally laminate the foam plastic insulation core material to the structural wood facers shall conform to ASTM D 2559 or *approved* alternative specifically intended for use as an adhesive used in the lamination of structural insulated panels. Each container of adhesive shall bear a *label* with the adhesive manufacturer's name, adhesive name and type and the name of the quality assurance agency.

R613.3.4 Lumber. The minimum lumber framing material used for SIPs prescribed in this document is NLGA graded No. 2 Spruce-pine-fir. Substitution of other wood species/grades that meet or exceed the mechanical properties and specific gravity of No. 2 Spruce-pine-fir shall be permitted.

R613.3.5 SIP screws. Screws used for the erection of SIPs as specified in Section R613.5 shall be fabricated from steel, shall be provided by the SIPs manufacturer and shall be sized to penetrate the wood member to which the assembly is being attached by a minimum of 1 inch (25 mm). The screws shall be corrosion resistant and have a minimum shank diameter of 0.188 inch (4.7 mm) and a minimum head diameter of 0.620 inch (15.5 mm).

TABLE R613.3.1
MINIMUM PROPERTIES FOR POLYURETHANE INSULATION USED AS SIPS CORE

PHYSICAL PROPERTY	POLYURETHANE
Density, core nominal. (ASTM D 1622)	2.2 lb/ft^3
Compressive resistance at yield or 10% deformation, whichever occurs first. (ASTM D 1621)	19 psi (perpendicular to rise)
Flexural strength, min. (ASTM C 203)	30 psi
Tensile strength, min. (ASTM D 1623)	35 psi
Shear strength, min. (ASTM C 273)	25 psi
Substrate adhesion, min. (ASTM D 1623)	22 psi
Water vapor permeance of 1.00-in. thickness, max. (ASTM E 96)	2.3 perm
Water absorption by total immersion, max. (ASTM C 272)	4.3% (volume)
Dimensional stability (change in dimensions), max. [ASTM D2126 (7 days at 158°F/100% humidity and 7 days at -20°F)]	2%

For SI: 1 pound per cubic foot = 16.02 kg/m^3, 1 pound per square inch = 6.895 kPa, °C = [(°F) - 32]1.8.

TABLE R613.3.2
MINIMUM PROPERTIES[a] FOR WOOD STRUCTURAL PANEL FACING MATERIAL USED IN SIP WALLS

THICKNESS (inch)	PRODUCT	FLATWISE STIFFNESS[b] ($lbf\text{-}in^2/ft$)		FLATWISE STRENGTH[c] (lbf-in/ft)		TENSION[c] (lbf/ft)		DENSITY[b, d] (pcf)
		Along	Across	Along	Across	Along	Across	
$^7/_{16}$	Sheathing	54,700	27,100	950	870	6,800	6,500	35

For SI: 1 inch = 25.4 mm, 1 $lbf\text{-}in^2/ft = 9.415 \times 10^{-6}$ kPa/m, 1 lbf-in/ft = 3.707×10^{-4} kN/m, 1 lbf/ft = 0.0146 N/mm, 1 pound per cubic foot = 16.018 kg/m^3.

a. Values listed in Table R613.3.2 are qualification test values and are not to be used for design purposes.

b. Mean test value shall be in accordance with Section 7.6 of DOC PS 2.

c. Characteristic test value (5th percent with 75% confidence).

d. Density shall be based on oven-dry weight and oven-dry volume.

R613.3.6 Nails. Nails specified in Section R613 shall be common or galvanized box unless otherwise stated.

R613.4 SIP wall panels. SIPs shall comply with Figure R613.4 and shall have minimum panel thickness in accordance with Tables R613.5(1) and R613.5(2) for above-grade walls. All SIPs shall be identified by grade mark or certificate of inspection issued by an *approved* agency.

R613.4.1 Labeling. All panels shall be identified by grade mark or certificate of inspection issued by an *approved* agency. Each (SIP) shall bear a stamp or *label* with the following minimum information:

1. Manufacturer name/logo.
2. Identification of the assembly.
3. Quality assurance agency.

R613.5 Wall construction. Exterior walls of SIP construction shall be designed and constructed in accordance with the provisions of this section and Tables R613.5(1) and R613.5(2) and Figures R613.5(1) through R613.5(5). SIP walls shall be fastened to other wood building components in accordance with Tables R602.3(1) through R602.3(4).

Framing shall be attached in accordance with Table R602.3(1) unless otherwise provided for in Section R613.

R613.5.1 Top plate connection. SIP walls shall be capped with a double top plate installed to provide overlapping at corner, intersections and splines in accordance with Figure R613.5.1. The double top plates shall be made up of a single 2 by top plate having a width equal to the width of the panel core, and shall be recessed into the SIP below. Over this top plate a cap plate shall be placed. The cap plate width shall match the SIP thickness and overlap the facers on both sides of the panel. End joints in top plates shall be offset at least 24 inches (610 mm).

R613.5.2 Bottom (sole) plate connection. SIP walls shall have full bearing on a sole plate having a width equal to the nominal width of the foam core. When SIP walls are supported directly on continuous foundations, the wall wood sill plate shall be anchored to the foundation in accordance with Figure R613.5.2 and Section R403.1.

R613.5.3 Wall bracing. SIP walls shall be braced in accordance with Section R602.10. SIP walls shall be considered continuous wood structural panel sheathing for purposes of computing required bracing. SIP walls shall meet the requirements of Section R602.10.4 except that SIPs corners shall be fabricated as shown in Figure R613.9. When SIP walls are used for wall bracing, the SIP bottom plate shall be attached to wood framing below in accordance with Table R602.3(1).

R613.6 Interior load-bearing walls. Interior load-bearing walls shall be constructed as specified for exterior walls.

R613.7 Drilling and notching. The maximum vertical chase penetration in SIPs shall have a maximum side dimension of 2 inches (51 mm) centered in the panel core. Vertical chases shall have a minimum spacing of 24-inches (610 mm) on center. Maximum of two horizontal chases shall be permitted in each wall panel, one at 14 inches (360 mm) from the bottom of the panel and one at mid-height of the wall panel. The maximum allowable penetration size in a wall panel shall be circular or rectangular with a maximum dimension of 12 inches (305 mm). Overcutting of holes in facing panels shall not be permitted.

R613.8 Connection. SIPs shall be connected at vertical in-plane joints in accordance with Figure R613.8 or by other *approved* methods.

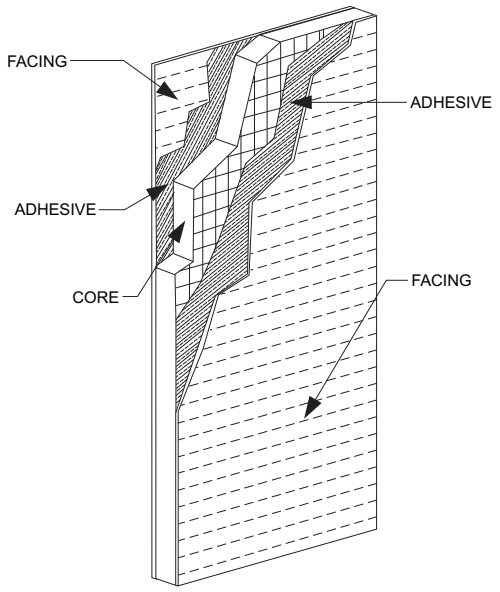


FIGURE R613.4
SIP WALL PANEL

R613.9 Corner framing. Corner framing of SIP walls shall be constructed in accordance with Figure R613.9.

R613.10 Headers. SIP headers shall be designed and constructed in accordance with Table R613.10 and Figure R613.5.1. SIPs headers shall be continuous sections without splines. Headers shall be at least $11^{7}/_{8}$ inches (302 mm) deep. Headers longer than 4 feet (1219 mm) shall be constructed in accordance with Section R602.7.

R613.10.1 Wood structural panel box headers. Wood structural panel box headers shall be allowed where SIP headers are not applicable. Wood structural panel box headers shall be constructed in accordance with Figure R602.7.2 and Table R602.7.2.

TABLE R613.5(1)
MINIMUM THICKNESS FOR SIP WALL SUPPORTING SIP LIGHT-FRAME ROOF ONLY (inches)

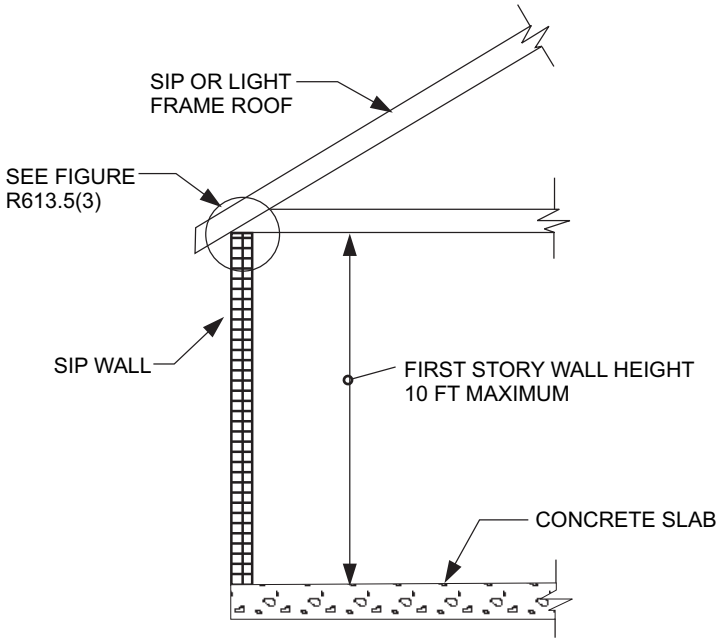
WIND SPEED (3-second gust)			BUILDING WIDTH (feet)														
			24			28			32			36			40		
Exp. A/B	Exp. C	SNOW LOAD (psf)	Wall Height (ft)			Wall Height (ft)			Wall Height (ft)			Wall Height (ft)			Wall Height (ft)		
			8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
85	—	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
100	85	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
110	100	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
120	110	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	4.5	6.5
130	120	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	4.5	6.5
		70	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	4.5	6.5	N/A
—	130	20	4.5	4.5	6.5	4.5	4.5	N/A	4.5	4.5	N/A	4.5	4.5	N/A	4.5	6.5	N/A
		30	4.5	4.5	N/A	4.5	4.5	N/A	4.5	4.5	N/A	4.5	6.5	N/A	4.5	6.5	N/A
		50	4.5	6.5	N/A	4.5	6.5	N/A	4.5	N/A	N/A	6.5	N/A	N/A	6.5	N/A	N/A
		70	4.5	N/A	N/A	6.5	N/A	N/A	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 pound per square foot = 0.0479 kPa.
Maximum deflection criterion: *L*/240.
Maximum roof dead load: 10 psf.
Maximum roof live load: 70 psf.
Maximum ceiling dead load: 5 psf.
Maximum ceiling live load: 20 psf.
Wind loads based on Table R301.2 (2).
N/A indicates not applicable.

TABLE R613.5(2)
MINIMUM THICKNESS FOR SIP WALLS SUPPORTING SIP OR LIGHT-FRAME ONE STORY AND ROOF (inches)

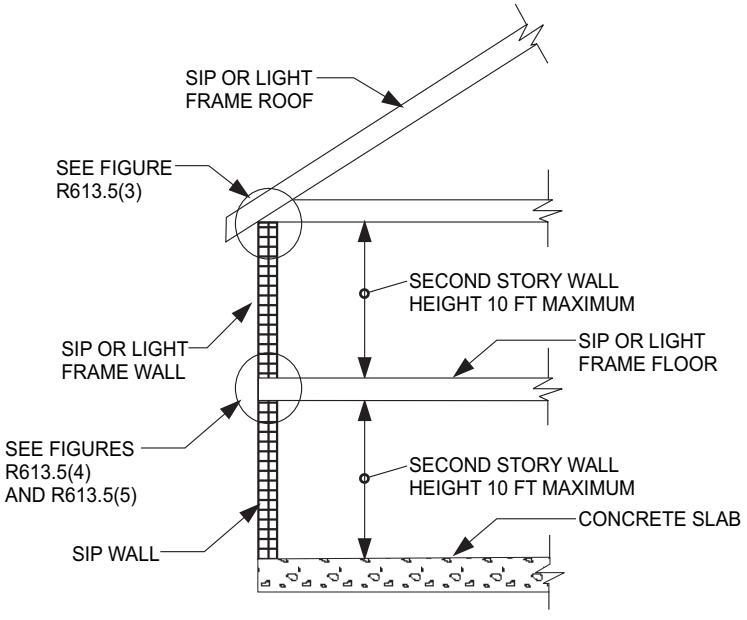
WIND SPEED (3-second gust)			BUILDING WIDTH (feet)													
			24			28			32			36			40		
Exp. A/B	Exp. C	SNOW LOAD (psf)	Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)		
			8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
85	—	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	6.5	6.5	6.5
100	85	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	6.5	6.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	6.5	6.5	6.5	6.5	N/A	N/A
110	100	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	6.5	6.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	6.5	6.5	6.5	6.5	N/A
		70	4.5	4.5	4.5	4.5	4.5	6.5	6.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A
120	110	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A
		30	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	6.5	6.5	N/A
		50	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A
		70	4.5	4.5	6.5	4.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
130	120	20	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	4.5	6.5	N/A	6.5	N/A	N/A
		30	4.5	4.5	6.5	4.5	4.5	N/A	4.5	6.5	N/A	6.5	N/A	N/A	6.5	N/A	N/A
		50	4.5	6.5	N/A	4.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		70	4.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
—	130	20	6.5	N/A	N/A	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		30	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		70	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 pound per square foot = 0.0479 kPa.
Maximum deflection criterion: *L*/240.
Maximum roof dead load: 10 psf.
Maximum roof live load: 70 psf.
Maximum ceiling dead load: 5 psf.
Maximum ceiling live load: 20 psf.
Maximum second floor live load: 30 psf.
Maximum second floor dead load: 10 psf.
Maximum second floor dead load from walls: 10 psf.
Maximum first floor live load: 40 psf.
Maximum first floor dead load: 10 psf.
Wind loads based on Table R301.2 (2).
N/A indicates not applicable.



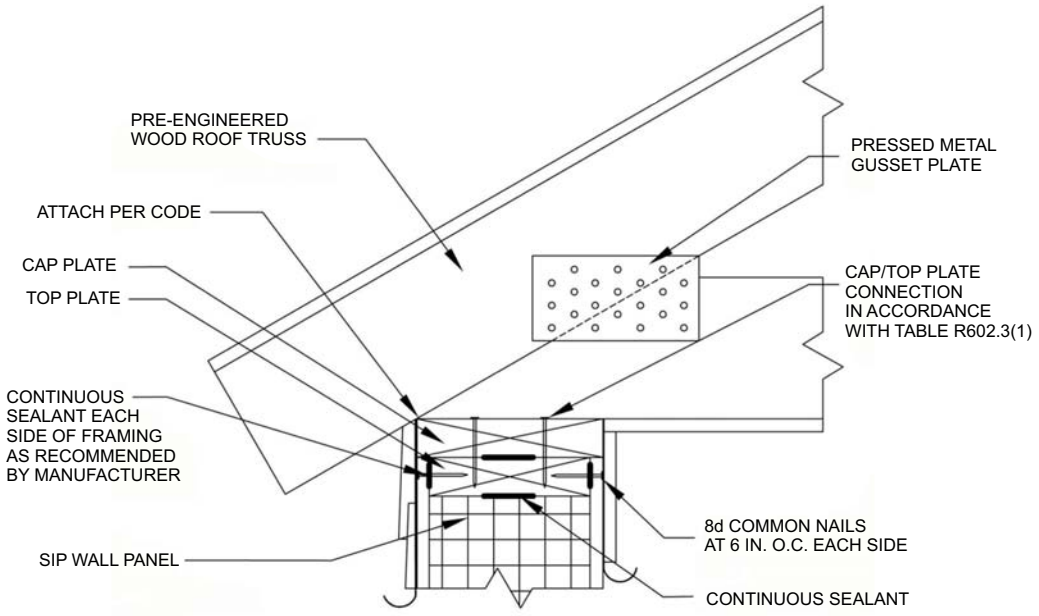
For SI: 1 foot = 304.8 mm.

FIGURE R613.5(1)
MAXIMUM ALLOWABLE HEIGHT OF SIP WALLS



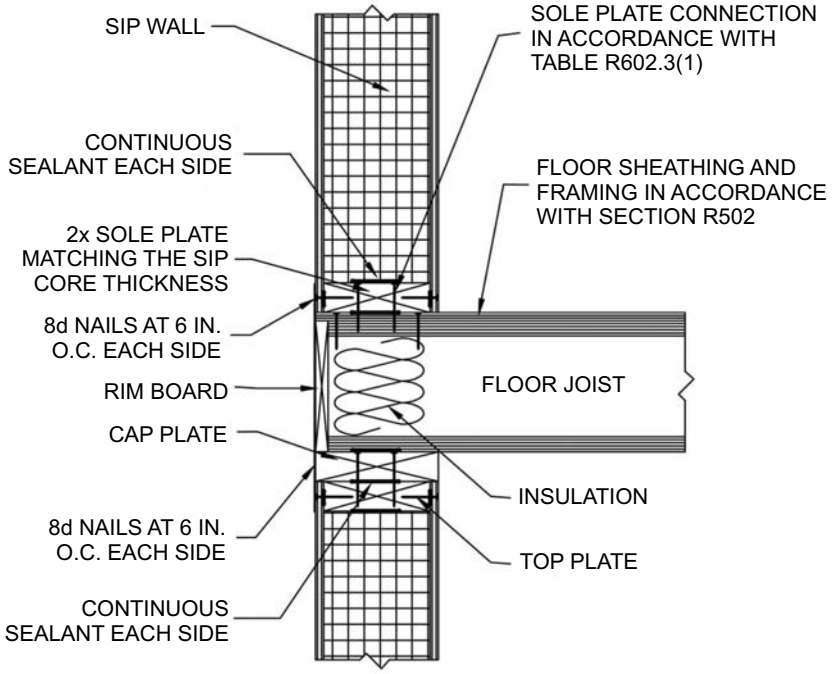
For SI: 1 foot = 304.8 mm.

FIGURE R613.5(2)
MAXIMUM ALLOWABLE HEIGHT OF SIP WALLS



For SI: 1 inch = 25.4 mm.

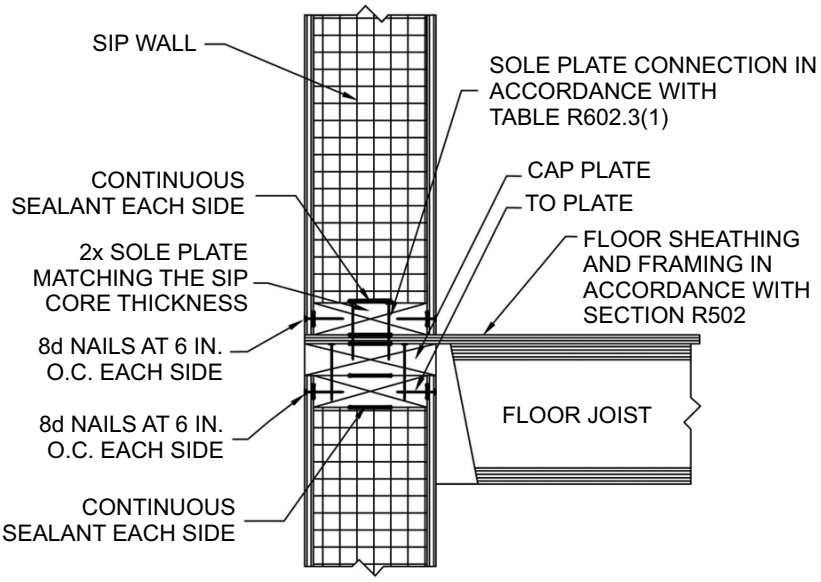
FIGURE R613.5(3)
TRUSSED ROOF TO TOP PLATE CONNECTION



For SI: 1 inch = 25.4 mm.

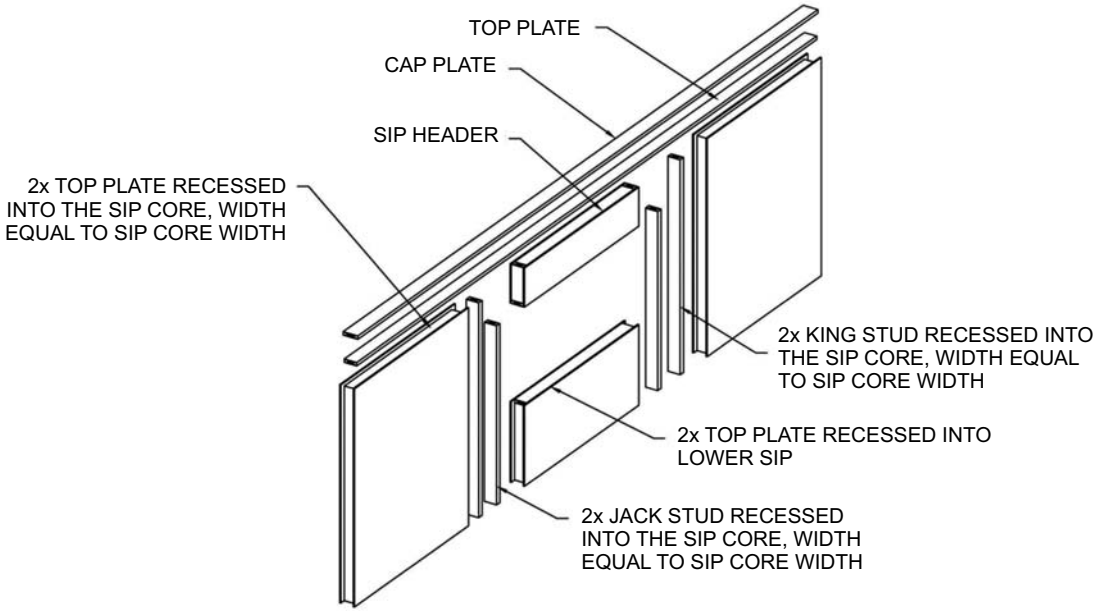
Note: Figures illustrate SIP-specific attachment requirements. Other connections shall be made in accordance with Table R602.3(1) and (2) as appropriate.

FIGURE R613.5(4)
SIP WALL TO WALL PLATFORM FRAME CONNECTION



For SI: 1 inch = 25.4 mm.
Note: Figures illustrate SIP-specific attachment requirements. Other connections shall be made in accordance with Tables R602.3(1) and (2), as appropriate.

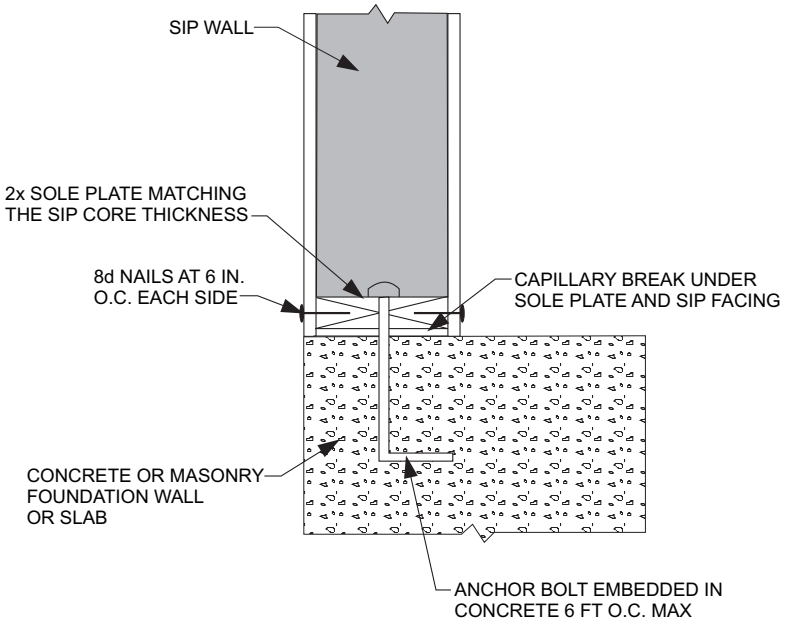
FIGURE R613.5(5)
SIP WALL TO WALL BALLOON FRAME CONNECTION
(I-Joist floor shown for Illustration only)



For SI: 1 inch = 25.4 mm.

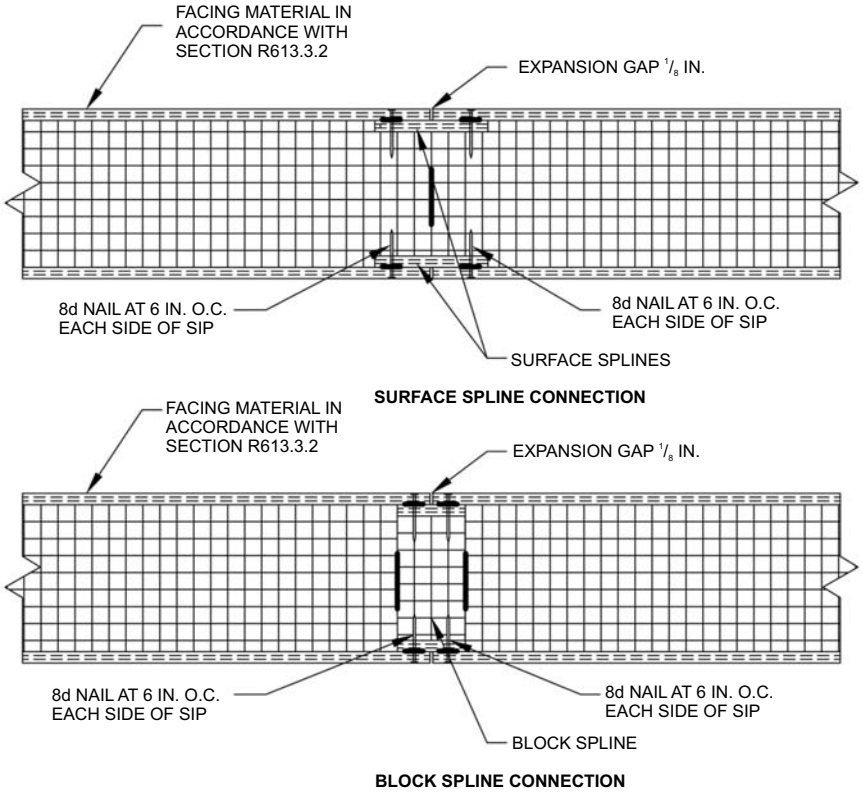
Notes:
1. Top plates shall be continuous over header.
2. Lower 2x top plate shall have a width equal to the SIP core width and shall be recessed into the top edge of the panel. Cap plate shall be placed over the recessed top plate and shall have a width equal to the SIPs width.
3. SIP facing surfaces shall be nailed to framing and cripples with 8d common or galvanized box nails spaced 6 inches on center.
4. Galvanized nails shall be hot-dipped or tumbled. Framing shall be attached in accordance to Section R602.3(1) unless otherwise provide for in Section R613.

FIGURE R613.5.1
SIP WALL FRAMING CONFIGURATION



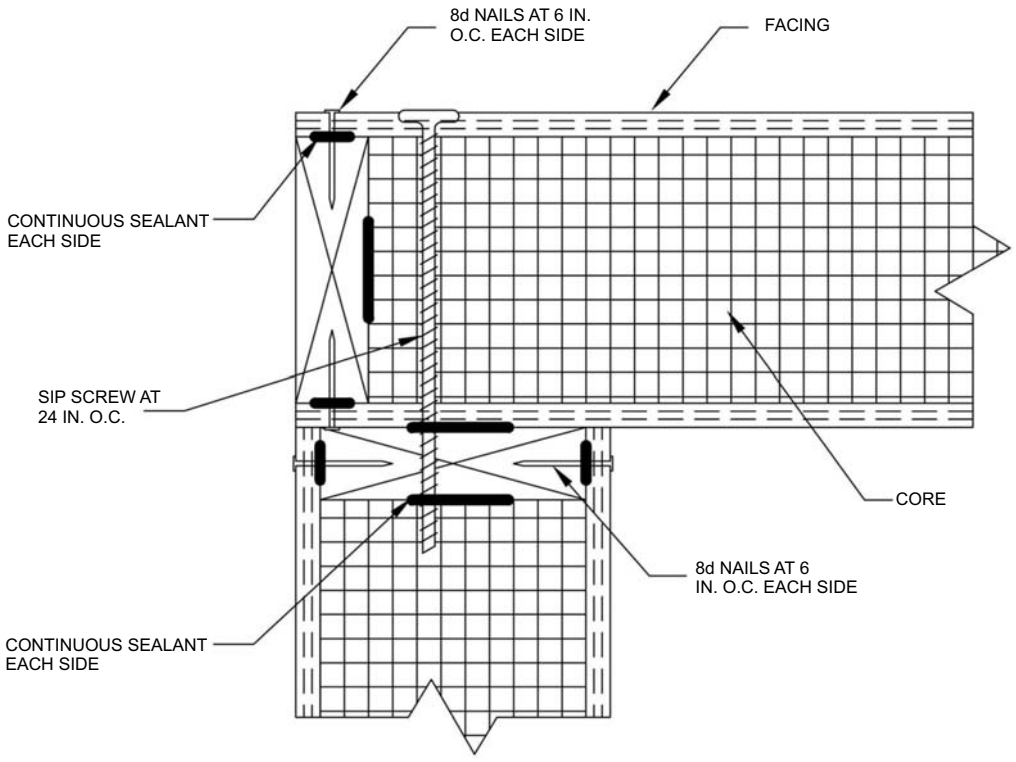
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R613.5.2
SIP WALL TO CONCRETE SLAB FOR FOUNDATION WALL ATTACHMENT



For SI: 1 inch = 25.4 mm.

FIGURE R613.8
TYPICAL SIP CONNECTION DETAILS FOR VERTICAL IN-PLANE JOINTS



For SI: 1 inch = 25.4 mm.

FIGURE R613.9
SIP CORNER FRAMING DETAIL

TABLE R613.10
MAXIMUM SPANS FOR $11^{7}/_{8}$ INCH DEEP SIP HEADERS (feet)

LOAD CONDITION	SNOW LOAD (psf)	BUILDING WIDTH (feet)				
		24	28	32	36	40
Supporting roof only	20	4	4	4	4	2
	30	4	4	4	2	2
	50	2	2	2	2	2
	70	2	2	2	N/A	N/A
Supporting roof and one-story	20	2	2	N/A	N/A	N/A
	30	2	2	N/A	N/A	N/A
	50	2	N/A	N/A	N/A	N/A
	70	N/A	N/A	N/A	N/A	N/A

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
Maximum deflection criterion: *L*/360.
Maximum roof dead load: 10 psf.
Maximum ceiling load: 5 psf.
Maximum second floor live load: 30 psf.
Maximum second floor dead load: 10 psf.
Maximum second floor dead load from walls: 10 psf.
N/A indicates not applicable.